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Greenhouse gas emission trends in Europe, 1990–2000

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Contents

Summary **4**

1. Introduction **12**

1.1. General **12**

1.2. Methods **13**

1.3. European Community and Member States' greenhouse gas emission targets **15**

1.4. Data sources and definitions **17**

2. Distance-to-target assessment **18**

2.1. Distance-to-target indicator (DTI) **18**

2.2. EC greenhouse gas emission trends and main driving forces **18**

2.3. Contribution of Member States to the EC greenhouse gas targets **21**

3. Sectoral assessment **25**

3.1. The selection of key source categories **25**

3.2. Energy **28**

3.2.1. Energy industries (CO_2) 28

3.2.2. Manufacturing industries and construction (CO_2) 34

3.2.3. Transport (CO_2) 39

3.2.4. Transport (N_2O) 43

3.2.5. Other sectors (CO_2) (small combustion including households) 45

3.2.6. Fugitive emissions from solid fuels (CH_4) 50

3.3. Industrial processes **52**

3.3.1. Mineral products (CO_2) 52

3.3.2. Chemical industry (N_2O) 54

3.3.3. Consumption of halocarbons and SF_6 (HFC) 56

3.4. Agriculture **58**

3.4.1. Agricultural soils (N_2O) 58

3.4.2. Enteric fermentation (CH_4) 61

3.5. Waste **63**

3.5.1. Solid waste disposal on land (CH_4) 63

References **65**

Units and abbreviations **67**

Annex 1: Greenhouse gas emission indicators for the EC Member States and the EU as a whole **70**

Annex 2: Summary of EC and Member States greenhouse gas emissions data **134**

Annex 3: Greenhouse gas emission trends in the candidate countries 1990–1999 (2000) **139**

Annex 4: Summary of candidate countries greenhouse gas emissions data **166**

Summary

The purpose of this report is to identify progress of the European Community (EC) as a whole towards fulfilling its greenhouse gas emission commitments under the UNFCCC and the Kyoto Protocol and the contribution of each Member State to the EC targets. Main greenhouse gas sources are identified at EU level and emission trends of the Member States are analysed. Some main explanations for these trends are provided in terms of either socio-economic developments or policies and measures. In an annex to this report, similar information is provided for 10 EU candidate countries for the years 1990–99.

Distance-to-target assessment of the EU

In 2000, total EC greenhouse gas emissions ([1]) were 4 059 Tg (CO_2 equivalents), a figure which was 0.3 % above 1999 but 3.5 % below 1990 levels. In the Kyoto Protocol, the EC agreed to reduce its greenhouse gas emissions by 8 % by 2008–12, from 1990 levels. Assuming a linear target path from 1990 to 2010, total EC greenhouse gas emissions were 0.5 index points above this target path in 2000 (Figure A), i.e. the distance-to-target indicator (DTI) is plus 0.5 index points. The most important reason for emission increases in 2000 compared to 1999 was increased use of coal for electricity production. High economic growth in 2000 enhanced the use of energy, whereas a relatively mild winter in most EC Member States counteracted this development to a certain extent.

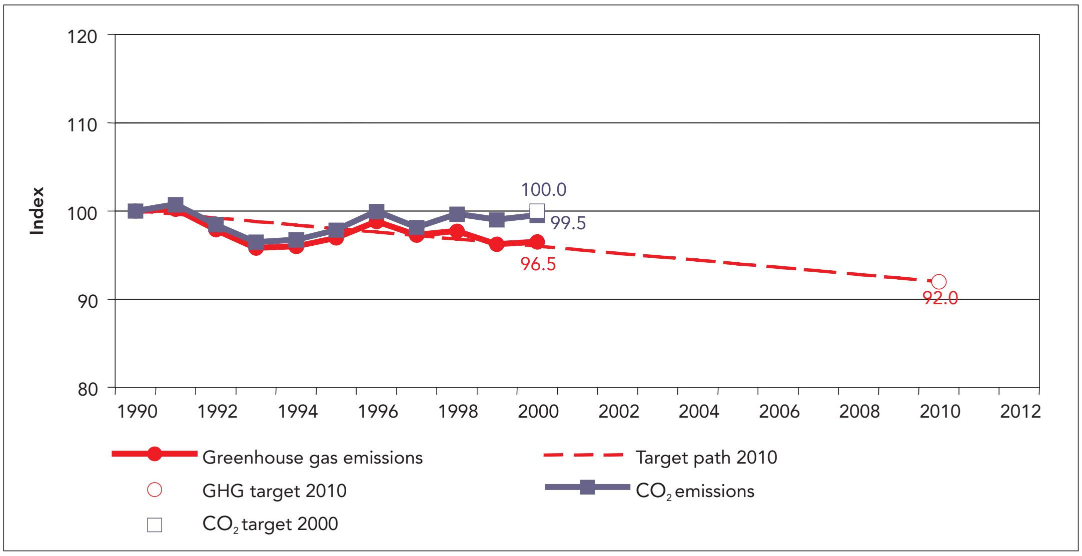
CO_2 is the most important greenhouse gas, accounting for 82 % of total EC emissions in 2000. In 2000, EC CO_2 emissions were 3 325 Tg, up 0.5 % from 1999 and 0.5 % below 1990 levels. This means that the EC achieved its target to stabilise CO_2 emissions at 1990 levels by 2000 (Figure A).

The main driving forces for CO_2 emissions

CO_2 emissions from fossil-fuel combustion account for 77 % of total EU greenhouse gas emissions. The relationship between the main driving forces and CO_2 emissions from fossil-fuel combustion can be demonstrated in a decomposition analysis by decomposing emissions into five factors: (1) population, (2) GDP per capita, (3) energy intensity of

Figure A — **EC greenhouse gas emissions compared with targets for 2000 and 2008–12 (excl. LUCF)**

Source: Inventory submissions by the EC Member States (CRF tables), EEA (2002a).

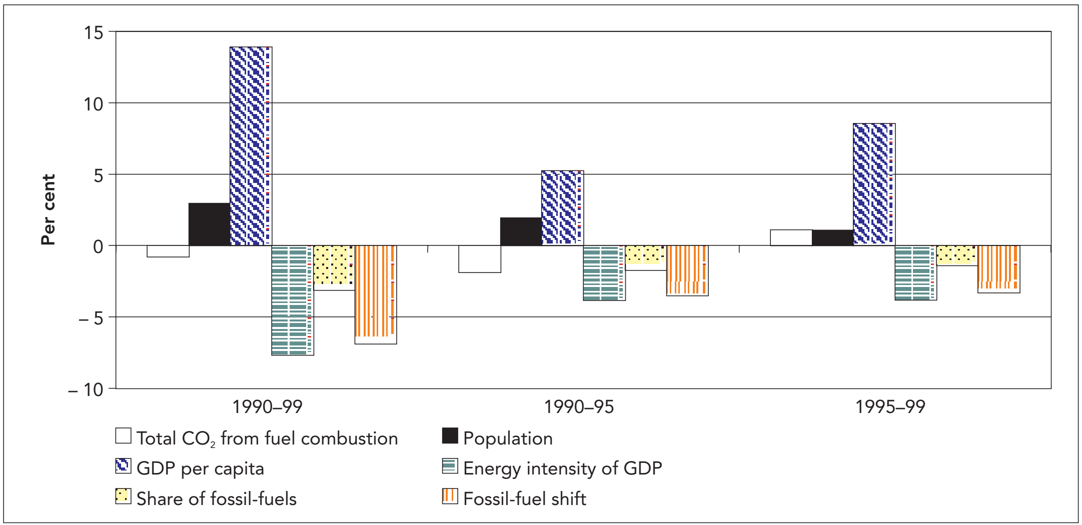


Note: The target path is used to analyse how close 2000 emissions were to a linear path of emission reductions or allowed increases from the base year to the Kyoto Protocol target, assuming domestic measures are used (including emissions trading within the EU). In this report, 1990 is assumed to be the base year for the EU for all Kyoto Protocol greenhouse gases.

(1) Total GHG emissions for the European Community are calculated by the aggregation of national GHG emissions reported by Member States (MS) and are referred to as 'EC' or 'EU' emissions later in this report.

Percentage change of CO_2 emissions from fossil-fuel combustion and the contribution of main driving forces (population, GDP per capita, energy intensity of GDP, share of fossil fuels, CO_2 intensity of fossil fuels) in the EC in the 1990s

Figure B



Source: Eurostat, inventory submissions by the EC Member States (CRF tables), EEA (2002a).

GDP, (4) the share of fossil fuels in energy consumption, (5) the shift within fossil fuels towards lower carbon fuels (CO_2 intensity of fossil fuels).

Figure B shows that CO_2 emissions from fossil-fuel combustion decreased by 0.8 % between 1990 and 1999. GDP growth is an important driving force, but improvements of energy intensity of GDP and the shift within the use of fossil fuels towards lower carbon fuels offset emission increases. Furthermore, the share of fossil fuels decreased, thereby also contributing to lower CO_2 emissions.

The comparison between the first and the second half of the 1990s shows that the pattern of driving forces has changed: the reduction of CO_2 emissions from fossil-fuel combustion was achieved in the first half of the 1990s; in the second half, emissions increased. GDP growth has been a larger driving force in the second half of the 1990s than in the first half, whereas the opposite development took place for population growth.

Contribution of Member States to the EC greenhouse gas targets
Table A shows large variations in greenhouse gas emission trends between Member States. Compared to 1999, eight Member States reduced their emissions in 2000; the range of change was between – 6 % (Denmark) and + 4.8 % (Greece). Seven Member States were below base-year levels in 2000, with a range of – 45.1 % (Luxembourg) and + 33.7 % (Spain).

The overall EC greenhouse gas emission trend is dominated by the two largest emitters — Germany and the UK — accounting for about 40 % of EC greenhouse gas emissions. These two Member States achieved total greenhouse gas emission reductions of 325 Tg compared to 1990.

The main reasons for the favourable trend in Germany are increasing efficiency in power and heating plants and the economic restructuring of the five new *Länder* after the German reunification. The reduction of greenhouse gas emissions in the UK was primarily the result of liberalising the energy market and the subsequent fuel switches from oil and coal to gas in electricity production and N_2O emission-reduction measures in the chemical industry.

Progress of the Member States
If greenhouse gas emissions of the Member States are compared with their linear target path for 2008–12 and the CO_2 target for 2000, the following progress of Member States can be reported:

In 2000, six Member States (Finland, France, Germany, Luxembourg, Sweden, the United Kingdom) were on track towards fulfilling their Kyoto target, i.e. they were below their Kyoto target paths (Table A and Figure C). Nine Member States were well above their Kyoto target paths (Spain, Ireland and Portugal by more than 10 index points). Denmark is above its target path by 8.8 index points for non-adjusted data and by 0.7 index points, if Danish greenhouse gas emissions are adjusted for electricity trade in 1990.

Table A

Greenhouse gas emissions in CO_2 equivalents (excl. LUCF) and Kyoto Protocol targets for 2008–12 for EC Member States

Source: Inventory submissions by the EC Member States (CRF tables), EEA (2002a).

MEMBER STATE	1990 (million tonnes)	2000 (million tonnes)	Change 1999–2000 (%)	Change 1990–2000 [1]) (%)	Targets 2008–12 under Kyoto Protocol and EU 'burden sharing' (%)	Distance-to-target indicator (DTI) (index points)	Evaluation of progress in 2000 [3])
Austria	77,4	79,8	0,0	2,7	– 13,0	9,2	☹
Belgium	143,1	151,9	0,5	6,3	– 7,5	10,0	☹
Denmark [2])	69,4	68,5	– 6,0	– 1.7 (– 9.8)	– 21,0	8.8 (0.7)	☹ (☹)
Finland	77,1	74,0	– 2,9	– 4,1	0,0	– 4,1	☺
France	551,8	542,3	– 1,1	– 1,7	0,0	– 1,7	☺
Germany	1 222,8	991,4	– 0,2	– 19,1	– 21,0	– 8,6	☺
Greece	104,8	129,7	4,8	21,2	25,0	8,7	☹
Ireland	53,4	66,3	1,5	24,0	13,0	17,5	☹
Italy	522,1	543,5	0,7	3,9	– 6,5	7,2	☹
Luxembourg	10,8	5,9	– 0,6	– 45,1	– 28,0	– 31,1	☺
Netherlands	210,3	216,9	– 0,4	2,6	– 6,0	5,6	☹
Portugal	65,1	84,7	– 1,1	30,1	27,0	16,6	☹
Spain	286,4	386,0	4,1	33,7	15,0	26,2	☹
Sweden	70,6	69,4	– 1,6	– 1,9	4,0	– 3,9	☺
United Kingdom	742,5	649,1	0,4	– 12,9	– 12,5	– 6,7	☺
EU-15	**4 207,6**	**4 059,3**	**0,3**	**– 3,5**	**– 8,0**	**0,5**	**☹**

1) For the fluorinated gases most Member States have selected a base year other than 1990 (namely 1995), as allowed for under the protocol. The percentage change in this column and the analysis of the MS in Annex 1 refer to the change from the base year to 2000. As the EU as a whole has not yet chosen a base year, the analysis of EU-15 emission trends in this report assumes 1990 as the base year for all gases for the EU. For base-year emissions of the Member States, see Annex 2.

2) For Denmark, data that reflect adjustments for electricity trade (import and export) in 1990 are given in brackets. This method is used by Denmark to monitor progress towards its national target under the EC 'burden sharing' agreement. For the EU-15 emissions, total non-adjusted Danish data have been used.

3) The EEA's evaluation of progress to 2000 awards 'smileys' according to the distance-to-target indicator in 2000 (for more details see Section 1.2). The following rating system is used:
☺ Positive contribution to EU trend: the negative distance-to-target indicator means that the Member State is below its linear target path.
☹ Negative contribution to EU trend: the positive distance-to-target indicator means that the Member State is above its linear target path.

Sectoral assessment

In order to analyse the sectoral greenhouse gas trends in more detail, the most important greenhouse gas source categories (key sources) have been identified. For the EU as a whole, 22 key source categories have been identified, covering 97 % of total EC GHG emissions (Table B and Figure D).

The emission trends of the key source categories vary widely. Table B shows the ranking of key source categories in descending order of their contribution to emissions in 1990 and 2000 and to the cumulative total emissions in 2000 (in percentage).

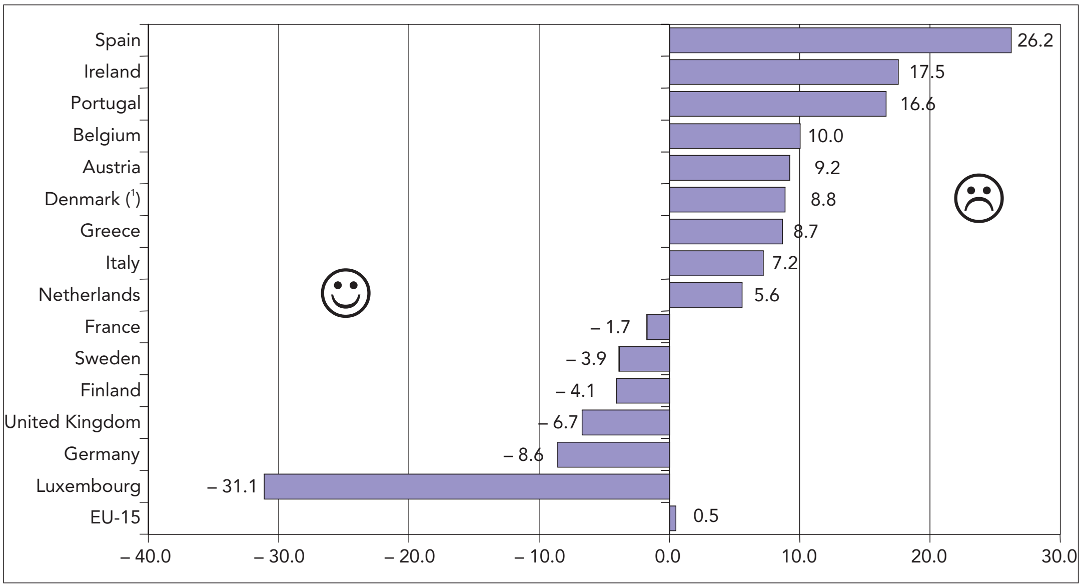
The changes of the eight most important key sources, covering approximately 90 % of all greenhouse gas emissions, are summarised below.

Energy industries (CO_2):

- Share in total GHG emissions in 2000: 27 %.
- Change 1990–2000: – 5 %.
- Main driving force: production and consumption of electricity.
- CO_2 emissions from energy industries decoupled considerably from electricity consumption. This was mainly due to fuel shifts in power production from coal to natural gas, and larger shares of electricity generation from renewable energy sources and nuclear power, as well as efficiency improvements. Electricity consumption continued to increase (+ 19 % between the years 1990 and 1999).

Distance-to-target indicators (DTI in index points) for the Kyoto Protocol and EC burden sharing targets of EC Member States

Figure C



Source: Inventory submissions by the EC Member States (CRF tables), EEA (2002a).

[1]) The Danish DTI is + 0.7 index points, if Danish greenhouse gas emissions are adjusted for electricity trade in 1990.

Note: The distance-to-target indicator (DTI) measures the deviation of actual emissions in 2000 from the (hypothetical) linear target path between 1990 and 2010. The DTI gives an indication on progress towards the Kyoto and Member States' sharing targets. It assumes that the Member States meet their target entirely on the basis of domestic measures. See Section 1.2 for an explanation of the DTI.

EC greenhouse gas source categories identified as key sources (emissions in Gg of CO_2 equivalents, on the basis of the IPCC tier 1 method)

Table B

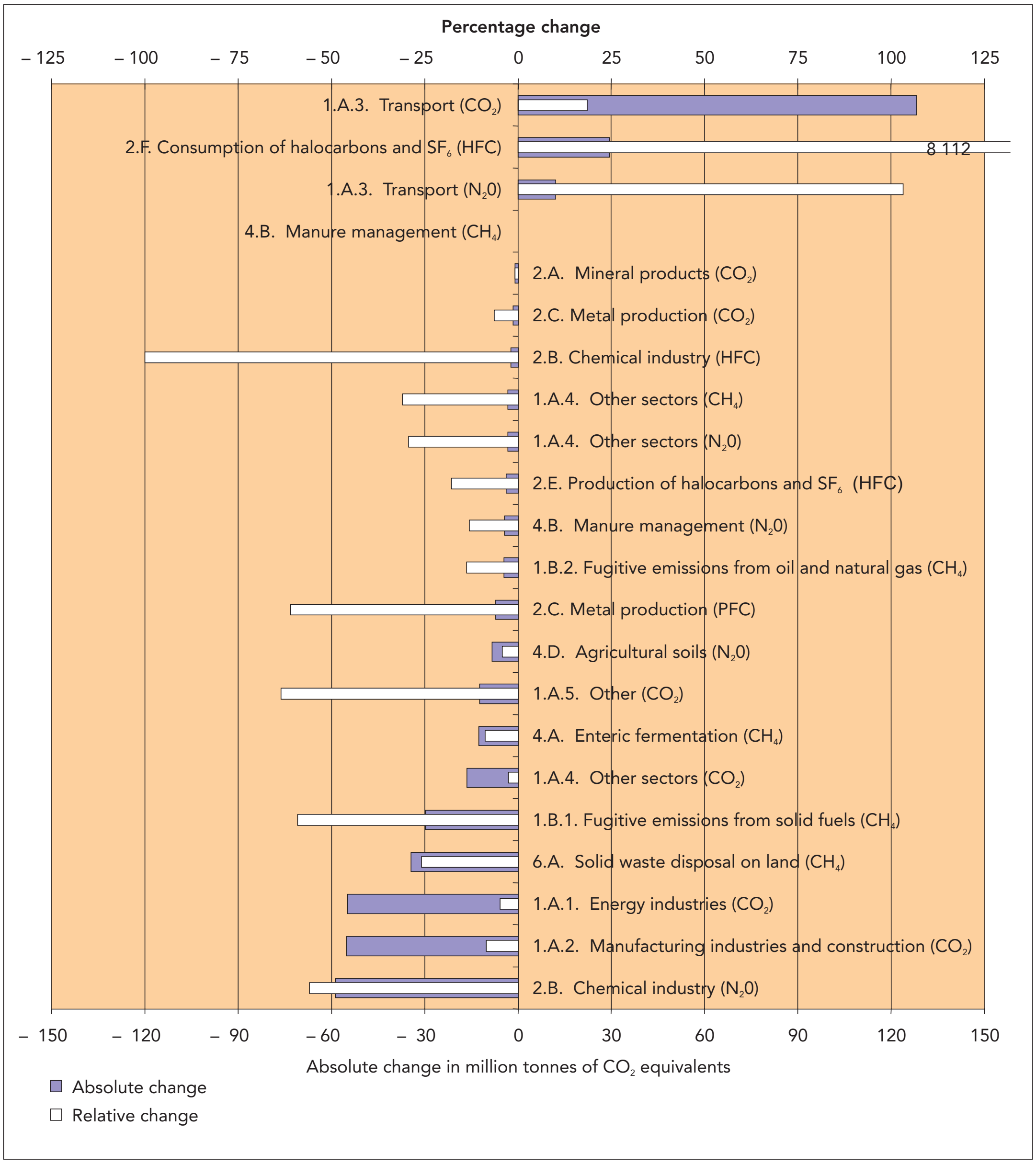
Greenhouse gas source categories	Gas	GHG emissions in 1990 (Gg)	GHG emissions in 2000 (Gg)	Cumulative total in 2000 (%)
1.A.1. Energy industries	CO_2	1 147 013	1 092 146	26,9
1.A.3. Transport	CO_2	694 767	822 954	47,2
1.A.4. Other sectors	CO_2	635 943	619 478	62,4
1.A.2. Manufacturing industries and construction	CO_2	649 732	594 615	77,1
4.D. Agricultural soils	N_2O	198 043	189 726	81,8
4.A. Enteric fermentation	CH_4	143 991	131 367	85,0
2.A. Mineral products	CO_2	111 937	111 009	87,7
6.A. Solid waste disposal on land	CH_4	133 016	98 641	90,2
2.B. Chemical industry	N_2O	105 126	46 422	91,3
4.B. Manure management	CH_4	33 095	33 118	92,1
2 F Consumption of halocarbons and SF_6	HFC	362	29 723	92,9
4.B. Manure management	N_2O	33 457	29 100	93,6
1.B.2. Oil and natural gas	CH_4	32 429	27 962	94,3
2.C. Metal production	CO_2	25 663	24 024	94,9
1.A.3. Transport	N_2O	11 681	23 721	95,4
1.B.1. Solid fuels	CH_4	50 310	20 601	95,9
2 E Production of halocarbons and SF_6	HFC	21 373	17 562	96,4
1.A.4. Other sectors	N_2O	11 217	7 926	96,6
1.A.4. Other sectors	CH_4	10 508	7 251	96,7
1.A.5. Other	CO_2	19 431	7 091	96,9
2 C Metal production	PFC	11 825	4 613	97,0
2 B Chemical industry	HFC	2 340	0	97,0

Source: EEA (2002a).

Figure D

Absolute and relative (percentage) change from 1990 to 2000 of EC key source emissions (in million tonnes of CO_2 equivalents and per cent respectively)

Source: Inventory submissions by the EC Member States (CRF tables), EEA (2002a).



Note: The absolute change is shown by the axis at the bottom of the graph (in million tonnes of CO_2 equivalents), while the relative change (in per cent) is shown by the axis at the top of the graph.

Transport (CO_2):

- Share in total GHG emissions in 2000: 20 %.
- Change 1990–2000: + 18 %.
- Main driving force: transport volumes on road (passenger and freight transport).
- The year 2000 was the first year of the decade where emissions from transport did not increase. Passenger transport in cars increased by 17 % between 1990 and 1999, freight transport by 42 %.

Small combustion (including households) (CO_2):

- Share in total GHG emissions in 2000: 15 %.
- Change 1990–2000: – 3 %.
- Main driving forces: number and size of dwellings, building codes, age distribution of the existing building stock, fuel split for heating and warm water, climate.
- The pattern of CO_2 emissions from small combustion follows very closely the pattern of heating degree days: the coldest years in the decade had the highest CO_2 emissions from small combustion.

Manufacturing industries and construction (CO_2):
- Share in total GHG emissions in 2000: 15 %.
- Change 1990–2000: – 8 %.
- Main driving force: energy use in industry.
- The emission reductions were already achieved in 1993, which was mainly due to efficiency improvements and structural change in Germany after the reunification and low economic activity in the EU.

Agricultural soils (N_2O):
- Share in total GHG emissions in 2000: 4.7 %.
- Change 1990–2000: – 4 %.
- Main driving force: fertiliser use.
- Use of fertilisers decreased by 2 % between 1990 and 1999, which was partly due to the effects of the 1992 reform of the common agricultural policy and the resulting shift from production-based support mechanisms to direct area payments in arable production.

Enteric fermentation (CH_4):
- Share in total GHG emissions in 2000: 3.2 %.
- Change 1990–2000: – 9 %.
- Main driving force: number of cattle.
- The number of cattle declined almost in parallel with the CH_4 emissions from enteric fermentation.

Mineral products (CO_2):
- Share in total GHG emissions in 2000: 2.7 %.
- Change 1990–2000: – 1 %.
- Main driving force: cement production.
- Emissions declined in the early 1990s, but increased again in recent years. Cement production was 2 % above 1990 levels in 1999.

Solid waste disposal on land (CH_4):
- Share in total GHG emissions in 2000: 2.4 %.
- Change 1990–2000: – 26 %.
- Main driving force: amount of biodegradable waste going to landfills.
- The reductions were mainly achieved by reducing solid waste disposal on land and by recovering CH_4 from landfills. The emission reductions are also partly due the implementation of the landfill waste directive or similar legislation of the MS.

Greenhouse gas emission trends in the candidate countries 1990–99

Annex 3 of this report is the first step towards regular assessment of greenhouse gas emission trends in 10 candidate countries: Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.

The main data source for this report are data supplied by the candidate countries under the UNFCCC, data reported to the UNECE/ EMEP, and data (CRF tables) submitted voluntarily under Council Decision 1999/ 296/EC by May 2002. Background data were obtained from the IEA and Eurostat. No emission data are available for Cyprus, Malta and Turkey.

The completeness of the data sets differs among the countries (Table C). Some countries reported emissions for the whole period 1990–2000 in consistent time series. Several countries still need to remove gaps and inconsistencies both in estimation methods and sectoral emissions.

As transition economies, the 10 candidate countries can apply certain flexibility in the implementation of their commitments and therefore some candidate countries use a base year other than 1990.

Distance-to-target assessment of 10 candidate countries

In the Kyoto Protocol eight candidate countries agreed to reduce their greenhouse gas emissions by 8 % by 2008–12, from base-year levels. Hungary and Poland agreed to reduce their emissions by 6 % from base-year levels. All countries have to reach their targets individually as defined in the Kyoto Protocol, and all candidate countries aim to stabilise emissions in line with Article 4.2 of the UNFCCC.

Table C **Data and base year of the candidate countries**

Source: Submissions by candidate countries (CRF tables, IPCC tables), UNFCCC database, EMEP database.

Country	Base year	Emissions CO_2, CH_4, N_2O	Emissions of fluorinated gases
Bulgaria	1988	1988, 1990–99	1998–99
Czech Republic	1990	1990–2000	1995–2000
Estonia	1990	1990–2000	NA
Hungary	Average 1985–87	Average 1985–87, 1990–2000	1998–2000
Latvia	1990	1990–2000	1999–2000
Lithuania	1990	1990, 1995–98	NA
Poland	1988	1988, 1990–99	1995–2000
Romania	1989	1989,1990–94	NA
Slovakia	1990	1990–2000	1990–2000
Slovenia	1986	1986, 1990–96	1990–96
Cyprus	NA	NA	NA
Malta	NA	NA	NA
Turkey	NA	NA	NA

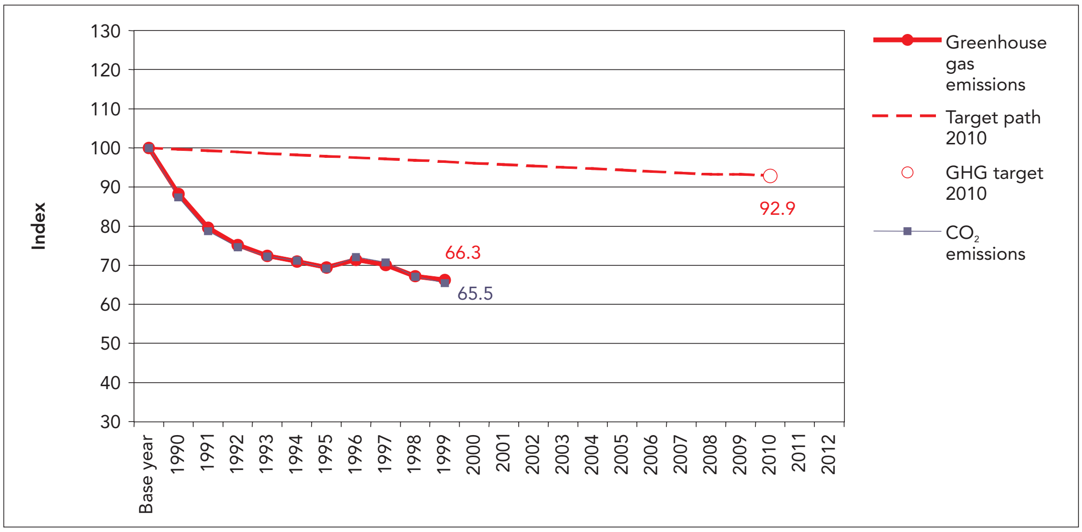
Note: NA means data are not available from any of these sources.

In the CC10, total greenhouse gas emissions declined by 33.7 % between the base year and 1999 (Figure E). The aggregated base-year emission for the 10 candidate countries is assumed to be the sum of the base-year emissions of the individual candidate countries (Table D). In 1999, the distance-to-target indicator (DTI) for the whole region was – 30.2 index points. This means that the 10 candidate countries as a region were far below their hypothetical Kyoto target path in 1999.

The performance of the candidate countries, however, varies considerably (Figure F). Nine countries were below their Kyoto target path, with DTI ranging from – 13 index points in Hungary to – 60 index points in Latvia. Only Slovenia was above its target path, with + 2.9 index points. The calculated DTI for the whole region as well as for Romania, Slovenia and Lithuania are indicative, since the three countries did not provide complete emission time series.

Figure E **Greenhouse gas emissions of 10 candidate countries compared with their Kyoto targets for 2008–12 (excl. fluorinated gases and LUCF)**

Source: Submissions by candidate countries (CRF tables, IPCC tables), UNFCCC database, EMEP database.



Note: Lithuania 1998, Romania 1994, Slovenia 1996 did not report the complete time series, for missing years the values were interpolated (in the middle of series) or data from the last submitted year were used.

Table D

Greenhouse gas emissions in CO_2 equivalents (excl. fluorinated gases and LUCF) and Kyoto Protocol targets for 2008–12 for candidate countries

Source: Submissions by candidate countries (CRF tables, IPCC tables), UNFCCC database, EMEP database.

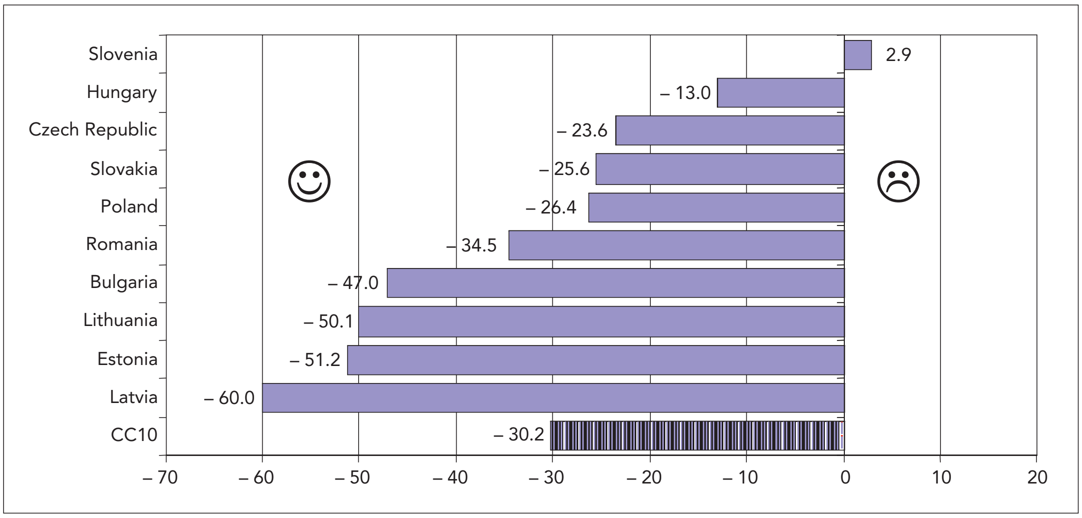
Country	Base year (million tonnes)	1990 (million tonnes)	1999 (million tonnes)	Change 1998–99 (%)	Change base year–1999 (%)	Targets 2008–12 under Kyoto Protocol (%)	Distance-to-target indicator (DTI) (index points)	Evaluation of progress in 1999
Bulgaria	157,1	137,7	77,6	-3,9	-50,6	-8,0	-47,0	☺
Czech Republic	192,0	192,0	139,8	-5,5	-27,2	-8,0	-23,6	☺
Estonia	43,5	43,5	19,7	-8,6	-54,8	-8,0	-51,2	☺
Hungary	101,6	86,6	85,7	3,6	-15,7	-6,0	-13,0	☺
Latvia	31,0	31,0	11,3	-6,6	-63,6	-8,0	-60,0	☺
Lithuania	51,5	51,5	23,9	-	-53,7	-8,0	-50,1	☺
Poland	564,3	459,0	400,2	-0,6	-29,1	-6,0	-26,4	☺
Romania	264,9	229,1	164,0	-	-38,1	-8,0	-34,5	☺
Slovakia	72,6	72,6	51,4	-2,6	-29,2	-8,0	-25,6	☺
Slovenia	19,9	18,3	19,8	-	-0,7	-8,0	2,9	☹
CC10	**1 498,4**	**1 321,4**	**993,3**	**-1,5**	**-33,7**	**-7,1**	**-30,2**	☺

Note: Lithuania 1998, Romania 1994, Slovenia 1996 did not report the complete time series; for missing years, the values from the last submitted year were used. The percentage change of 1998–99 does not include the data for these countries.

Note: The common target under Kyoto Protocol for all candidate countries was calculated for the presentation of the development in the 10 candidate countries as a region for this report only, and does not have any legally binding implication.

Figure F

Distance-to-target indicators (in index points) for the Kyoto Protocol of candidate countries



Source: Submissions by candidate countries (CRF tables, IPCC tables), UNFCCC database, EMEP database.

Note: The distance-to-target indicator is related to the year 1999 for all candidate countries, except for Lithuania 1998, Romania 1994, Slovenia 1996. The year 1999 was used for comparison, since for this year data for seven countries were available. For 2000, data for only five countries were available.

Emission trends

- Bulgaria, the Czech Republic, Estonia, Latvia, Poland, and Slovakia achieved substantial greenhouse emission cuts in 1999 compared to 1998. All these countries have already achieved or will achieve the aim of the UNFCCC to keep greenhouse gas emissions below 1990 levels by the year 2000 (not all of these countries provided data for 2000).
- In most candidate countries, the CO_2 emissions decreased more than total greenhouse gas emissions.
- All countries reduced significantly emissions of greenhouse gases in the first half of the 1990s. The further development of greenhouse gas emissions was different between countries, depending on the country's specific economic developments.

1. Introduction

1.1. General

This report is an indicator-based assessment of European Community greenhouse gas emissions trends based on data from the EC Member States compiled by the European Topic Centre on Air and Climate Change (ETC/ACC) in the *Annual European Community greenhouse gas inventory 1990–2000 and inventory report 2002* (EEA, 2002a) and additional data from Eurostat. The report is a follow-up report of similar reports in 2000 and 2001 (see EEA, 2001a).

This report is again based on emission and background data provided by the MS in their annual inventory submission under the monitoring mechanism and on Eurostat data. The sectoral analysis refers to the concept of 'key source categories', as identified in EEA (2002a). In addition, the report includes three new elements: (1) CO_2 intensity indicators mainly based on Eurostat data especially in the chapter on CO_2 from energy use in manufacturing industry; (2) a new approach for the analysis of the main driving forces of CO_2 emissions from fossil-fuel combustion; (3) a separate annex on progress and greenhouse gas emission trends in the candidate countries.

The purpose of this report is:

- To identify actual progress of Member States and the EC as a whole towards fulfilling their greenhouse gas emission commitments for 2000 under the UNFCCC and present an assessment of progress by each Member State and the EC towards their targets under the Kyoto Protocol (distance-to-target assessment). For this purpose, for the EC and each Member State, distance-to-target indicators (DTI) are calculated as a measure of the deviation of actual emissions in 2000 from the linear target path 1990 to 2010. This report does not analyse emission projections taking into account policies and measures, which is the subject of a separate report by the EEA (Greenhouse gas projections for Europe).

- To present trends of greenhouse gas emissions in the EC and its Member States by gas and by key sources (sectoral assessment). Sectoral indicators, for socio-economic driving forces behind greenhouse gas emissions, and CO_2 intensity indicators are identified and presented by using data from Eurostat or from Member States' detailed inventories.

- To identify decreasing or less increasing emission trends by comparing and analysing Member States' key source emissions and, to provide main explanations, either socio-economic developments or policies and measures, for these trends in some Member States (policy-effectiveness assessment). These explanations are based on the indicators derived from data provided by Member States (CRF) and by Eurostat.

- To present progress of the candidate countries towards fulfilling their greenhouse gas emission commitments under the UNFCCC and the Kyoto Protocol (distance-to-target assessment). And to present trends of greenhouse gas emissions for these countries by gas and by key sources (sectoral assessment).

The legal basis of this report is Council Decision 1993/389/EEC as amended by Decision 1999/296/EC for a monitoring mechanism of Community CO_2 and other greenhouse gas emissions [2]. This decision establishes a mechanism for: (1) monitoring, in the Member States, all anthropogenic greenhouse gas emissions not controlled by the Montreal Protocol (CO_2, carbon dioxide; CH_4, methane; N_2O, nitrous oxide; HFCs, PFCs and SF_6, industrial fluorinated gases), and (2) evaluating actual and projected progress towards meeting commitments in respect of these emissions.

According to Article 6 of Council Decision 1999/296/EC, the Commission shall assess annually whether the actual and projected progress of Member States is sufficient to ensure fulfilment of the EC commitments under the United Nations Framework

(2) OJ L 117, 5.5.1999, p. 35.

Convention on Climate Change (UNFCCC) and the Kyoto Protocol and shall report to the European Parliament and the Council. The annual evaluation report of the Commission has to be forwarded to the European Parliament and the Council by October each year. The last annual Commission progress report under the decision was published in November 2001 (EC, 2001c).

This report, prepared by the EEA and its European Topic Centre on Air and Climate Change (ETC/ACC), serves as an input to the annual evaluation report of the European Commission. In addition, it is a basis for the EEA issues report on 'Greenhouse gas emission trends and projections in Europe'.

The outline of this report
The report starts with a summary, providing the main conclusions on the indicator-based assessment of the emission trends and the progress in Europe towards achieving the UNFCCC and Kyoto Protocol targets.

Chapter 1 briefly characterises the methods behind the distance-to-target assessment and the analysis of the main driving forces of CO_2 emissions from fossil-fuel combustion. In addition, greenhouse gas emission targets of the EC and its Member States and the primary data basis for this report are presented.

Chapter 2 uses indicators to evaluate progress of the European Union as a whole towards fulfilling its greenhouse gas emission commitments and to analyse trends and driving forces of greenhouse gas emissions in the EU. In addition, individual contributions of the Member States to the EC greenhouse gas emission targets are evaluated.

Chapter 3 aims at analysing the sectoral performance of the EC as a whole and of its Member States. First, the selection of the EC key sources for the presentation in this report is described. Then, the trends of emissions and driving forces are analysed for each key source selected with the following elements: (1) presentation of emission trends and sectoral driving force at EU level; (2) the contribution of each Member State to the key source, in order to identify decreasing or less increasing emission trends in the Member States; (3) an overview of trends of emissions and sectoral driving forces at MS level. Moreover, for several key sources, additional information is given. Sectoral driving-force indicators are presented based on data submitted by the Member States (FCCC common reporting format or CRF tables) and additional data from Eurostat. The data basis for the CO_2 intensity indicators is primarily Eurostat.

Annex 1 presents for each Member State indicators following the general outline of the analysis on EC greenhouse gas trend assessment. This includes distance-to-target indicators, an analysis of greenhouse gas emissions by gas, the contribution of the main driving forces to CO_2 from fossil-fuel combustion. For each Member State, a summary (four pages) is presented with the following uniform structure: the first page contains a description of the main trends of the indicators, the second page presents the three main figures (total emissions compared with targets; emission trends by gas; contribution of main driving forces), the third and fourth pages include the main indicators. In addition, the tables of EC greenhouse gas emission and driving-force indicators are presented.

Annex 2 provides short summary tables of greenhouse gas emissions by gas (CO_2, CH_4, N_2O, HFCs, PFCs and SF_6) for the EC and its Member States. More detailed tables of CO_2, CH_4 and N_2O emissions and emission data on HFCs, PFCs and SF_6 for the EC and its Member States have been compiled by the ETC/ACC and are available in EEA (2002a). These data are also available on the EEA web site (http://www.eea.eu.int/).

Annex 3 includes an evaluation of the progress and emission trends of the candidate countries. The outline of the evaluation is similar to the analysis made for the EC Member States.

Annex 4 provides short summary tables of greenhouse gas emissions by gas (CO_2, CH_4, N_2O) for the candidate countries.

1.2. Methods

The distance-to-target analysis
This report aims at evaluating actual progress of the European Community towards fulfilling its greenhouse gas emission targets by comparing past (actual) performance with the greenhouse gas emission target path for 2008–12. It does not refer to emission projections, i.e. it does not evaluate projected

Note: This report does not aim at evaluating compliance of Member States with targets, and it does not analyse emission projections. EC and Member State projections (for 2010), taking into account adopted policies and measures, are analysed by the Commission in line with the requirements of the monitoring mechanism (Article 6). In addition, the EEA prepares a separate report on greenhouse gas emission trends and projections in Europe.

Instead, this report aims at evaluating the Member State contribution to the actual EC greenhouse gas emissions in 2000. This is done by comparing actual values in 2000 with hypothetical values for 2000 on the linear target paths. These linear paths are not set as such in any official document, but used in this report in order to perform a consistent and comparable assessment of the contribution of the Member States to the progress of the European Community as a whole towards the targets within the period 1990 to 2000. The reference to the hypothetical target path 1990–2010 assumes that MS meet their target entirely on the basis of domestic measures (including emissions trading within the EU). At the UNFCCC conference in Marrakesh, countries agreed to the rules for the use of the flexible mechanisms (joint implementation, clean development mechanism, international emissions trading) and carbon sinks for meeting the Kyoto targets. After entry into force of the Kyoto Protocol, countries could therefore also use these options to meet their targets. It is not yet known to what extent this will take place, because only few countries have provided such information.

progress. The distance-to-target indicator (DTI) is a measure for the deviation of actual emissions in 2000 from the (hypothetical) linear path between 1990 and 2010 (i.e. the mid-point of the Kyoto range 2008–12). This analysis gives an indication on progress towards the Kyoto and Member States' sharing targets.

The distance-to-target indicators are presented for each Member State, in order to evaluate their contribution to the fulfilment of the targets by the European Community.

The distance-to-target assessment consists of four steps (see Figure 1 for a theoretical example of a country's situation):

1. Plotting the index of actual performance (i. e. 1990–2000 index of greenhouse gas emissions) against the index of the Kyoto target path (hypothetical linear line between 1990 and 2010).

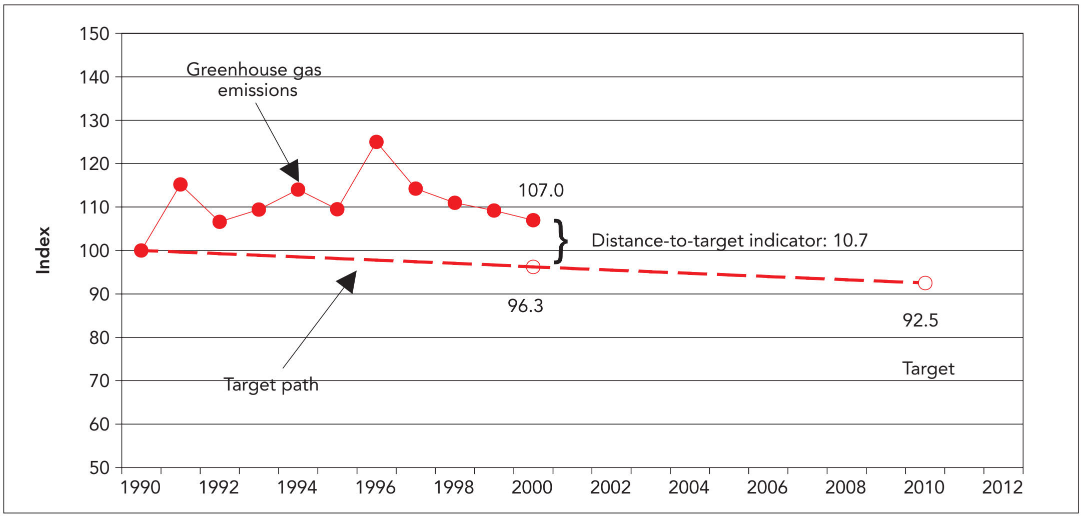
2. Calculating the hypothetical, interpolated, value on the target path in 2000 (in Figure 1: 96.3).

3. Calculating the deviation of the emission index value in 2000 (in Figure 1: 107) from the value on the target path. In the example, the deviation is 10.7 index points, i.e. the distance-to-target indicator (DTI) is 10.7 index points.

4. Awarding smileys according to the achievements with the following ratings:
   - ☺ Positive contribution to EU trend: the negative distance-to-target indicator means that the Member State is below its linear target path
   - ☹ Negative contribution to EU trend: the positive distance-to-target indicator means that the Member State is above its linear target path

The performance of the example country in Figure 1 would be evaluated with L, since the trend is not following the hypothetical linear path towards the Kyoto target.

Figure 1 **Index of greenhouse gas emissions compared with the Kyoto target 2010 (theoretical example)**



The analysis of the main driving forces
This report contains a presentation of the main driving forces of the CO_2 emissions from fossil-fuel combustion in the EU and in its Member States. The development of total CO_2 emissions of an economy can be decomposed both to demonstrate the development of the individual factors and to quantify the relevance of these factors for changes in emissions.

The amount of emissions in a country each year can be decomposed into the following five multiplicatory factors:

The amount of emissions in a country can be expressed as

- P — population
- y — GDP per capita
- e — gross energy consumption per GDP (energy intensity)
- a — share of fossil fuels in gross energy consumption
- c — CO_2 intensity of fossil fuels (fuel shift within fossil fuels)

The amount of emissions (C) in a country can be expressed as:

$$C = P * y * e * a * c$$

and variation of CO_2 emissions between 1990 and 1999 can be expressed as:

$$C[1999] - C[1990] = P[1999] * y[1999] * e[1999] * a[1999] * c[1999] -$$

$$P[1990] * y[1990] * e[1990] * a[1990] * c[1990]$$

To quantify the relevance of the different factors for the changes, individual components can be determined to show:

- the effect of population fluctuations on the changes in CO_2 emissions between 1999 and 1990;
- the effect of changes in per capita income;
- the effect of changes in energy intensity;
- the effect of changes in the share of fossil fuels;
- the effect of changes in the CO_2 emission factor.

By changing only one factor (while keeping the other factors constant), an estimate for the contribution of this factor to total emission change can be calculated.

For the analysis in this report, a decomposition analysis has been used with a proportional allocation of the residual term ([3]). The calculations have been performed for 1990–99, 1990–95 and 1995–99. The contribution of each factor is expressed in per cent of 1990 or 1995 emissions.

The results of this analysis, however, should be interpreted with care. As there are several approaches of decomposition analysis, which might provide slightly different results, this analysis does not provide exact estimates. Instead, the results should be seen as rough indications on the magnitude of the contribution of each factor to the emission change. In addition, there might be small inconsistencies resulting from the data used in the analysis. The data on gross inland energy consumption and fossil-fuel consumption are taken from Eurostat. The CO_2 intensity of fossil-fuel use is calculated on basis of the CO_2 emissions submitted by the Member States.

1.3. European Community and Member States' greenhouse gas emission targets

The Kyoto greenhouse gas emission target for 2008–12
In the Kyoto Protocol (December 1997), the European Community agreed to reduce its greenhouse gas emissions by 8 % below 1990 levels by 2008–12. According to Council Decision 2002/358/CE ([4]), the European Community and its Member States notified the United Nations their joint fulfilment of commitments under the Kyoto Protocol. This means that not all Member States will have to reduce their greenhouse gas emissions by 8 % as long as the EC as a whole meets the target.

In June 1998, the Council of Ministers agreed on different emission limitation and/or reduction targets for each Member State basically according to economic circumstances, called the 'burden sharing' agreement. These targets were reaffirmed in

(3) The approach in this report is based on the approach taken by Schleich et al. (2001) and Eichhammer et al. (2001). For more details on methodological aspects see Diekmann et al. (1997).
(4) OJ L 130, 15.5.2002, p. 1.

Council Decision 2002/358/CE. Table 1 summarises all Member States targets. It shows that eight Member States agreed to reduction targets by 2008–12 (Austria, Belgium, Denmark, Germany, Italy, Luxembourg, the Netherlands, the United Kingdom). Two Member States (Finland, France) agreed to stabilise greenhouse gas emissions by 2008–12, whereas five Member States (Greece, Ireland, Portugal, Spain, Sweden) agreed to limit their increases by 2008–12.

The CO_2 stabilisation targets

In 1990, the Council of Ministers (joint energy/environment) of 29 October agreed on the objective to stabilise EC CO_2 emissions by 2000 at 1990 levels. Additionally, Article 4 of the UNFCCC establishes that Annex I parties to this convention (including all EC Member States and the European Community as parties) have to adopt policies and measures with the aim of returning their anthropogenic CO_2 and other greenhouse gas emissions, individually or jointly, by the year 2000 to 1990 levels. The Member States of the European Community aim to achieve the stabilisation target throughout the EC as a whole.

The objective of stabilising CO_2 emissions at 1990 levels by 2000 was agreed for the European Union as a whole, but Member States contribute in different ways to achieve this target. Most Member States have set national CO_2 limitation targets. Three Member States (Belgium, Denmark and the Netherlands) have set reduction targets (corrected for temperature variations). Five Member States aim at stabilising their CO_2 emissions by 2000 at 1990 levels (Austria, Italy, Luxembourg, Sweden the United Kingdom), whereas France has set a stabilisation target on basis of per capita fossil-fuel use. Greece, Ireland and Spain aim at limiting the increase of CO_2 emissions by 2000 (see Table 1).

Table 1 **National greenhouse gas emission targets of EC Member States** (5)

Member State	National CO_2 emission targets by 2000	National greenhouse gas emission targets (including removals) by 2008–12 according to Council Decision 2002/358/EC
Austria	Stabilisation at 1990 level	– 13 %
Belgium	5 % reduction compared to 1990 levels (corrected for temperature variations)	– 7.5 %
Denmark	5 % reduction compared to 1990 (corrected for temperature variations and calculated as if all electricity used in Denmark was produced in Denmark)	– 21 %
Finland	Limitation of the increase of CO_2 emissions from energy production and consumption by the end of the 1990s	0 %
France	Stabilisation of fossil-fuel-related CO_2 emissions at less than 2tC per capita per year by 2000	0 %
Germany	No 2000 target	– 21 %
Greece	Limitation of the increase in CO_2 emissions to 15 %, during the period 1990 to 2000	+ 25 %
Ireland	Limitation of the increase in CO_2 emissions to 20 % during the period 1990–2000 (or to 11 % if carbon sinks are also included in calculation)	+ 13 %
Italy	Stabilisation at 1990 level	– 6.5 %
Luxembourg	Stabilisation at 1990 level	– 28 %
Netherlands	3 % reduction compared to 1990 levels (corrected for temperature variations)	– 6 %
Portugal	No 2000 target	+ 27 %
Spain	Limitation of the increase in CO_2 emissions to 11 to 13 % during the period 1990–2000	+ 15 %
Sweden	Stabilisation at 1990 level	+ 4 %
United Kingdom	Stabilisation at 1990 level	– 12.5 %

(5) In the Council decision on the approval by the EC of the Kyoto Protocol, the different commitments of the Member States are expressed as percentage change from the base year. In 2006, the respective emission levels shall be expressed in terms of tonnes of carbon dioxide equivalent. In this connection, the Council of Environment Ministers and the Commission have in a joint statement agreed to take into account the assumptions in Denmark's statement to the Council conclusions from 16 and 17 June 1998 relating to base-year emissions.

1.4. Data sources and definitions

> **Greenhouse gas data restrictions**
>
> Greenhouse gas emission data, as referred to in this report, do not include emissions and removals from land-use change and forestry (LUCF) (CRF Category 5) for two reasons: (1) inconsistent calculation methods of Member States;
> (2) Member States decided not to update their LUCF data before the IPCC good practice guidance for the LUCF sector has become available. Therefore, data on carbon sinks in line with the COP 7 decisions were not available for this report.
>
> In addition, no adjustments for temperature variations or electricity trade are made for the EC as a whole. However, for Denmark, additional emission data adjusted for temperature variations or electricity trade are presented separately (as the Danish target refers to adjusted data and data was submitted).

The two main data sources of this report are data supplied by the EC Member States under the monitoring mechanism (for greenhouse gas data and sectoral background data) and data from Eurostat's NewCronos database (for main and sectoral driving-force data and data for the CO_2 intensity indicators). The data availability (time series) for each MS and the EU as a whole can be seen in Annex 1.

Greenhouse gas emissions
For the preparation of this report, EC greenhouse gas inventories as compiled under the EC monitoring mechanism (by the EEA ETC/ACC) and submitted by the European Commission to the UNFCCC (April 2002) have been used. The data are presented in EEA (2002a) and are also available on the EEA web site (http://www.eea.eu.int/). In addition, Annex 2 includes the main data. The EC inventory contains data submitted by the Member States to the European Commission by 5 April 2002. All MS provided data by this time for the most recent years. A data gap filling procedure was applied in accordance with the guidelines of the monitoring mechanism for Luxembourg (CO_2, CH_4 and N_2O for 1991–93) and Belgium and Portugal (fluorinated gases for 1990– 94). See EEA (2002a) for more details.

Main and sectoral driving-force data
There are two main data sources for sectoral background data.

(1) The data as supplied by the Member States under the monitoring mechanism in the common reporting format (CRF tables) by April 2001. For 12 Member States, sectoral background data were available. In all, 10 Member States provided time series from 1990 to 2000.

(2) Data downloaded from Eurostat's NewCronos database; this database was also used to derive the main driving-force data. In addition, the data used for the calculation of the CO_2 intensity indicators were provided by Eurostat (both emission and driving-force data).

The geographical coverage of emission statistics and other statistics is not fully consistent (i.e. inclusion of overseas territories in emission data). However, this is not expected to distort overall trends and main conclusions.

Some important definitions included in the annex are given below:

All output of power plants	Refers to heat and power produced in the power plants
Small combustion	Refers to the key source category '1.A.4. Other sectors' and includes emissions from fossil-fuel combustion in households, small businesses, public institutions and agricultural businesses
Volume passenger transport	Refers to the annual volume of passenger-kilometres travelled in cars
Volume freight transport	Refers to the annual number of tonne-kilometres transported on road

2. Distance-to-target assessment

This chapter evaluates progress of the European Community as a whole towards fulfilling its greenhouse gas emission targets. Indicators are used for this purpose. The first section evaluates actual progress of the EU by presenting distance-to-target indicators (DTI). The DTIs are based on a comparison of 2000 greenhouse gas emission data with the target path in 2000 for total greenhouse gas emissions (2008–12) and with the target for CO_2 emissions in 2000. Section 2 presents overall greenhouse gas emission trends and the contribution of major driving forces to energy-related CO_2 emissions. Section 3 evaluates the contribution of the Member States to the fulfilment of the EC greenhouse gas targets.

2.1. Distance-to-target indicator (DTI)

In the European Community, greenhouse gas emissions increased in 2000 compared to 1999. In 2000, total EC greenhouse gas emissions were 4 059 Tg (CO_2 equivalents), which was 0.3 % above 1999 but 3.5 % below 1990 levels. The most important reason for emission increases in 2000 compared to 1999 was increased use of coal for electricity production. High economic growth in 2000 enhanced the use of energy, whereas a relatively mild winter in most EC MS counteracted this development to a certain extent.

In the Kyoto Protocol, the EC agreed to reduce its greenhouse gas emissions by 8 % by 2008–12, from 1990 levels. Assuming a linear target path from 1990 to 2010, total EC greenhouse gas emissions were 0.5 index points above this target path in 2000 (Figure 2), i.e. the DTI is plus 0.5. Note that the trend changes slightly, if the EC selects a base year other than 1990 for fluorinated gases, as allowed for under the Kyoto Protocol.

CO_2 is by far the most important greenhouse gas, accounting for 82 % of total EC emissions in 2000. In 2000, EC CO_2 emissions (excluding LUCF) were 3 325 Tg, up 0.5 % from 1999, but 0.5 % below 1990 levels ([6]). This means that the EC achieved its target to stabilise CO_2 emissions at 1990 levels by 2000 (Figure 2).

2.2. EC greenhouse gas emission trends and main driving forces

Greenhouse gas emission trends

Total greenhouse gas emissions decreased by 3.5 % between 1990 and 2000, but trends of the different gases varied considerably. Figure 3 shows that the importance of CO_2 emissions and fluorinated gas emissions increases, whereas the share of methane and nitrous oxide in total greenhouse gases decreased in the last decade.

CO_2 emissions account for 82 % of total greenhouse gas emissions. In 2000, CO_2 emissions increased mainly because of increases in power production from coal, but over the period 1990–2000 emissions decreased slightly (– 0.5 %). A sharp increase in transport-related CO_2 emissions between 1990 and 2000 was outweighed by reductions in energy-related emissions from manufacturing industries and from electricity production.

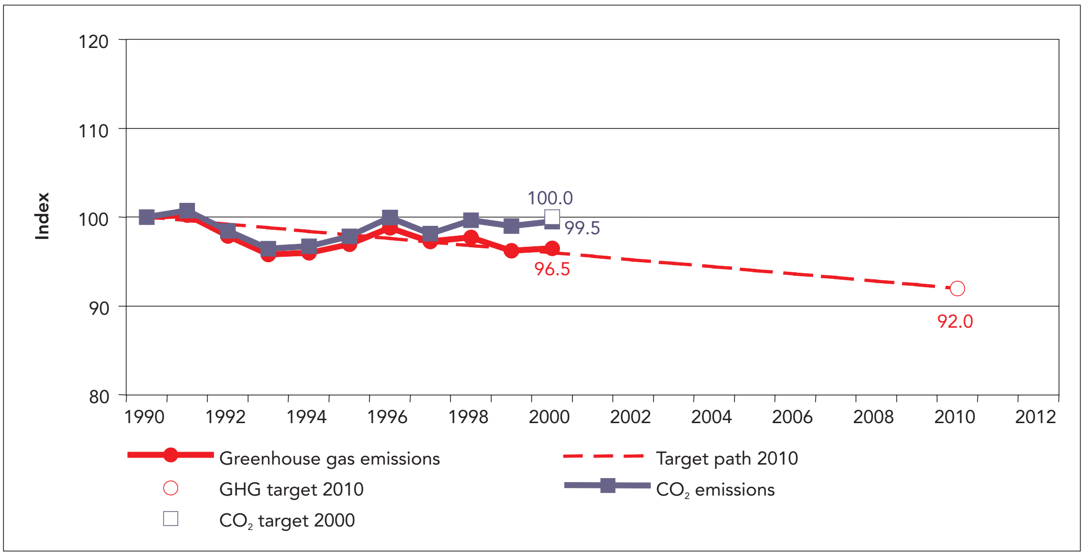
CH_4 emissions account for 8 % of total EC greenhouse gas emissions and decreased by 20 % between 1990 and 2000. Also, in 2000, emissions decreased compared to 1999. The main reasons for declining CH_4 emissions were reductions in solid waste disposal on land, the decline of coal mining and falling cattle population.

N_2O emissions are responsible for 8 % of total greenhouse gas emissions and decreased by 16 %. The main reason for large N_2O emission cuts between 1997 and 1999 were reduction measures in the chemical industry (adipic acid production).

Despite of a sharp increase of fluorinated gas emissions since 1992, they account for only 2 % of total greenhouse gas emissions. Fluorinated gas emissions show opposing trends: HFC emissions almost doubled between 1990 and 2000 (+ 94 %), whereas

(6) The EC CO_2 emissions including LUCF were slightly above the 1990 levels.

EC greenhouse gas emissions compared with targets for 2000 and 2008–12 (excl. LUCF) Figure 2



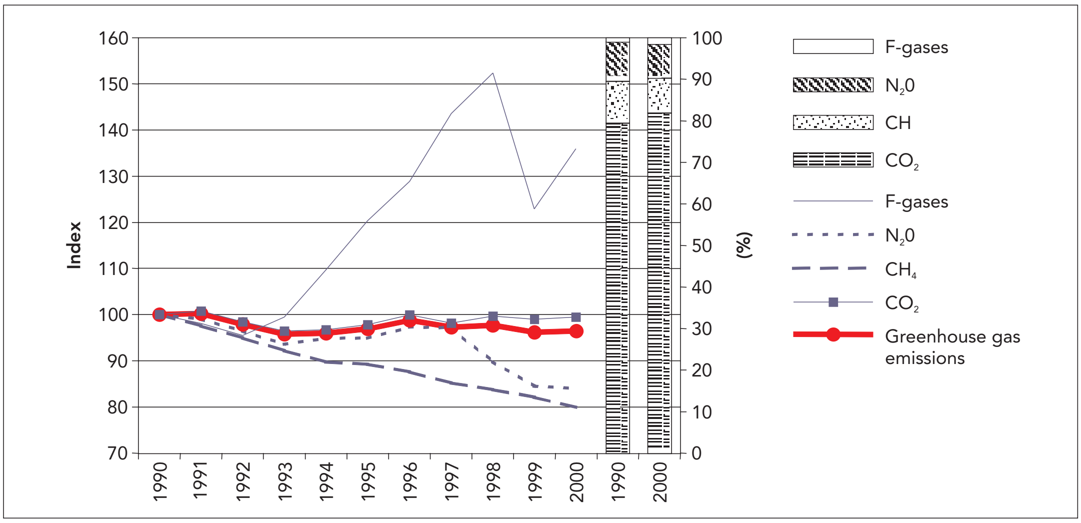
Source: Inventory submissions by the EC Member States (CRF tables), EEA (2002a).

Note (1): The target path is used to analyse how close 2000 emissions were to a linear path of emission reductions or allowed increases from the base year to the Kyoto Protocol target, assuming domestic measures are used (including emissions trading within the EU). In this report, 1990 is assumed to be the base year for the EU for all Kyoto Protocol greenhouse gases.

Note (2): Greenhouse gas emission data for the EC as a whole do not include emissions and removals from LUCF. In addition, no adjustments for temperature variations or electricity trade are considered. See Section 1.4 for details.

Note (3): For the fluorinated gases, most Member States have selected 1995 as base year, as allowed for under the Kyoto Protocol. As the EU as a whole has not yet chosen a base year, the analysis of EU-15 emission trends in this report assumes 1990 as the base year for all gases for the EU.

EC greenhouse gas emissions by gas (excl. LUCF) Figure 3



Source: Inventory submissions by the EC Member States (CRF tables), EEA (2002a).

Note: The figure shows the trend in greenhouse emissions as an index, with 1990 = 100 (left side of the figure) and the percentage contribution of the main greenhouse gases to the total emissions in 1990 and 2000 (right side of the figure).

PFC emissions declined by 49 %. SF_6 emissions were 6 % above 1990 levels in 2000. In 2000, HFC emissions increased by 16 % compared to 1999, whereas PFC and SF_6 emissions decreased. The main reason for rapidly growing fluorinated gas emissions in the EU is the phase-out of ozone-depleting substances such as chlorofluorocarbons under the Montreal Protocol and the replacement of these substances with HFCs (mainly in refrigeration, air conditioning, foam production and as aerosol propellants). The decline of fluorinated gas emissions in 1999 compared to 1998 is due to HFC reduction measures in the HCFC production in the UK.

Figure 4

Greenhouse gas emissions per capita of EC Member States for 1990–2000

Source: Inventory submissions by the EC Member States (CRF tables), EEA (2002a) and Eurostat for population.

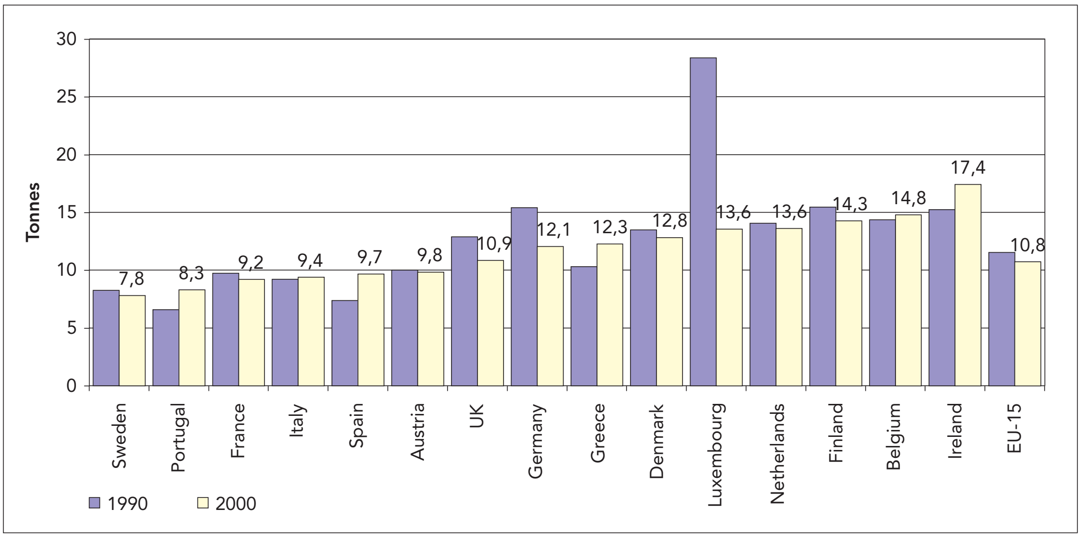


Figure 5

GDP, gross inland energy consumption, CO_2 emissions from fossil-fuel combustion and CO_2 intensity of GDP (as an index)

Source: Eurostat, inventory submissions by the EC Member States (CRF tables), EEA (2002a).

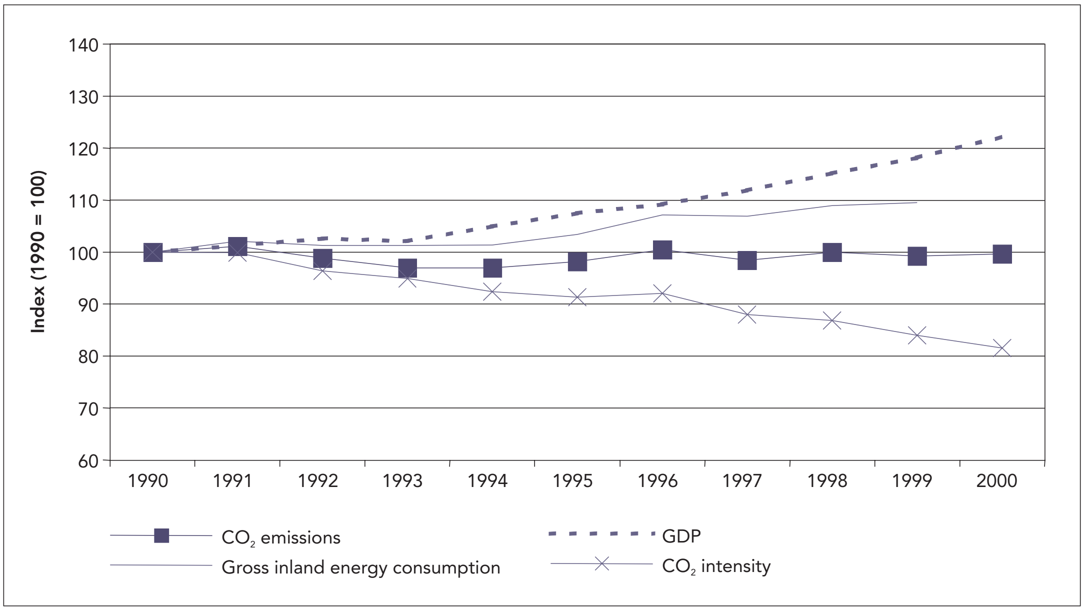


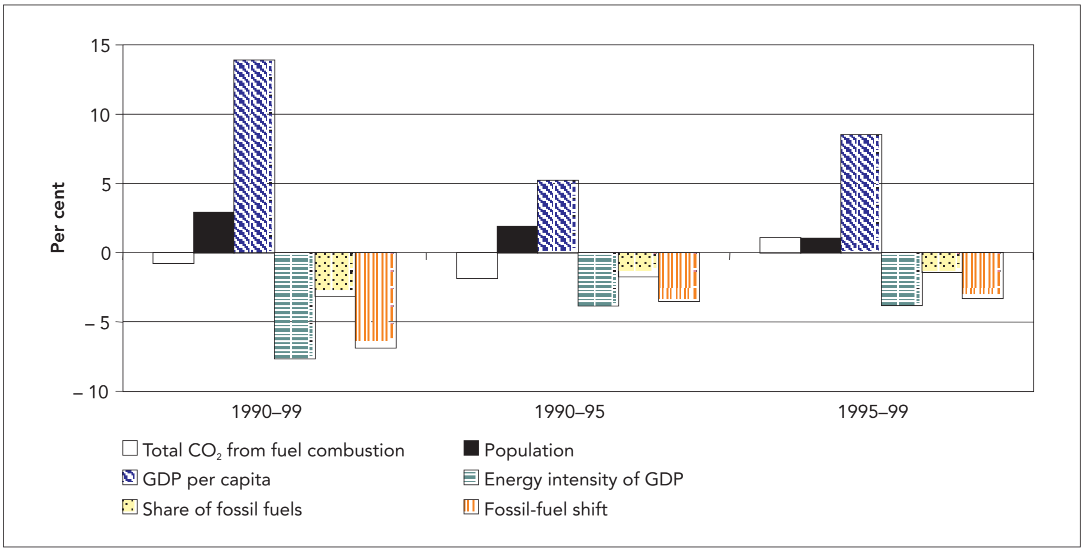
Figure 4 shows the development of greenhouse gas emissions per capita in the EU and by Member States between 1990 and 2000. In the EU, greenhouse gas emissions per capita decreased by 7 % from 11.5 tonnes in 1990 to 10.8 tonnes in 2000. This reduction is largely due to decreases in Germany (– 22 %) and the UK (– 16 %). There have also been decreases in Austria, Denmark, Finland, France, Luxembourg, the Netherlands and Sweden. In six Member States, per capita emissions have increased between 1990 and 2000, with Portugal and Spain showing percentage increases of more than 20 %. The highest per capita emissions in 2000 were in Ireland (17.4 tonnes), the lowest in Sweden (7.8 tonnes).

Main driving forces for CO_2 emissions from fossil fuels

CO_2 emissions from fossil-fuel combustion account for 77 % of total EU greenhouse gas emissions. Figure 5 shows the development of main driving forces of CO_2 emissions from fossil-fuel combustion: real GDP grew by 22 % between 1990 and 2000, energy consumption decoupled from GDP and increased by 9 % between 1990 and 1999. CO_2 emissions from fossil fuels were at 1990 levels in 2000. Therefore, CO_2 emissions decoupled from both GDP and energy consumption; CO_2 intensity of GDP decreased by 18 %.

Percentage change of CO_2 emissions from fossil-fuel combustion and the influence of main driving forces (population, GDP per capita, energy intensity of GDP, share of fossil fuels, CO_2 intensity of fossil fuels) in the 1990s

Figure 6



Source: Eurostat, inventory submissions by the EC Member States (CRF tables), EEA (2002a).

The relationship between the main driving forces and CO_2 emissions from fossil-fuel combustion can be further analysed by decomposing emissions into five factors: (1) population, (2) GDP per capita, (3) energy intensity of GDP, (4) the share of fossil fuels in energy consumption, (5) the shift within fossil fuels towards lower carbon fuels (CO_2 intensity of fossil fuels). The impact of each of the five factors has been estimated by performing a decomposition analysis (see Section 1.2 for the method used).

Figure 6 shows that CO_2 emissions from fossil-fuel combustion decreased by 0.8 % between 1990 and 1999. GDP growth is an important driving force, but improvements of energy intensity of GDP and the shift within fossil fuels towards lower carbon fuels offset emission increases. Also, the share of fossil fuels reduced, thereby contributing to lower CO_2 emissions.

The comparison between the first and the second half of the 1990s shows that the pattern of driving forces has changed: the reduction of CO_2 emissions from fossil-fuel combustion was only achieved in the first half of the 1990s; in the second half, emissions increased. GDP growth has been a larger driving force in the second half of the 1990s, whereas the opposite development took place for population growth.

2.3. Contribution of Member States to the EC greenhouse gas targets

Table 2 shows large variations in greenhouse gas emission trends between Member States. Compared to 1999, eight Member States reduced their emissions in 2000; the range of change was between – 6 % (Denmark) and + 4.8 % (Greece). Seven Member States were below base-year levels in 2000, with a range of – 45.1 % (Luxembourg) and + 33.7 % (Spain).

The overall EC greenhouse gas emission trend is dominated by the two largest emitters — Germany and the UK — accounting for about 40 % of EC greenhouse gas emissions. These two Member States achieved total greenhouse gas emission reductions of 325 Tg compared to 1990 (7).

The main reasons for the favourable trend in Germany are increasing efficiency in power and heating plants and the economic restructuring of the five new *Länder* after the German reunification. The reduction of greenhouse gas emissions in the UK was primarily the result of liberalising the energy market and the subsequent fuel switches from oil and coal to gas in electricity production and N_2O emission-reduction measures in the chemical industry.

(7) The EU as a whole needs emission reductions of total greenhouse gases of 337 Tg in order to meet the Kyoto target.

Table 2

Greenhouse gas emissions in CO_2 equivalents (excl. LUCF) and Kyoto Protocol targets for 2008–12

Source: Inventory submissions by the EC Member States (CRF tables), EEA (2002a).

MEMBER STATE	1990 (million tonnes)	2000 (million tonnes)	Change 1999–2000 (%)	Change 1990–2000 [1] (%)	Targets 2008–12 under Kyoto Protocol and EU 'burden sharing' (%)	Distance-to-target indicator (DTI) (index points)	Evaluation of progress in 2000 [3]
Austria	77,4	79,8	0,0	2,7	– 13,0	9,2	☹
Belgium	143,1	151,9	0,5	6,3	– 7,5	10,0	☹
Denmark [2]	69,4	68,5	– 6,0	– 1.7 (– 9.8)	– 21,0	8.8 (0.7)	☹ (☹)
Finland	77,1	74,0	– 2,9	– 4,1	0,0	– 4,1	☺
France	551,8	542,3	– 1,1	– 1,7	0,0	– 1,7	☺
Germany	1 222,8	991,4	– 0,2	– 19,1	– 21,0	– 8,6	☺
Greece	104,8	129,7	4,8	21,2	25,0	8,7	☹
Ireland	53,4	66,3	1,5	24,0	13,0	17,5	☹
Italy	522,1	543,5	0,7	3,9	– 6,5	7,2	☹
Luxembourg	10,8	5,9	– 0,6	– 45,1	– 28,0	– 31,1	☺
Netherlands	210,3	216,9	– 0,4	2,6	– 6,0	5,6	☹
Portugal	65,1	84,7	– 1,1	30,1	27,0	16,6	☹
Spain	286,4	386,0	4,1	33,7	15,0	26,2	☹
Sweden	70,6	69,4	– 1,6	– 1,9	4,0	– 3,9	☺
United Kingdom	742,5	649,1	0,4	– 12,9	– 12,5	– 6,7	☺
EU-15	**4 207,6**	**4 059,3**	**0,3**	**– 3,5**	**– 8,0**	**0,5**	**☹**

1) For the fluorinated gases most Member States have selected a base year other than 1990 (namely 1995), as allowed for under the protocol. The percentage change in this column and the analysis of the MS in Annex 1 refer to the change from the base year to 2000. As the EU as a whole has not yet chosen a base year, the analysis of EU-15 emission trends in this report assumes 1990 as the base year for all gases for the EU. For base-year emissions of the Member States, see Annex 2.

2) For Denmark, data that reflect adjustments for electricity trade (import and export) in 1990 are given in brackets. This method is used by Denmark to monitor progress towards its national target under the EC 'burden sharing' agreement. For the EU-15 emissions, total non-adjusted Danish data have been used.

3) The EEA's evaluation of progress to 2000 awards 'smileys' according to the distance-to-target indicator in 2000 (for more details see Section 1.2). The following rating system is used:
- ☺ Positive contribution to EU trend: the negative distance-to-target indicator means that the Member State is below its linear target path.
- ☹ Negative contribution to EU trend: the positive distance-to-target indicator means that the Member State is above its linear target path.

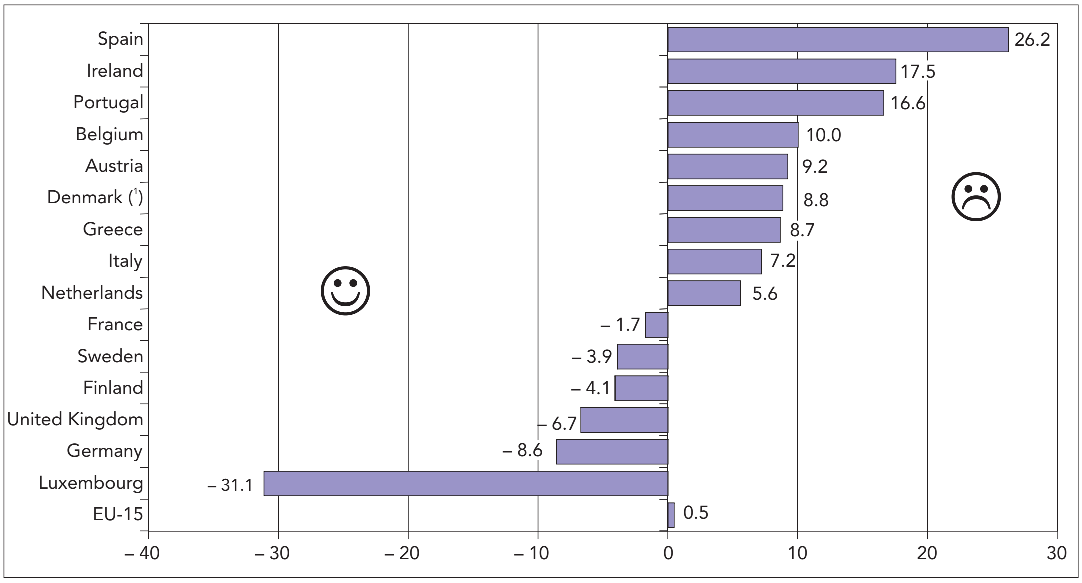
A study published recently quantifies the effects of the reunification and the liberalisation of the electricity market for Germany and the UK respectively. According to this study, in both Member States, these special circumstances account for about 50 % of the reduction of all six greenhouse gas emissions. This share increases to 60 % if only energy-related CO_2 emissions are considered. A diverse set of policies affecting energy-related CO_2 emissions and policies directed towards non-CO_2 emissions (in particular waste management and the reduction of N_2O from adipic acid production) accounts for the remaining 50 % of the greenhouse gas emission reductions in both countries (Eichhammer et al., 2001).

From 1999 to 2000, Germany further decreased greenhouse gas emissions slightly, whereas the UK had a small emission increase. In Germany, reductions in CO_2 emissions from small combustion offset increases in CO_2 emissions from coal-fired power production. In the UK, CO_2 emissions grew mainly due to increases in coal use for power production.

Italy and France are the third and fourth largest emitters with a share of 13 % each. Italy's greenhouse gas emissions were 0.7 % above 1999 and 4 % above 1990 levels in 2000. Italian greenhouse gas emissions increased between 1990 and 2000 primarily in the transport sector and in electricity production. France reduced greenhouse gas emissions by 1.1 % in 2000, compared to 1999, and was 2 % below 1990 levels in 2000. In France, large reductions were achieved in N_2O emissions from the chemical industry,

Distance-to-target indicators (in index points) for the Kyoto Protocol and EC burden sharing targets of EC Member States

Figure 7



Source: Inventory submissions by the EC Member States (CRF tables), EEA (2002a).

¹) The Danish DTI is 0.7 index points, if Danish greenhouse gas emissions are adjusted for electricity trade in 1990.

Note: The distance-to-target indicator (DTI) measures the deviation of actual emissions in 2000 from the (hypothetical) linear target path between 1990 and 2010. The DTI gives an indication on progress towards the Kyoto and Member States' sharing targets. It assumes that the Member States meet their target entirely on the basis of domestic measures. See Section 1.2 for an explanation of the DTI.

but CO_2 emissions from transport increased considerably between 1990 and 2000.

Spain, as the fifth largest emitter in the EU, accounts for 10 % of total EC greenhouse gas emissions and increased emissions by 34 % between 1990 and 2000. In 2000, greenhouse gas emissions were 4 % higher than in 1999. The main sources contributing to the increase are the same as in Italy, i.e. transport and electricity production.

Progress of the Member States

If greenhouse gas emissions of the Member States are compared with their linear target path for 2008–12 and the CO_2 target for 2000, the following conclusions with regard to progress of Member States can be drawn:

Kyoto target for 2008–12 (Figure 7)

In 2000, six Member States (Finland, France, Germany, Luxembourg, Sweden, the United Kingdom) were on track towards fulfilling their Kyoto target, i.e. they were below their Kyoto target paths. Nine Member States were well above their Kyoto target paths (Spain, Ireland and Portugal by more than 10 index points). The Danish distance-to-target indicator is 8.8 index points for non-adjusted data and 0.7 index points, if Danish greenhouse gas emissions are adjusted for electricity trade in 1990.

A more detailed analysis of the progress of each Member State is given in Annex 1.

CO_2 target for 2000

Table 3 shows that three Member States reached their CO_2 emission target in 2000 (Luxembourg, Sweden, the UK). In addition, Denmark achieved its target, if adjustments for electricity trade are taken into account, in accordance with the conditions under which the CO_2 emission target in 2000 was set as mentioned in Table 1. Seven Member States did not reach their CO_2 targets; Belgium, Ireland, the Netherlands and Spain were more than 10 index points above their CO_2 emission target. Four Member States did not have targets for CO_2 for 2000.

Table 3 **CO_2 emissions (excl. LUCF) and targets for 2000**

Source: Inventory submissions by the EC Member States (CRF tables), EEA (2002a).

MEMBER STATE	1990 (million tonnes)	2000 (million tonnes)	Change 1999–2000 (%)	Change 1990–2000 (%)	UNFCCC and national targets for 2000 (%)	Distance-to-target indicator (DTI) (index points)	Target reached in 2000 [1]
Austria	62,3	66,1	0,1	6,1	0,0	6,1	☹
Belgium	118,0	127,0	1,1	7,7	– 5,0	12,7	☹
Denmark [2]	52,6	52,9	– 7,7	0.4 (– 10.3)	– 5,0	5.4 (– 5.3)	☹ (☺)
Finland	62,5	62,3	– 2,8	– 0,3	No target	No target	No target
France	394,1	401,9	– 1,2	2,0	No target	No target	No target
Germany	1 014,5	857,9	– 0,2	– 15,4	No target	No target	No target
Greece	84,3	103,7	5,2	23,0	15,0	8,0	☹
Ireland	31,5	43,8	4,8	39,1	20,0	19,1	☹
Italy	441,1	461,8	0,6	4,7	0,0	4,7	☹
Luxembourg	10,2	5,4	– 0,6	– 46,8	0,0	– 46,8	☺
Netherlands	159,6	173,5	0,9	8,7	– 3,0	11,7	☹
Portugal	44,1	63,2	– 1,4	43,2	No target	No target	No target
Spain	227,2	306,6	3,9	34,9	12,0	22,9	☹
Sweden	56,1	55,9	– 1,1	– 0,4	0,0	– 0,4	☺
United Kingdom	583,7	542,7	1,2	– 7,0	0,0	– 7,0	☺
EU-15	3 341,8	3 324,8	0,5	– 0,5	0,0	– 0,5	☺

[1]) See note 3 in Table 3.
[2]) See note 2 in Table 3.

3. Sectoral assessment

This chapter analyses the sectoral performance of the EC as a whole and of its Member States. First, the selection of the EC key sources for the presentation in this report is described. Then, the trends of emissions and driving forces are analysed for each key source selected with the following elements: (1) presentation of emission trends and sectoral driving force at EU level; (2) the contribution of each Member State to the key source, in order to identify decreasing or less increasing emission trends in the Member States; (3) an overview of trends of emissions and sectoral driving forces at MS level. Moreover, for several key sources, additional information is given.

The key sources are presented according to the IPCC source sectors 'Energy', 'Industrial processes', 'Agriculture' and 'Waste'. Information on methodologies and emission factors used by the MS is included for each key source in EEA (2002a). Sectoral driving-force indicators are presented based on data submitted by the Member States (FCCC common reporting format or CRF tables) and additional data from Eurostat. The data basis for the CO_2 intensity indicators is primarily Eurostat.

Note that the comparisons of key source indicators refer to the trend from 1990 to 2000 in the Member States. The different national circumstances in the Member States are not taken into account. This might give a misleading picture for Member States that already implemented emission-reduction measures or fuel shifts before 1990. Also, for Member States with lower-than-EC-average economic welfare in 1990, but which had a higher-than-EC-average economic growth, emission reductions or limited growth may have been difficult to achieve.

3.1. The selection of key source categories

In order to analyse the sectoral greenhouse gas trends in greater detail, this report focuses on the most important key sources. The selection of the most important key sources takes as a starting point the key source analysis provided in the EC inventory report 2002 (EEA, 2002a), which is based on the methodology (tier 1) described in the IPCC good practice guidance report (IPCC, 2000). A key source category is defined as an emission source that has a significant influence on a country's greenhouse gas inventory in terms of the absolute level of emissions, the trend in emissions, or both. The key source identification is carried out in a two-step process in EEA (2002a): in the first step (level assessment), 15 key source categories have been identified covering 95 % of EC greenhouse gas emissions. In the second step (trend assessment), seven categories have been added because of their remarkable trend increase or decrease. In total, EEA (2002a) identifies 22 key source categories for the EU, covering 97 % of total EC greenhouse gas emissions in 2000 (Table 4).

The analysis in this report focuses on the first eight key sources (covering 90 % of total EU greenhouse gas emissions) plus those four key sources that in addition had large changes between 1990 and 2000 in absolute terms. The four additional key source categories are '2.F. Consumption of halocarbons and SF_6 (HFC)', '1.A.3. Transport (N_2O)', '2.B. Chemical industry (N_2O)' and '1.B.1. Solid fuels (CH_4)'. Figure 8 shows that the former two key sources mentioned had large increases between 1990 and 2000, whereas the latter two key sources had large emission decreases.

Figure 8 shows the absolute and relative change of key source categories between 1990 and 2000. The thick dark bar indicates absolute change against the bottom of the graph, the thin white bar indicates percentage changes against the top of the graph.

Table 4 **EC greenhouse gas source categories identified as key sources (emissions in Gg of CO_2 equivalents)**

Source: EEA (2002a).

Greenhouse gas source categories	Gas	GHG emissions in 1990 (Gg)	GHG emissions in 2000 (Gg)	Cumulative total in 2000 (%)
1.A.1. Energy industries	CO_2	1 147 013	1 092 146	26,9
1.A.3. Transport	CO_2	694 767	822 954	47,2
1.A.4. Other sectors	CO_2	635 943	619 478	62,4
1.A.2. Manufacturing industries and construction	CO_2	649 732	594 615	77,1
4.D. Agricultural soils	N_2O	198 043	189 726	81,8
4.A. Enteric fermentation	CH_4	143 991	131 367	85,0
2.A. Mineral products	CO_2	111 937	111 009	87,7
6.A. Solid waste disposal on land	CH_4	133 016	98 641	90,2
2.B. Chemical industry	N_2O	105 126	46 422	91,3
4.B. Manure management	CH_4	33 095	33 118	92,1
2 F Consumption of halocarbons and SF_6	HFC	362	29 723	92,9
4.B. Manure management	N_2O	33 457	29 100	93,6
1.B.2. Oil and natural gas	CH_4	32 429	27 962	94,3
2.C. Metal production	CO_2	25 663	24 024	94,9
1.A.3. Transport	N_2O	11 681	23 721	95,4
1.B.1. Solid fuels	CH_4	50 310	20 601	95,9
2 E Production of halocarbons and SF_6	HFC	21 373	17 562	96,4
1.A.4. Other sectors	N_2O	11 217	7 926	96,6
1.A.4. Other sectors	CH_4	10 508	7 251	96,7
1.A.5. Other	CO_2	19 431	7 091	96,9
2 C Metal production	PFC	11 825	4 613	97,0
2 B Chemical industry	HFC	2 340	0	97,0

Sectors with large increase in emissions
Emissions from transport have risen rapidly since 1990 (mainly CO_2, but also N_2O emissions). CO_2 emissions increased by 128 million tonnes or 18 %. This is mainly due to growth rates of road transport in almost all Member States (but in particular in the cohesion States: Ireland, Spain, Portugal and Greece). N_2O emission increases from transport are mainly due to the increased use of catalytic converters, which reduce emissions of air pollutants, but produce N_2O as a by-product.

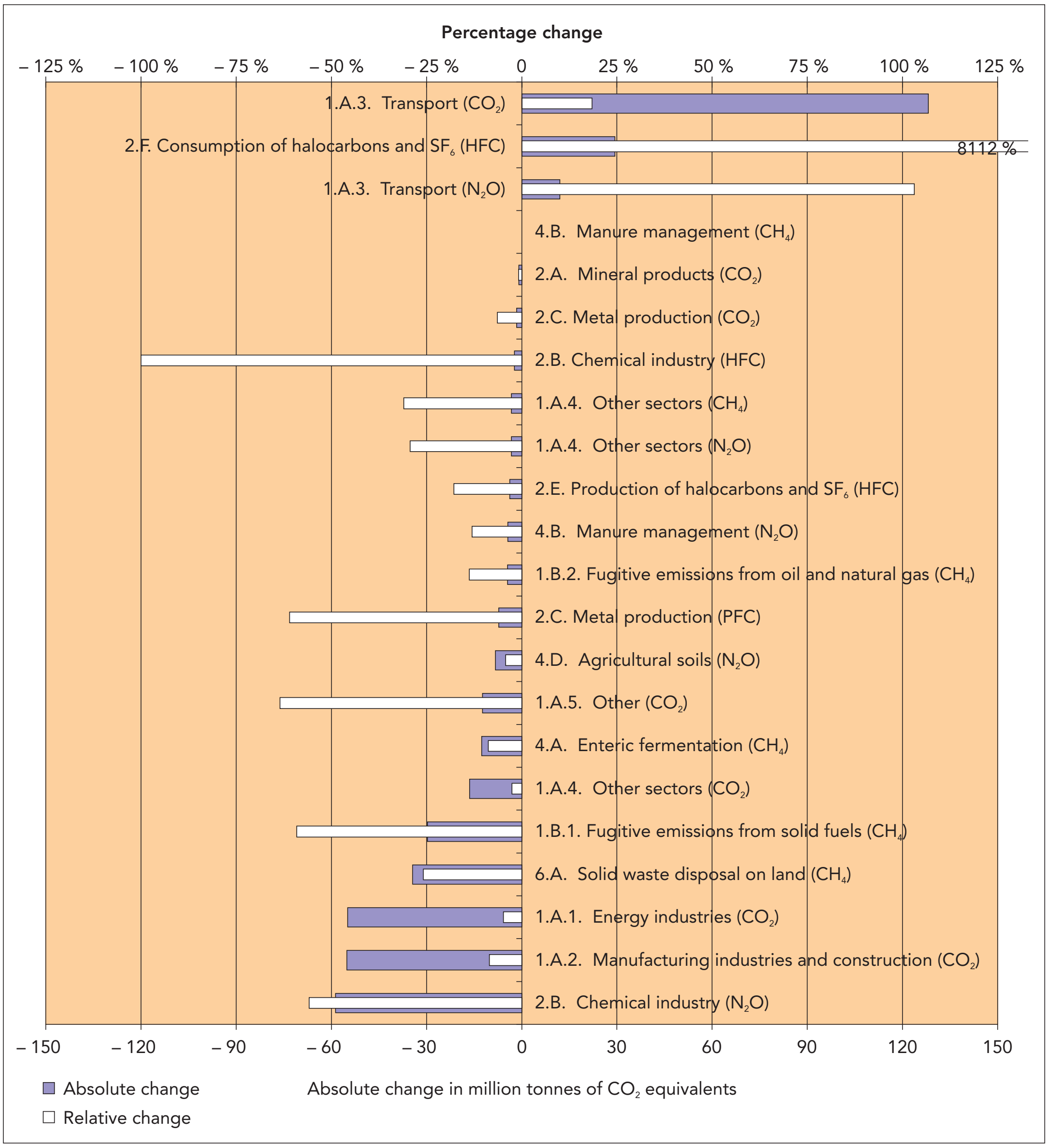
The second key source category with substantially increasing emissions is HFC emissions from consumption of halocarbons and SF_6. Emissions increased by a factor of 80 or 29 million tonnes. This is mainly due to the use of some HFCs as substitutes for ozone-depleting CFCs which have been gradually phased out in the 1990s.

Sectors with reductions in emissions
The largest reductions in absolute terms were achieved in N_2O from the chemical industry mainly in the UK, Germany and France due to specific measures in the adipic acid production in these countries. Emissions decreased by 59 million tonnes or 56 %.

Second largest were reductions of CO_2 emissions from fossil-fuel combustion in the manufacturing industries mainly due to economic restructuring and efficiency improvements in the German manufacturing industry after German reunification. Emissions decreased by 55 million tonnes or 8 %.

Absolute and relative change 1990–2000 of EC key source emissions (in million tonnes of CO_2 equivalents and per cent)

Figure 8



Source: Inventory submissions by the EC Member States (CRF tables), EEA (2002a).

Third largest reductions were achieved for CO_2 emissions in the energy sector (electricity and heat production), mainly due to fuel shifts from coal to gas in several Member States (above all in the UK) and efficiency improvements (above all in Germany). Emissions decreased by 55 million tonnes or 5 %.

Substantial CH_4 emission reductions were achieved from solid waste disposal on land (landfilling) and fugitive emissions from solid fuels. These reductions are mainly due to measures related to the implementation of the European landfill waste directive and the decline of coal-mining after cuts in coal subsidies mainly in the UK, Germany and France.

The cuts in CO_2 emissions from small combustion (1.A.4. Other sectors) occurred mainly in Germany, whereas the emission cuts of CH_4 from enteric fermentation are due to falling cattle numbers in various EC Member States.

3.2. Energy

3.2.1. Energy industries (CO_2)

CO_2 emissions from energy industries are the largest source of greenhouse gas emissions in the EU. Between 1990 and 2000, emissions reduced mainly due to fuel switch from coal to gas, a shift towards renewable and nuclear power production and efficiency increases in electricity production.

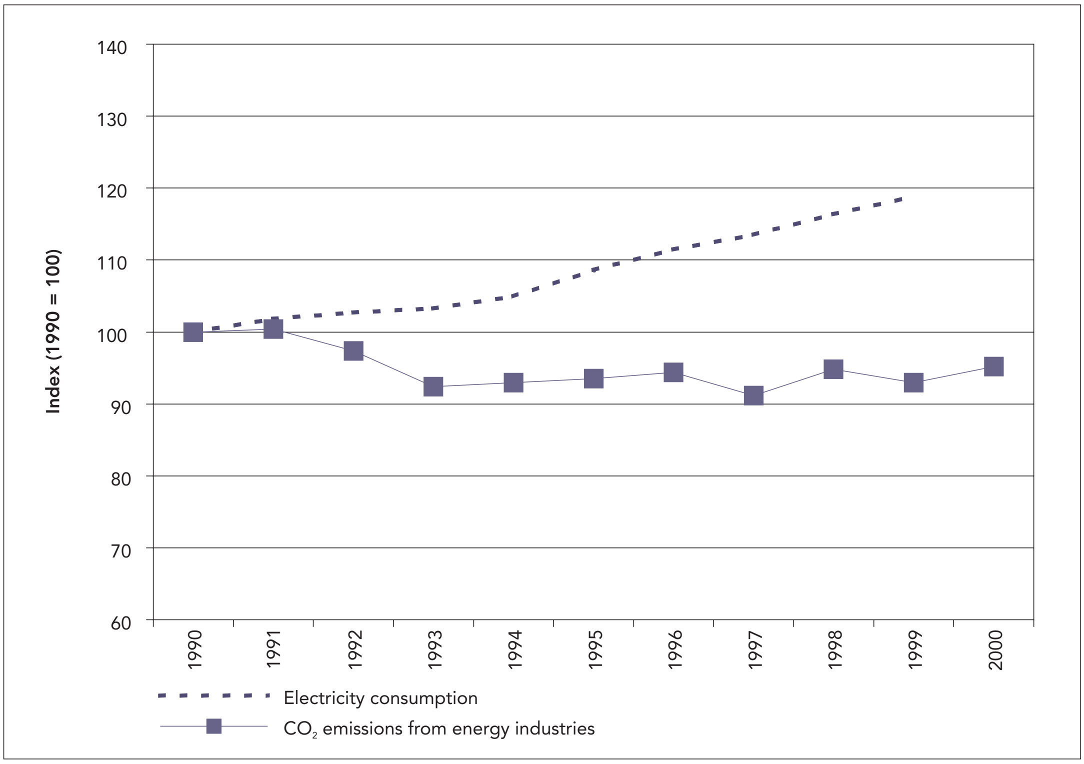
In 1990:	1 147 Tg
In 2000:	1 092 Tg
Change 1990–2000:	– 55 Tg – 5 %
Share in total EU greenhouse gases: 27 %	

CO_2 emissions from energy industries are the largest single source of greenhouse gas emissions in the EU accounting for 27 % of total greenhouse gas emissions in 2000. They include emissions from fossil-fuel combustion in public electricity and heat production, petroleum refining, and the manufacture of solid fuels and other energy industries.

Between 1990 and 2000, CO_2 emissions from energy industries declined by 5 % in the EU. The main driving force of CO_2 emissions from energy industries is production and consumption of electricity. Final electricity consumption increased by 19 % between 1990 and 1999. Figure 9 shows that CO_2 emissions from energy industries decoupled considerably from electricity consumption. This was mainly due to fuel shifts in power production from coal to natural gas, and larger shares of electricity generation from renewable energy sources and nuclear power, as well as efficiency improvements. In 2000, CO_2 emissions from energy industries increased by 2 % compared to 1999, which was mainly due to increased use of coal for power production.

Member States' contribution
Table 5 shows the contribution of the EC Member States to level and trend of total EU CO_2 emissions from energy industries. Germany is the largest emitter in the EU accounting for 31 % of total EC CO_2 emissions from energy industries, followed by the UK (17.5 %) and Italy (14 %).

Figure 9 — CO_2 emissions from energy industries and electricity consumption



Source: Eurostat and inventory submissions by the EC Member States (CRF tables), EEA (2002a).

Member States contribution to CO_2 emissions from energy industries — Table 5

Member State	Greenhouse gas emissions ($Gg\ CO_2$ equivalents)			Share in EU-15 emissions in 2000 (%)	Change 1999–2000		Change 1990–2000	
	1990	1999	2000		($Gg\ CO_2$ equiva-lents)	(%)	($Gg\ CO_2$ equiva-lents)	(%)
Germany	412 896	329 848	337 466	30,9	7 619	2	– 75 430	– 18
United Kingdom	228 089	180 843	190 833	17,5	9 991	6	– 37 256	– 16
Italy	142 927	146 563	152 078	13,9	5 515	4	9 151	6
Spain	76 717	98 783	103 542	9,5	4 759	5	26 825	35
France	65 492	61 397	60 173	5,5	– 1 224	– 2	– 5 319	– 8
Netherlands	51 513	57 911	59 085	5,4	1 174	2	7 572	15
Greece	43 302	50 220	55 058	5,0	4 839	10	11 756	27
Belgium	28 572	26 950	27 357	2,5	407	2	– 1 216	– 4
Denmark	26 202	28 237	25 250	2,3	– 2 986	– 11	– 952	– 4
Portugal	15 884	24 837	22 377	2,0	– 2 460	– 10	6 493	41
Finland	18 517	21 029	19 815	1,8	– 1 214	– 6	1 298	7
Ireland	11 057	15 728	16 016	1,5	289	2	4 959	45
Austria	14 395	12 918	12 137	1,1	– 781	– 6	– 2 259	– 16
Sweden	10 170	11 129	10 704	1,0	– 425	– 4	534	5
Luxembourg	1 277	103	255	0,0	152	147	– 1 022	– 80
EU-15	1 147 013	1 066 494	1 092 146	100,0	25 652	2	– 54 866	– 5

Source: Inventory submissions by the EC Member States (CRF tables), EEA (2002a).

In 2000, compared to 1999, the largest emission increases in absolute terms occurred in the UK and Germany, mainly due to increases in the use of coal for power production. Also, Italy, Greece and Spain had large emission increases in absolute terms, whereas Denmark and Portugal showed substantial emission decreases.

Between 1990 and 2000, large emission decreases in absolute and relative terms occurred in Germany and the UK, whereas emissions increased considerably in Spain. In general, the cohesion countries — Ireland, Greece, Portugal and Spain — show high emission growth rates. The most important reason for German CO_2 reductions from energy industries was efficiency improvements in coal-fired power plants. In the UK, the most important factor for emission reductions was the fuel switch from coal to gas in power production. The main reasons for the 80 % decrease of Luxembourg's CO_2 emissions from energy industries were reductions in thermal power production and increases in electricity imports and hydropower production.

Figure 10 shows the changes of CO_2 emissions from energy industries and of electricity consumption for each EC Member State between 1990 and 1999. All Member States had increases in final electricity consumption in the 1990s. All Member States, except Portugal and Sweden, decoupled CO_2 emissions from electricity consumption. Six MS even achieved a strong decoupling, which means that CO_2 emissions decreased while electricity consumption increased.

As was mentioned above, the main driving force of CO_2 emissions from energy industries is production and consumption of electricity. In the EU as a whole, electricity production and consumption decoupled from CO_2 emissions. CO_2 emissions from electricity generation have fallen by 8 % over the period 1990–99, despite a 16 % increase in the amount of electricity produced (EEA, 2002b).

Figure 11 shows that if the structure of electricity production had remained unchanged from 1990, then by 1999 emissions of CO_2 would have increased in line with electricity output by 16 %. In fact, over this period, there have been a number of changes in the electricity industry in the EU that caused annual emission reductions of CO_2 by 8 %. Changes in the fossil-fuel mix from coal and lignite to natural gas account for 46 % of this reduction. A further 20 % came from an increase in the efficiency of electricity production from fossil fuels and much of this is also linked to the switch to high-efficiency combined-cycle gas technology. The remaining 34 % of the reduction is attributable to the increased share of nuclear power and renewable energy sources (EEA, 2002b).

Figure 10

Percentage change of CO_2 emissions from energy industries and electricity consumption in the EC Member States (1990–99)

Source: Eurostat and inventory submissions by the EC Member States (CRF tables), EEA (2002a).

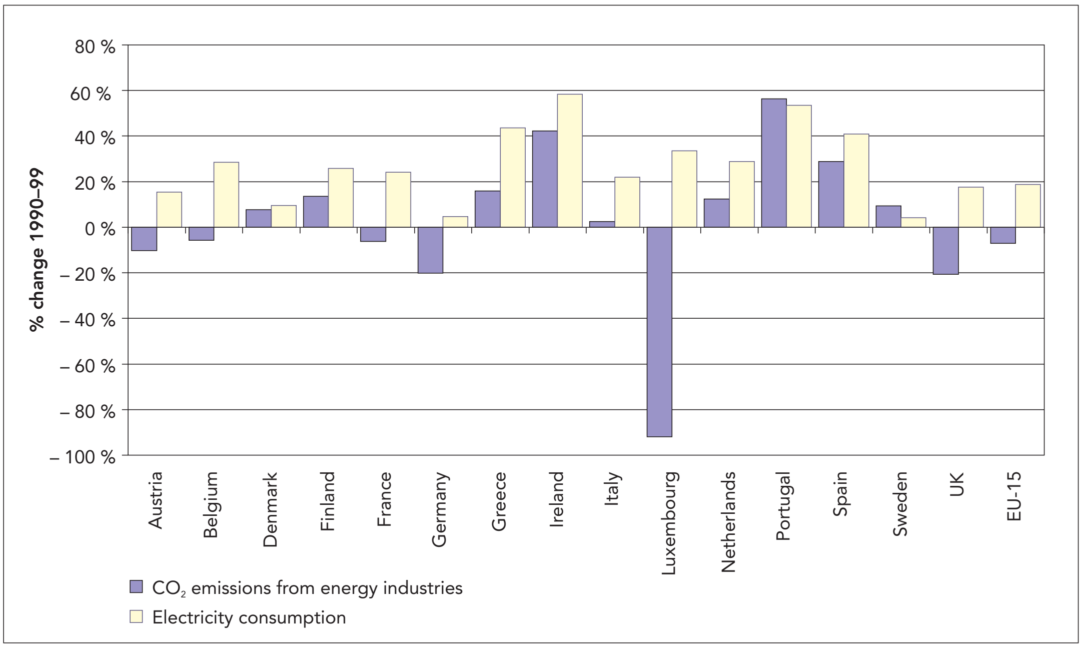
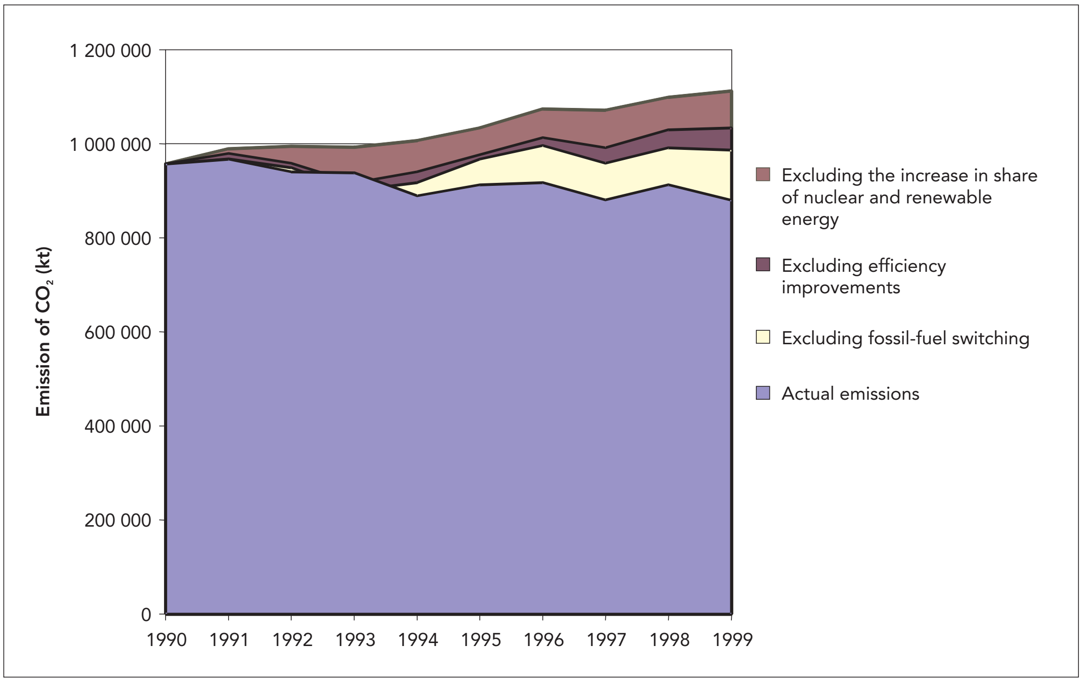


Figure 11

Explanations for the reduction of emissions of CO_2 in the EU electricity sector

Source: EEA (2002b).



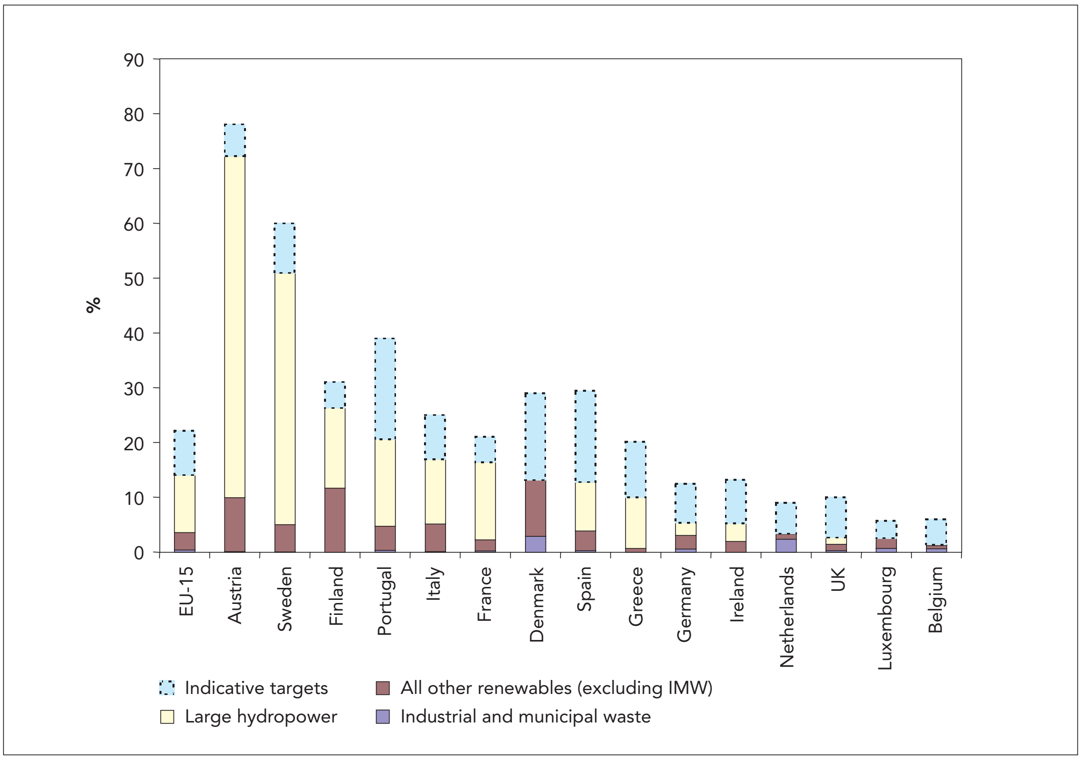
Note: Data and analysis presented here are preliminary results of ongoing work to refine and improve associated statistics and methodology.

Renewable energy

The share of renewable energy in the EU's electricity consumption grew slightly from 13.4 % to 14 % between 1990 and 1999. This was achieved through an average annual growth in output of 2.8 % per year over the 1990–99 period (EEA, 2002b). This growth rate will need to double to attain the EU's indicative target of 22.1 % by 2010 ([8]) (Figure 12).

(8) In its directive 2001/77/EC on the promotion of electricity from renewable sources in the internal electricity market the EU proposed indicative targets for Member States and agreed to an EU overall indicative target of 22.1 % of gross electricity consumption from renewable sources by 2010.

Share of electricity consumption met by renewable energy sources, 1999 Figure 12



Source: Eurostat, EEA (2002b).

Notes: Industrial and municipal waste (IMW) includes electricity from both biodegradable and non-biodegradable energy sources, as there are no separate data available for the biodegradable part. The EU's 22.1 % indicative target for the contribution of renewable electricity to gross electricity consumption by 2010 only classifies biodegradable waste as renewable. The share of renewable electricity in gross electricity consumption is therefore overestimated by an amount equivalent to the electricity produced from non-biodegradable IMW. National indicative targets shown here are reference values that Member States agreed to take into account when setting their indicative targets by October 2002, according to the EU renewable electricity directive.

Renewable electricity was dominated by large hydropower, which had a 74 % share of output in 1999, followed by small hydro (11 %) and biomass/waste (10 %). Large hydro is an established technology, but its capacity is not expected to increase substantially because of concerns linked to its impacts on the environment through the loss of land and the resultant destruction of natural habitats and ecosystems. Growth in renewable electricity will therefore have to come from renewable energy sources such as wind energy, solar power, biomass and small hydro (EEA, 2002b).

Box 1: Success stories in wind power production in the 1990s

Germany has established itself as the world leader in wind power by implementing a feed-in law with fixed tariffs for electricity generation from renewables.

In 1993:	674 GWh
In 1999:	5 528 GWh
Increase 1993–99:	4 854 GWh + 720 %

The single most important factor for the rapid and successful implementation of wind energy in Germany has been its electricity feed-in law. From 1991–2000, it provided a guaranteed market and fixed price for the electricity produced from renewable energy sources. Wind energy schemes benefited considerably during the late 1990s from the favourable tariffs available through these support measures. The successor of the feed-in law, the Renewable Energy Sources Act (2000), continues to be the principal mechanism for achieving the rapid uptake of wind energy in Germany.

Success factors:
- Political: national and regional support towards wind energy development.
- Legislative: premium-set tariffs combined with an obligation to purchase provide a stable, commercially favourable market for renewable electricity producers.
- Fiscal: tax exemptions are available to investment in renewable energy technologies.
- Financial: subsidies and low-interest loans are available to wind energy projects.
- Administration: planning guidance is being developed in some regions to identify areas for wind developments.
- Technological development: a strong and expanding German wind energy industry.
- Information, education and training: active involvement of local citizens in wind energy projects, active promotion of the benefits of renewable energies by wind energy developers.

Spain is rapidly becoming one of the leaders in wind power generation in Europe.

In 1993:	116 GWh
In 1999:	2 744 GWh
Increase 1993–99:	2 628 GWh + 2 266 %

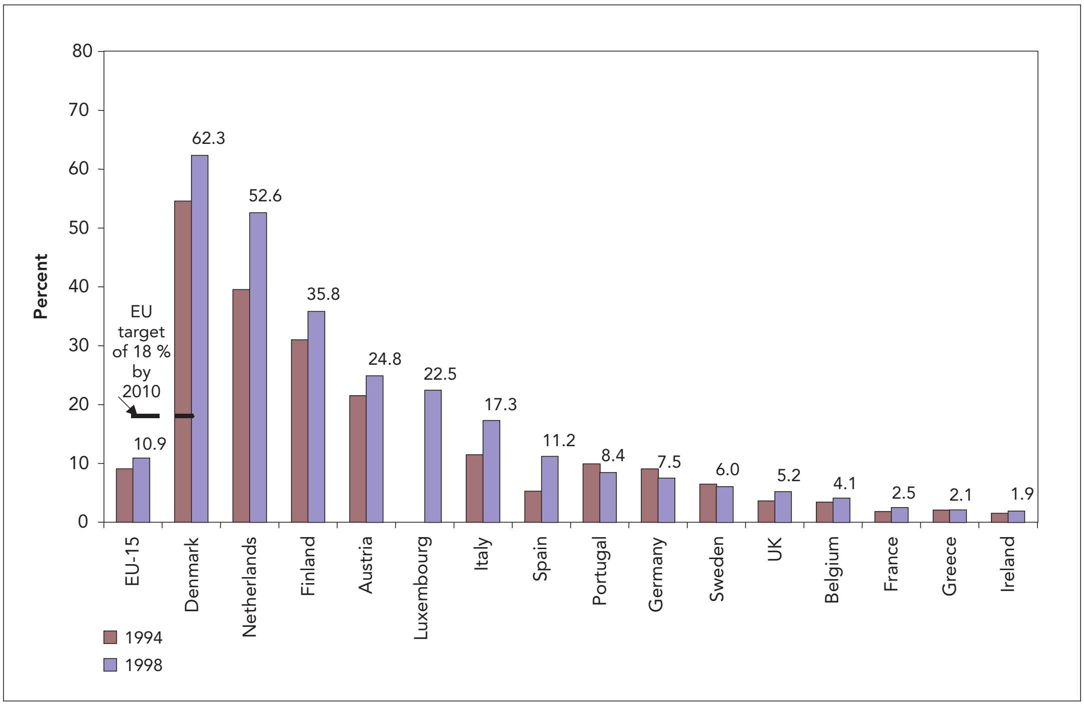
Spain has a high wind energy potential. The growth of renewable energies was mainly triggered by a series of royal decrees during the 1990s on support for electricity generation from renewable energy sources, waste and combined heat and power. Wind energy development is expanding considerably, mostly due to financial support through national feed-in tariffs, but also because of capital subsidies, in particular at the beginning of a development. Expansion may, however, be held back by lengthy planning procedures to obtain construction permission.

Success factors:
- Political: support for renewable energy implementation at both national and regional level.
- Legislative: premium-set tariffs combined with an obligation to purchase provide a stable, commercially favourable market for renewable electricity producers.
- Financial: State and regional subsidies available.
- Technological and industrial development: a thriving wind-manufacturing industry has been established.
- Administration: local involvement in renewable energy planning.
- Information, education and training: active promotion of the benefits of renewable energy by wind energy developers.

Source: EEA (2001b).

Combined heat and power
Combined heat and power (CHP) technology uses fossil fuels, biomass or waste to generate a mix of heat and electricity. In so doing, it avoids much of the waste heat losses associated with normal electricity production: CHP utilises over 80 % of the energy in the fuel rather than the average of about 36 % in current plants producing only electricity (EEA, 2002b). In the EU, CHP increased its share in electricity production from 9 % to almost 11 % between 1994 and 1998, but this rate of expansion is not sufficient to achieve the EU's target of 18 % by 2010 (Figure 13) (9).

Share of gross electricity production from combined heat and power plants Figure 13



Source: Eurostat, EEA (2002b).

Growth was highest in Member States that have positive programmes and targets for the technology such as Finland, Denmark, Italy, the Netherlands and Spain. However, progress in other countries with ambitious targets, such as Germany or the UK, was slower. Concern is raised by preliminary information for 2001, which suggests that CHP production has declined since 1998. This reverse is spread across the EU, but most severe indications were noted in Germany, the Netherlands and the UK. This decline has been caused by a combination of factors (EEA, 2002b):

- increasing natural gas prices (gas is the preferred fuel for new CHP) have reduced the cost-competitiveness of CHP;
- falling electricity prices, resulting from market liberalisation and increased competition, have also hit the cost-competitiveness of CHP;
- uncertainty over the evolution of electricity markets as liberalisation is progressively extended is making companies reluctant to invest in CHP;
- aggressive pricing has been used by electricity utilities to protect their market.

(9) The Commission's cogeneration strategy sets an overall indicative Community target of doubling the share of electricity production from cogeneration in total EU electricity production from 9 % in 1994 to 18 % by 2010 (COM(97) 514 final).

3.2.2. Manufacturing industries and construction (CO_2)

CO_2 emissions from fossil-fuel combustion in manufacturing industries is the fourth largest source of greenhouse gas emissions in the EU. The most important reason for emission reductions between 1990 and 2000 were efficiency increases and economic restructuring in Germany after the reunification.

In 1990:	650 Tg
In 2000:	595 Tg
Change 1990–2000:	– 55 Tg – 8 %
Share in total EU greenhouse gases: 15 %	

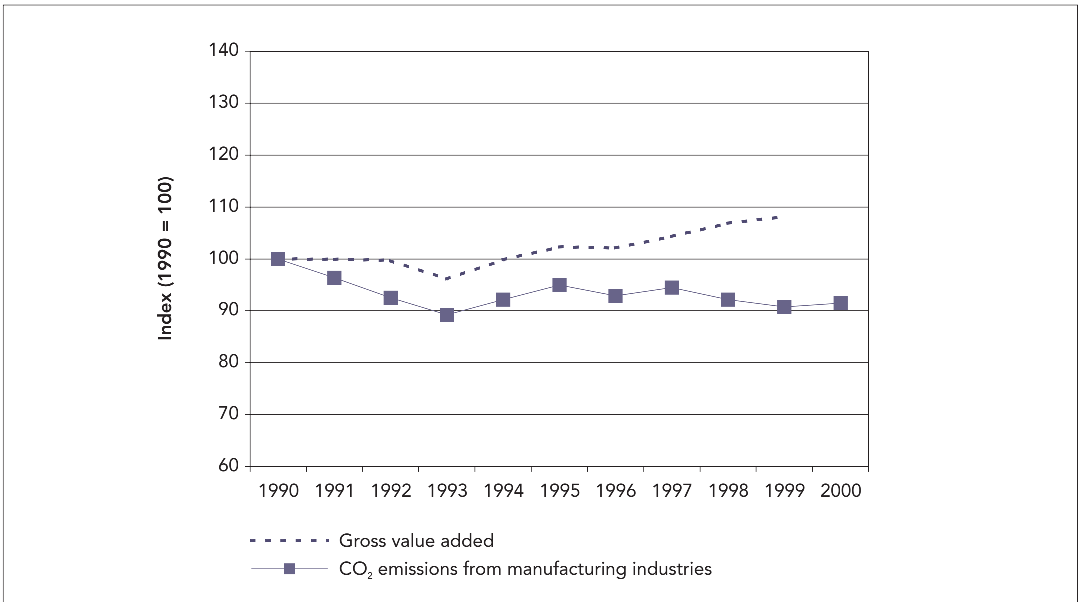
CO_2 emissions from fossil-fuel use in manufacturing industries is the fourth largest source of greenhouse gas emissions in the EU accounting for 15 % of total greenhouse gas emissions in 2000. Fossil fuels are used for combustion in the manufacturing industries or as a feedstock in the chemical industry ([10]).

Between 1990 and 2000, CO_2 emissions from manufacturing industries declined by 8 % in the EU. Figure 14 shows that the emission reductions were already achieved in 1993, which was mainly due to efficiency improvements and structural change in Germany after the reunification and low economic activity in the EU. In 2000, CO_2 emissions from manufacturing industries increased by 1 %, compared to 1999. The main driving force of CO_2 emissions from manufacturing industries is production output of industry. Between 1990 and 1999, industrial output in terms of gross value added increased by 8 %. Therefore, CO_2 emissions from manufacturing industries decoupled from gross value added.

Member States' contribution
Table 6 shows the contribution of the EC Member States to level and trend of total EU CO_2 emissions from energy use in manufacturing industries. Germany is the largest emitter accounting for about 23 % of EU emissions, followed by the UK (15 %), Italy (14 %) and France (14 %).

Figure 14 **CO_2 emissions from energy use in manufacturing industries and gross value added of industry**

Source: Eurostat and inventory submissions by the EC Member States (CRF tables), EEA (2002a).



(10) All fossil fuels are used as feedstocks for non-energy purposes to some degree (e.g. natural gas is used for ammonia production). CO_2 emissions from feedstocks may be a substantial fraction of total CO_2 emissions from manufacturing industries, e.g. in the Netherlands they account for about 25 % of total industry emissions.

Member States contribution to CO_2 emissions from manufacturing industries Table 6

Member State	Greenhouse gas emissions ($Gg\ CO_2$ equivalents)			Share in EU-15 emissions in 2000 (%)	Change 1999–2000		Change 1990–2000	
	1990	1999	2000		($Gg\ CO_2$ equiva-lents)	(%)	($Gg\ CO_2$ equiva-lents)	(%)
Germany	196 457	137 376	139 425	23,4	2 049	1	– 57 032	– 29
United Kingdom	94 133	89 698	86 510	14,5	– 3 188	– 4	– 7 623	– 8
Italy	86 908	80 484	82 159	13,8	1 675	2	– 4 749	– 5
France	84 924	80 904	81 081	13,6	176	0	– 3 843	– 5
Spain	44 530	56 699	58 203	9,8	1 503	3	13 673	31
Netherlands	41 889	43 150	43 003	7,2	– 147	0	1 114	3
Belgium	33 023	31 490	32 344	5,4	855	3	– 678	– 2
Finland	14 358	15 844	15 956	2,7	111	1	1 598	11
Sweden	11 776	11 991	12 558	2,1	567	5	782	7
Austria	8 450	9 997	10 607	1,8	609	6	2 157	26
Greece	9 792	9 552	10 415	1,8	862	9	622	6
Portugal	8 797	10 205	10 056	1,7	– 149	– 1	1 259	14
Denmark	5 605	6 129	5 823	1,0	– 306	– 5	218	4
Ireland	3 833	4 238	4 743	0,8	506	12	910	24
Luxembourg	5 258	1 785	1 734	0,3	– 51	– 3	– 3 523	– 67
EU-15	649 732	589 543	594 615	100,0	5 073	1	– 55 117	– 8

Source: Inventory submissions by the EC Member States (CRF tables), EEA (2002a).

Large emission increases in absolute terms were reported for Germany, Italy and Spain in 2000, compared to 1999, whereas in the UK emissions from fossil-fuel combustion decreased considerably.

Between 1990 and 2000, the four largest emitters reduced emissions, above all Germany, whereas many other Member States increased CO_2 emissions from manufacturing industries. Spain had large emission increases in absolute terms. In addition, Austria, Finland, Ireland and Portugal had emission increases of more than 10 %. The main reason for the 29 % cut in German CO_2 emissions from manufacturing industries was the restructuring of the German industry and efficiency improvements after the German reunification. The 67 % decrease of Luxembourg's CO_2 emissions were mainly due to a sharp decline in coke consumption after the conversion of the steel industry to electric arc furnaces.

Figure 15 shows the changes of CO_2 emissions from manufacturing industries and of industrial production for each EC Member State between 1990 and 1999. All Member States, for which data is available, had increases in industrial production (in terms of value added) in the 1990s. All Member States, except for Spain, decoupled CO_2 emissions from industrial output. Several MS even achieved a strong decoupling, which means that CO_2 emissions decreased while industrial output increased.

However, these results should be interpreted with care as different criteria are used by Member States to decide whether particular emissions are allocated to fossil-fuel combustion or to the relevant industrial process (e.g. steel production).

CO_2 intensity indicators

Figure 14 showed that CO_2 emissions from the energy use of manufacturing industries decoupled from gross value added. This means that overall CO_2 intensity of manufacturing industries decreased in the 1990s. The following figures show the development of the CO_2 emissions, activity (in terms of gross value added or tonnes produced) and CO_2 intensities or CO_2 unit consumption for the largest CO_2 emitting branches.

The iron and steel industry is the largest CO_2 emitter within industry. Figure 16 shows that CO_2 emissions from energy use in the iron and steel industry decreased by 15 % between 1990 and 1999. Also, gross value added of the branch was below 1990 levels in 2000 (– 11 %). CO_2 intensity of the branch increased in the early 1990s, but decreased in

Figure 15

Percentage change of CO_2 emissions from energy use in manufacturing industries and industrial production (in terms of value added) in the EC Member States (1990–99)

Source: Eurostat and inventory submissions by the EC Member States (CRF tables), EEA (2002a).

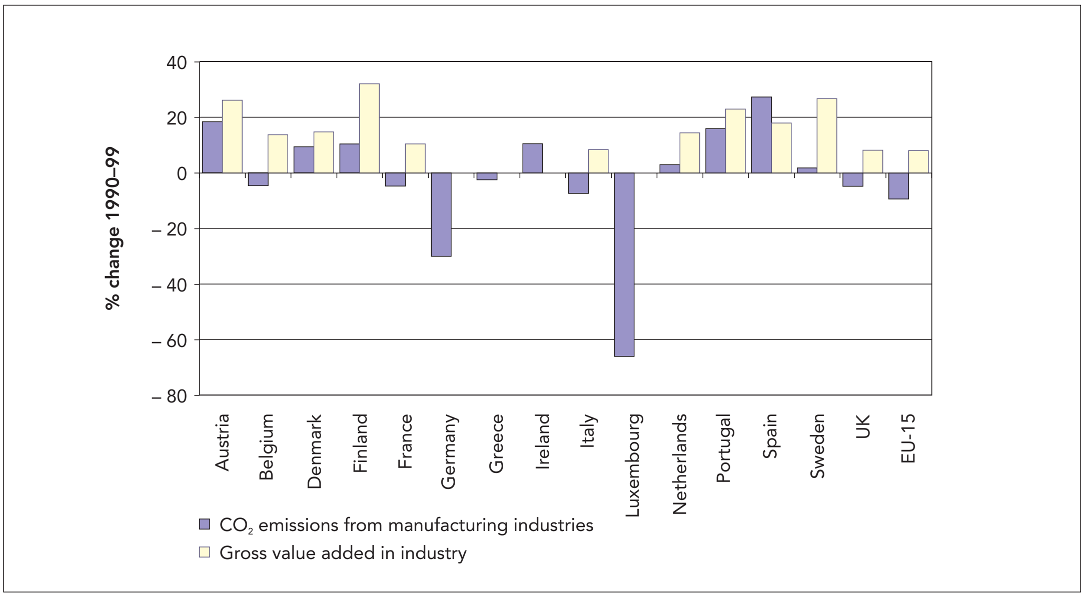
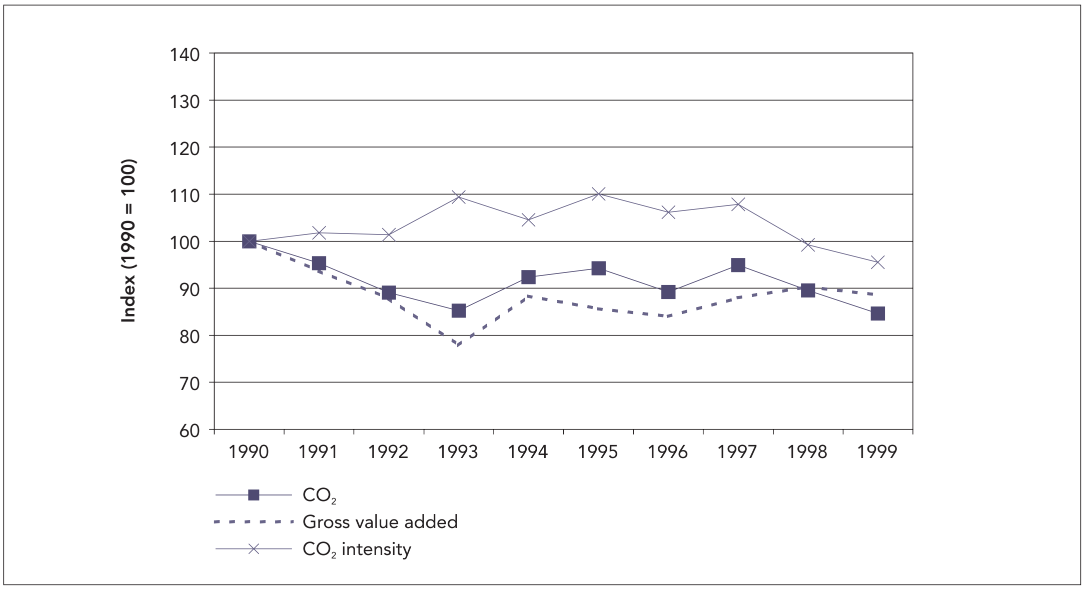


Figure 16

CO_2 emissions, gross value added and CO_2 intensity of the iron and steel industry in the EU

Source: Eurostat, Eurostat estimates for gross value added.

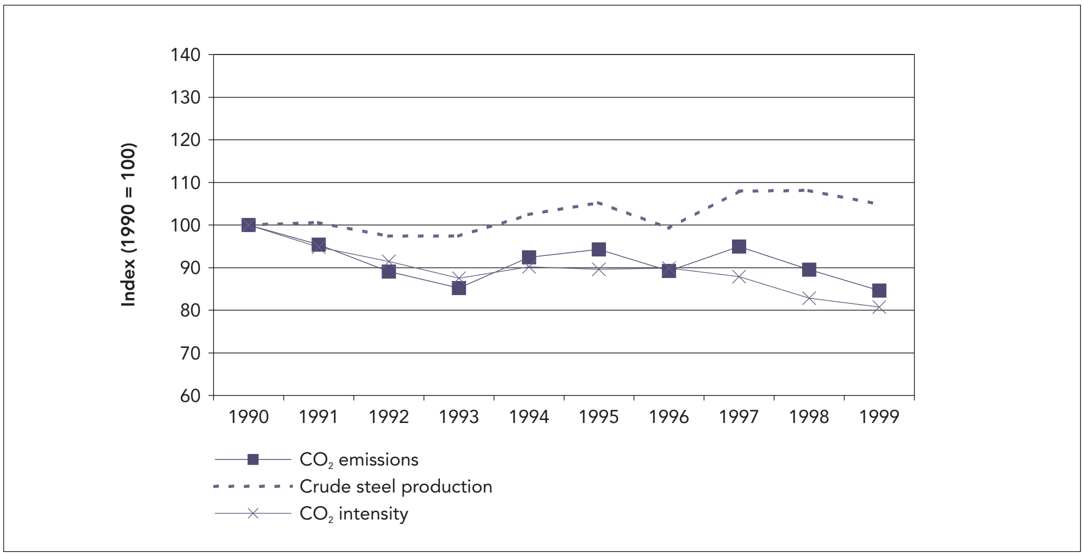


recent years and, in 1999, was 5 % below 1990 levels.

Whereas CO_2 intensity of iron and steel production (emission per gross value added) declined only slightly in the 1990s, CO_2 unit consumption (emissions per tonne of steel produced) of the same sector decreased significantly. Figure 17 shows that crude steel production increased by 5 % between 1990 and 1999. CO_2 emissions of the branch decreased by 15 % and the CO_2 unit consumption declined by 19 %.

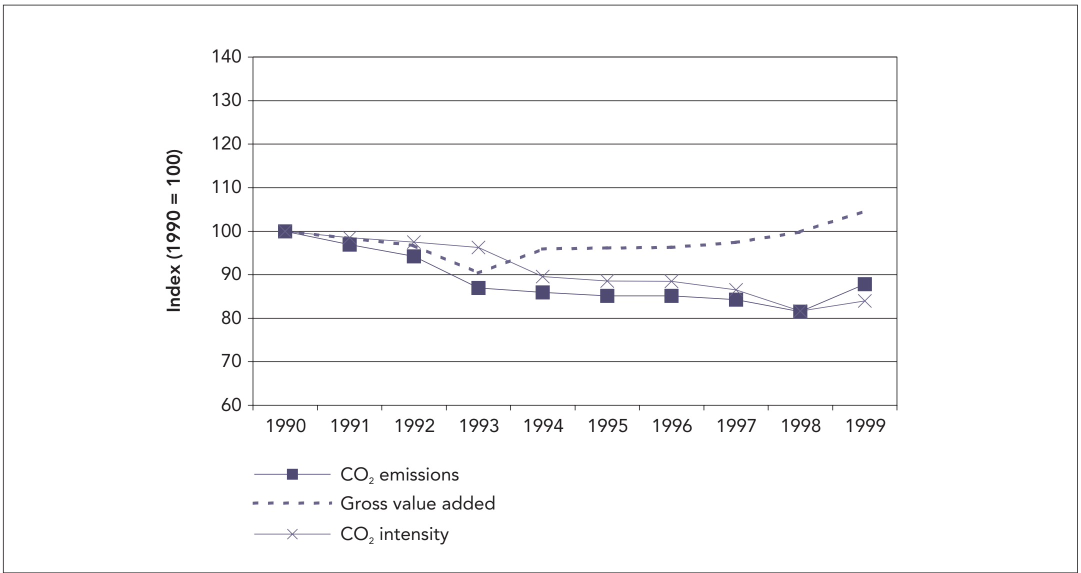
The glass, pottery and building material industry is the second largest CO_2 emitter within industry. The most important building material in terms of CO_2 emissions is cement. Figure 18 shows that the CO_2 emissions were 12 % below 1990 levels in 1999. Gross value added of the branch was 5 % above 1990 levels. This means that CO_2 intensity has declined and was 16 % below 1990 levels.

CO_2 emissions, crude steel production and CO_2 unit consumption of the iron and steel industry in the EU Figure 17



Source: Eurostat.

CO_2 emissions, gross value added and CO_2 intensity of the glass, pottery and building material industry in the EU Figure 18



Source: Eurostat, Eurostat estimates for gross value added.

The chemical industry is the third largest CO_2 emitter within industry. Figure 19 shows that the CO_2 emissions declined by 30 % between 1990 and 1999, whereas gross value added increased by 30 % in the branch. This means that CO_2 intensity has declined significantly by 46 %. The chemical industry is a very heterogeneous branch consisting among others of the production of agrochemicals, petrochemicals, inorganic chemicals and pharmaceuticals. The most energy-intensive process is the production of ammonia, which is the raw material for most fertilisers. Structural changes from energy-intensive chemical branches to less energy-intensive branches might be an important factor for overall reductions in CO_2 intensity of the branch. For this reason, a further split into energy-intensive and less energy-intensive chemical branches would be useful.

Finally, Figure 20 shows CO_2 emissions, power and heat production, and CO_2 intensity of auto-producer thermal power plants in the EU. CO_2 emissions from auto-producer power plants decreased by 9 %, but overall output (power and heat production) increased by 47 % between 1990 and 1999. Therefore, CO_2 intensity of power plants decreased by 38 %.

Figure 19 — CO_2 emissions, gross value added and CO_2 intensity of the chemical industry in the EU

Source: Eurostat, Eurostat estimates for gross value added.

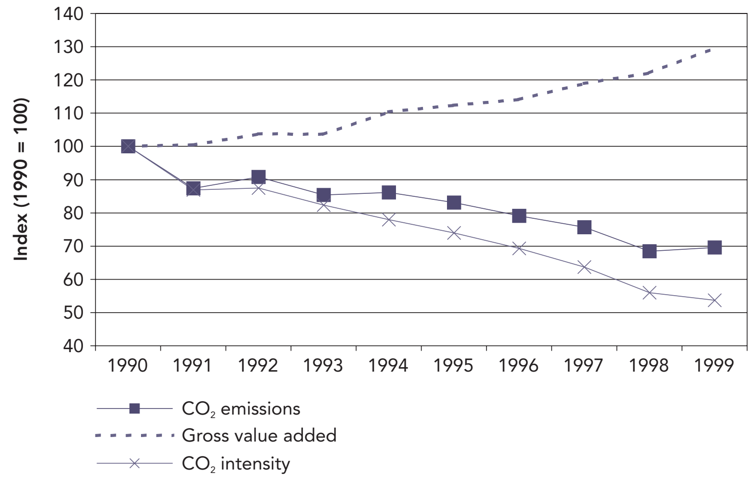
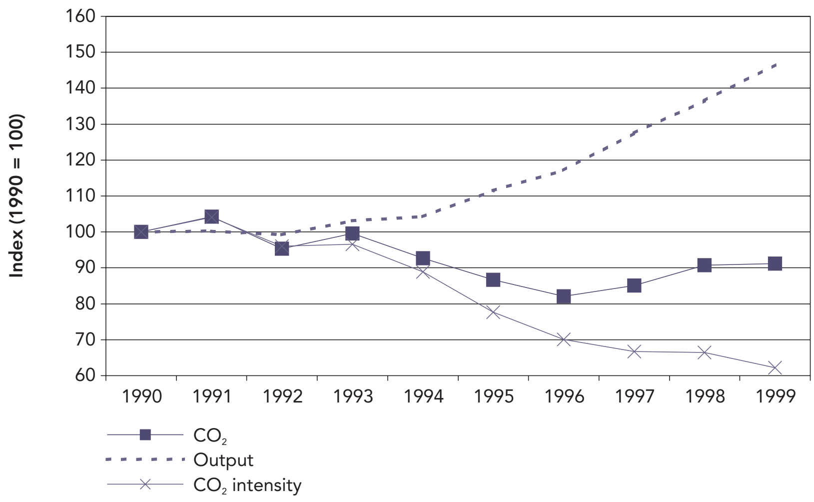


Figure 20 — CO_2 emissions, power and heat production and CO_2 intensity of the autoproducers thermal power plants in the EU

Source: Eurostat.



3.2.3. Transport (CO_2)

CO_2 emissions from transport is the second largest source of greenhouse gas emissions in the EU. Between 1990 and 2000, emissions grew rapidly mainly due to increases in road transport in almost all MS.

In 1990:	695 Tg
In 2000:	823 Tg
Change 1990–2000:	+ 128 Tg + 18 %
Share in total EU greenhouse gases: 20 %	

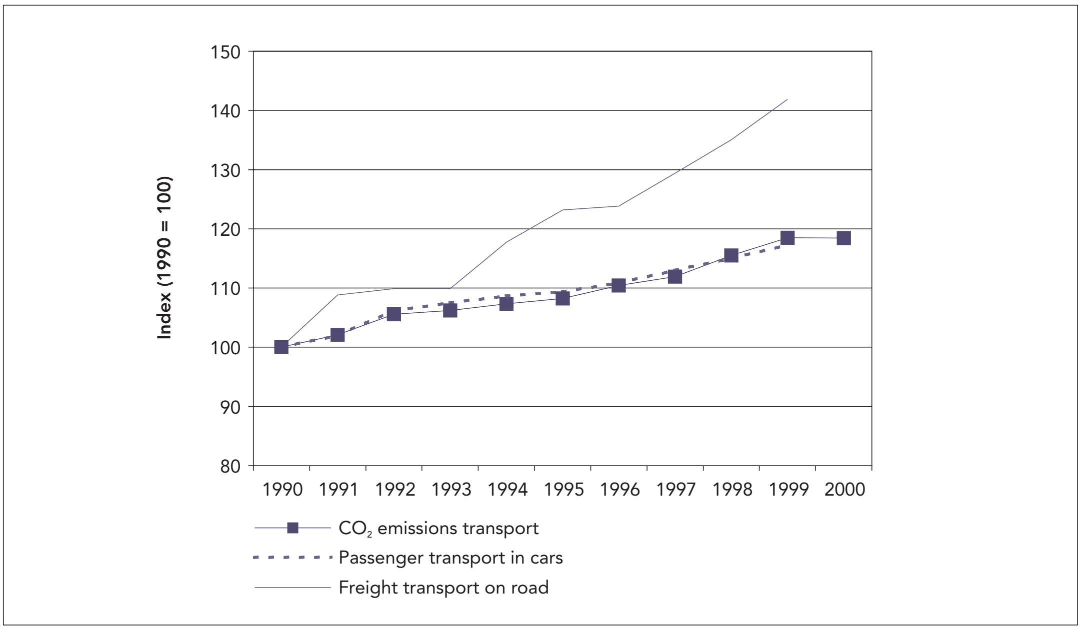
Transport includes emissions from fossil-fuel combustion in road transportation, national civil aviation, railways, national navigation, and other transportation (11). CO_2 emissions from transport are the second largest single source of greenhouse gas emissions in the EU accounting for 20 % of total greenhouse gas emissions in 2000.

Between 1990 and 2000, CO_2 emissions from transport increased by 18 % in the EU. Figure 21 shows that the emissions increased steadily in the 1990s; the year 2000 was the first year in the decade where emissions from transport did not increase. Road transport is by far the largest emission source from transport. Therefore, the main driving forces of CO_2 emissions from transport are transport volumes on road (passenger and freight transport). Figure 21 shows that passenger transport in cars increased by 17 % between 1990 and 1999, freight transport grew by 42 %.

Member States' contribution
Table 7 shows the contribution of the EC Member States to the level and trend of total EU CO_2 emissions from transport. The largest emitter is Germany accounting for 22 % of total EC CO_2 emissions from transport, followed by France (17 %), the UK (15 %), Italy (15 %) and Spain (10 %).

The stabilisation of CO_2 emissions from transport in 2000 was mainly due to emission cuts in Germany. Also, Greece reduced CO_2 emissions from transport by more than 1 million tonne (5 %). In contrast to this, both Spain and Portugal had considerable emission increases.

CO_2 emissions from transport and transport volumes (passenger transport in cars and freight transport on road) Figure 21



Source: Eurostat, inventory submissions by the EC Member States (CRF tables), EEA (2002a).

(11) Note that, in accordance with UNFCCC guidelines, these emissions do not include CO_2 emissions from international aviation and navigation, which were 232 Tg in 2000 or 6 % of total EC greenhouse gas emissions. Total EC CO_2 emissions from international aviation and navigation grew by 76 Tg or 49 % between 1990 and 2000.

Table 7 **Member States contribution to CO_2 emissions from transport**

Member State	Greenhouse gas emissions (Gg CO_2 equivalents)			Share in EU-15 emissions in 2000 (%)	Change 1999–2000		Change 1990–2000	
	1990	1999	2000		(Gg CO_2 equiva-lents)	(%)	(Gg CO_2 equiva-lents)	(%)
Germany	162 281	186 108	182 910	22,2	– 3197	– 2	20 629	13
France	119 159	138 279	137 783	16,7	– 496	0	18 624	16
United Kingdom	116 581	123 488	123 046	15,0	– 442	0	6 465	6
Italy	101 769	121 165	121 189	14,7	24	0	19 420	19
Spain	57 656	82 314	85 118	10,3	2804	3	27 462	48
Netherlands	29 085	34 682	35 120	4,3	437	1	6 034	21
Belgium	19 610	23 832	23 999	2,9	168	1	4 390	22
Greece	18 039	22 908	21 678	2,6	– 1229	– 5	3 639	20
Portugal	11 221	18 520	19 633	2,4	1113	6	8 411	75
Sweden	18 736	19 886	19 568	2,4	– 318	– 2	832	4
Austria	11 944	15 996	16 937	2,1	941	6	4 993	42
Finland	12 475	12 734	12 379	1,5	– 355	– 3	– 96	– 1
Denmark	10 381	12 184	12 028	1,5	– 156	– 1	1 647	16
Ireland	4 961	9 734	10 115	1,2	381	4	5 154	104
Luxembourg	870	1 337	1 451	0,2	114	9	580	67
EU-15	694 767	823 166	822 954	100,0	– 211	0	128 187	18

Between 1990 and 2000, CO_2 emissions from transport increased in almost all Member States, only Finland achieved emission reductions. The United Kingdom and Sweden achieved to limit emission growth to less than 10 % from 1990 to 2000, whereas Ireland doubled its CO_2 emissions from transport. In general, it is the cohesion States which show considerable growth rates due to their economic catch-up process. Explanations for the low growth rates and/or emission reductions of Finland, Sweden and the UK might be high emission levels (these MS had the highest per capita CO_2 emissions from transport in 1990) and high and/or rapidly growing road fuel prices (see Box 2). For the cohesion countries, the opposite is true: low starting points in terms of per capita emissions and low road fuel prices. They also have a strong growth in transport demand, particularly road, driven by economic growth and therefore also strong increases in CO_2.

Figure 22 shows the changes of CO_2 emissions from transport and of transport volumes for each EC Member State between 1990 and 1999. All Member States with the exception of Sweden (passenger) had increases in both types of transport; in most Member States, freight transport increased more rapidly than passenger transport. In a few countries, CO_2 emissions increased more rapidly than transport volumes (both passenger and freight).

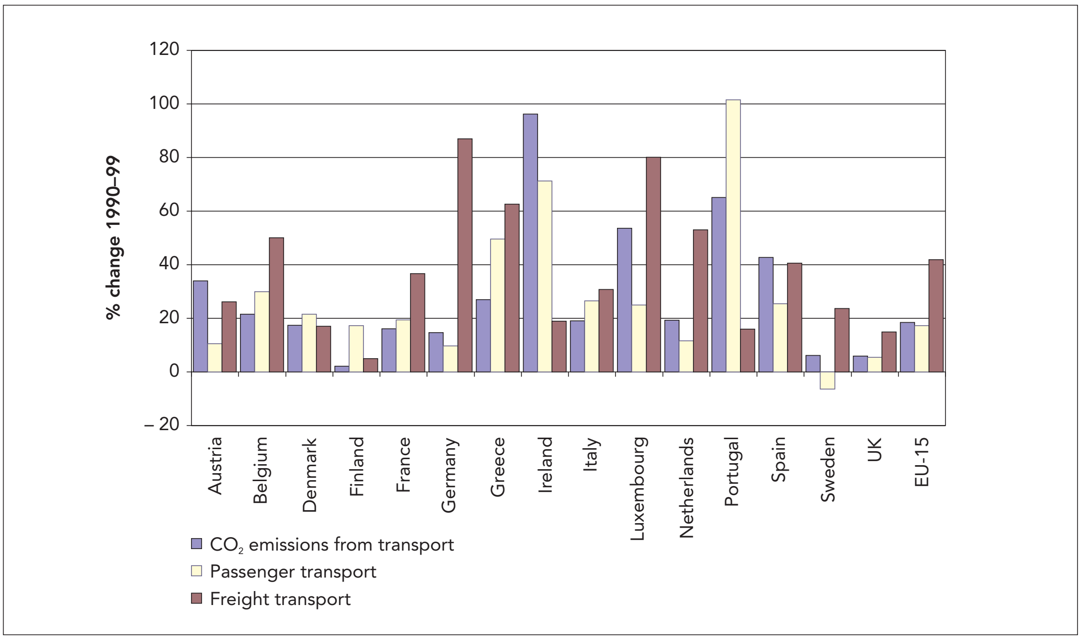
CO_2 intensity indicators

Figure 23 shows CO_2 emissions from freight transport, freight traffic volumes and CO_2 intensity of freight transport on road. CO_2 emissions increased by 36 % between 1990 and 1999, whereas transport volumes on road grew by 31 %. This means that CO_2 intensity of road transport on road increased by 4 %. However, in recent years, CO_2 intensity of freight transport declined slightly.

Percentage change of CO_2 emissions from transport, passenger car transport (passenger-kilometres) and road freight transport (tonne-kilometres) 1990–99

Figure 22

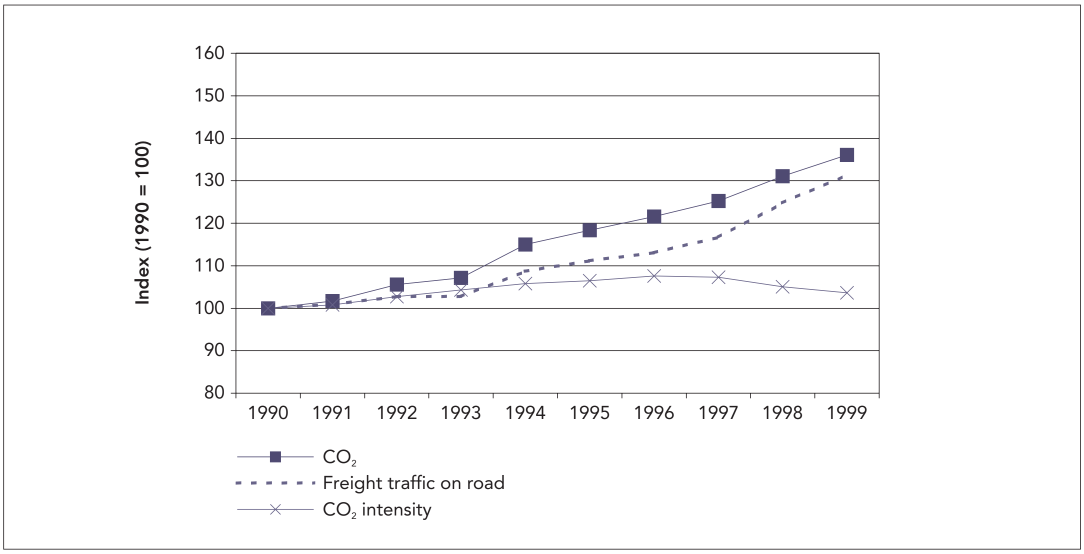
Source: Eurostat.



CO_2 emissions from diesel consumption of freight transport, freight traffic on road and CO_2 intensity of freight transport on road

Figure 23

Source: Eurostat.



Note: Does not include Belgium, Ireland, Luxembourg, Portugal.

As regards passenger cars, the EU aims at reducing the average specific CO_2 emissions of new cars to 120 g CO_2/km by 2005, and 2010 at the latest. In order to meet these targets, voluntary agreements between the EU and the European, Japanese and Korean automobile manufacturers associations (ACEA, JAMA, KAMA (12)) have been concluded. In these voluntary agreements, the automobile industry commits itself to aim at average specific CO_2 emissions of 140 g CO_2/km for new passenger cars by 2008 (ACEA) and 2009 (JAMA/KAMA).

According to the second annual report on the effectiveness of the strategy to reduce CO_2 emissions from cars (European Commission, 2001b), the average specific CO_2 emissions of new passenger cars reduced by 7.5 % from 186 g CO_2/km in 1995 to

(12) ACEA: European Automobile Manufacturers Association; JAMA: Japan Automobile Manufacturers Association; KAMA: Korea Automobile Manufacturers Association.

Box 2: CO_2 emissions from transport in Finland

Finland is the only MS having reduced its CO_2 emissions from transport in the 1990s. In addition, transport growth decoupled from GDP growth in recent years. These trends are most likely due to a combination of factors. The most important factors seem to be relatively high emission levels in 1990, the overall economic development in the 1990s and high prices of cars and road fuel:

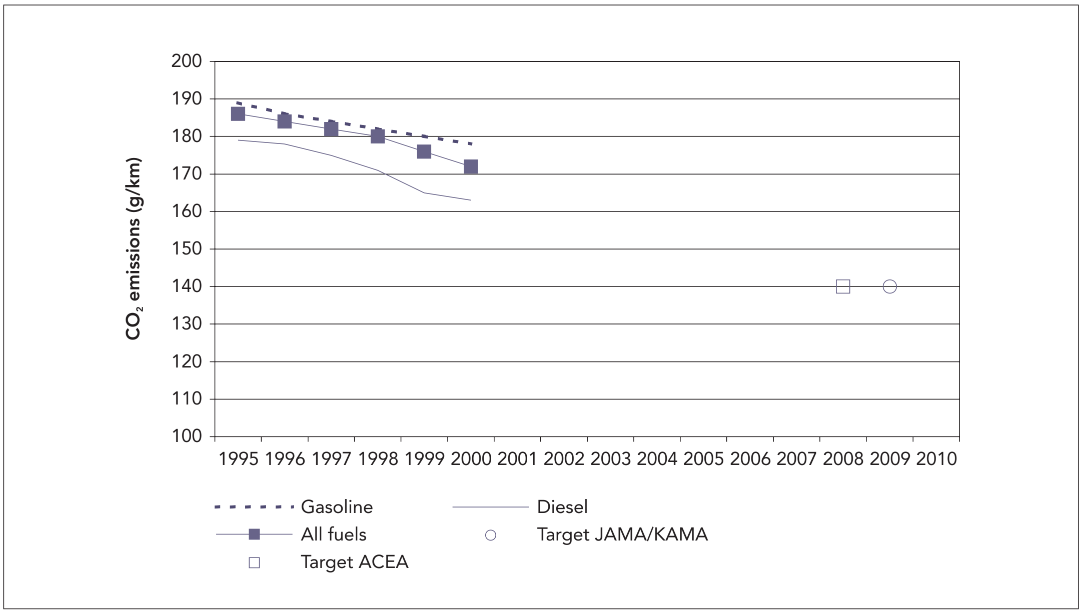
- The starting basis in 1990 was relatively high; in 1990, Finland had the highest per capita CO_2 emissions form transport among all EU Member States.
- Passenger transport in Finland decreased in the early 1990s. Tapio (2002) suggests that the severe economic recession at the beginning of the decade with rising unemployment and lower income levels might have played a role. After 1994, the growth of transport volumes seems to have been limited by relatively high prices of cars and road fuels. In the 1990s, the price of private car use in Finland increased almost parallel with real disposable income. In 1999, Finland had the highest petrol and the third highest diesel prices within the EU, with significant increases since 1995 (EEA, 2001a).
- Reductions of specific fuel consumption of passenger cars might have also played a role (Kirjavainen and Tamminen, 2002).
- Freight transport decreased in the early 1990s due to the recession. Freight transport growth after the recession has been limited due to a gradual change in the industrial structure from more transport-intensive industries towards less transport-intensive industries. Even though the paper and metal industries are still important in Finland, they have lost their relative importance in favour of high-technology industries (Kirjavainen and Tamminen, 2002).

172 g CO_2/km in 2000 (Figure 24). However, it should be noted that total number of passenger cars sold increased by 23.5 % between 1995 and 2000. In 2000, all associations reduced the average specific CO_2 emissions of their cars sold on the EU market: the ACEA and JAMA achieved in 2000 the highest reduction rates seen so far. The average CO_2 emissions of new passenger cars decreased in all Member States in 2000, although in some MS the specific CO_2 emissions of individual associations increased, for example in Portugal (for KAMA and JAMA), in Spain (for JAMA) and in France and Germany (for KAMA).

One of the reasons for the specific emission reductions between 1995 and 2000 was the technological development in diesel cars and a shift in fleet composition from petrol to diesel passenger cars. All associations increased the diesel share of their fleets: in 2000, one third of cars sold in the EU were diesel cars.

Figure 24 **Average specific CO_2 emissions of new passenger cars per fuel type**

Source: EC (2001b).



3.2.4. Transport (N_2O)

N_2O emissions from transport increased sharply between 1990 and 2000 mainly due to growing use of catalytic converters in petrol-engined cars.

In 1990:	12 Tg
In 2000:	24 Tg
Change 1990–2000:	+ 12 Tg + 103 %
Share in total EU greenhouse gases:	0.6 %

N_2O emissions from transport account for 0.6 % of total EC greenhouse gas emissions. They increased by 12 Tg between 1990 and 2000, showing the third largest increase of all EC key source categories in absolute terms.

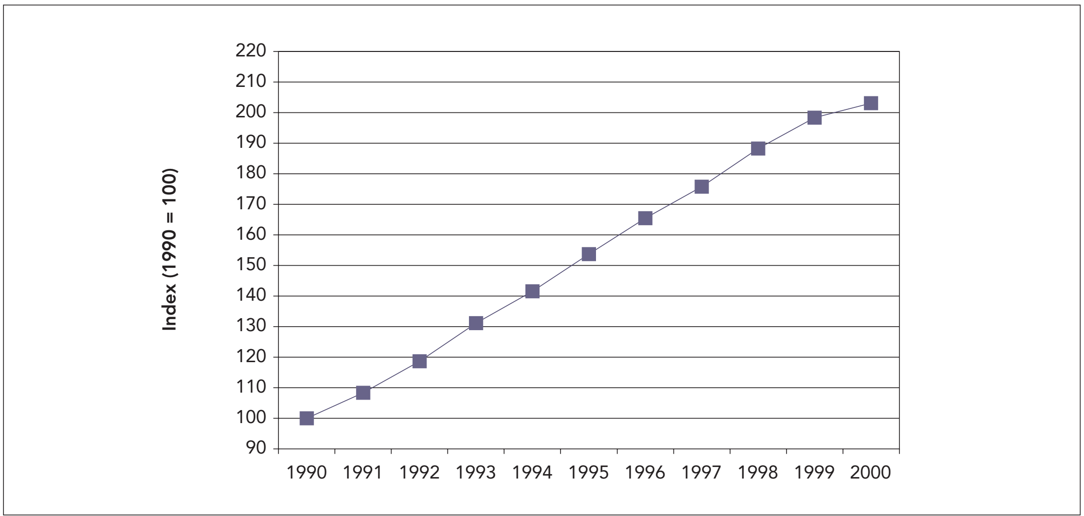
Between 1990 and 2000, N_2O emissions from transport grew by 103 % in the EU; in 2000, they increased by 2 %, compared to1999 (Figure 25). The most important source of N_2O from transport are petrol cars equipped with catalyst converters. N_2O emissions are mostly formed during the warm-up phase. If the catalyst degrades as it ages, then the length of the warm-up phase can be extended, and the period over which N_2O is emitted is also extended. Emissions measurements on petrol cars equipped with 'first generation' three way catalysts showed a substantial (ten-fold) increase in N_2O emissions compared to vehicles without catalysts, but it now seems likely that the increase in emissions from more modern catalysts is substantially lower than this (EC, 2000a).

Member States' contribution
Table 8 shows the contribution of the EC Member States to the level and trend of total EU N_2O emissions from transport. The largest emitters are Germany (22 %), the UK (18 %), France (15.5 %) and Italy (14 %).

Most Member States increased emissions in 2000, compared to 1999, but some Member States achieved to reduce their emissions. The emission reductions in recent years in some Member States (e.g. the Netherlands), despite the increase in transport volumes, might be explained by two main factors (Olivier et al., 2002):

- newer generations of catalytic converters appear to have lower N_2O emission factors;
- in many Member States, the share of diesel cars in road passenger transport has increased over the last years; diesel cars are assumed to have a lower emission factor with respect to N_2O than the catalyst-equipped petrol-engined cars.

N_2O emissions from transport — Figure 25



Source: Inventory submissions by the EC Member States (CRF tables), EEA (2002a).

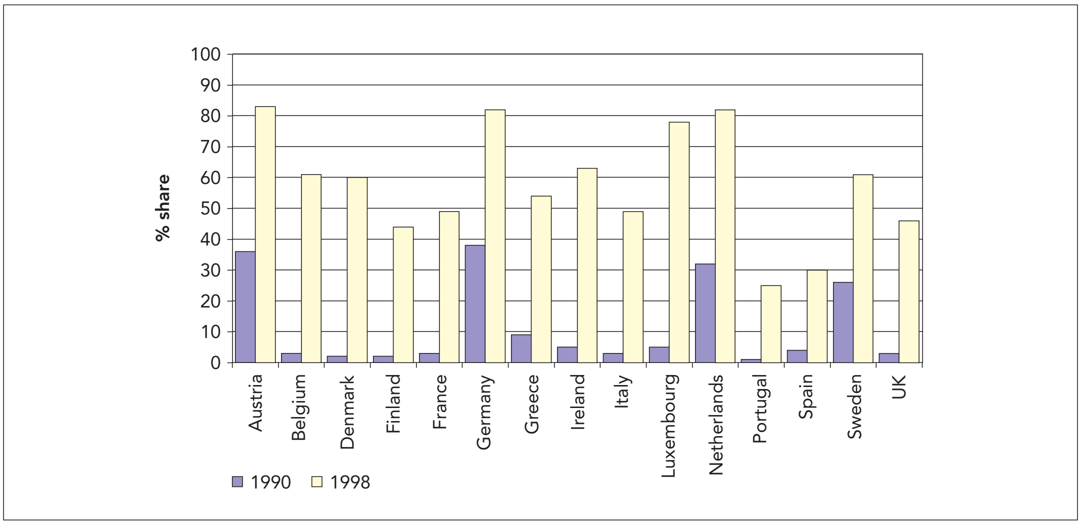
Table 8 **Member States' contribution to N_2O emissions from transport**

Source: Inventory submissions by the EC Member States (CRF tables), EEA (2002a).

Member State	Greenhouse gas emissions (Gg CO_2 equivalents)			Share in EU-15 emissions in 2000 (%)	Change 1999–2000		Change 1990–2000	
	1990	1999	2000		(Gg CO_2 equivalents)	(%)	(Gg CO_2 equivalents)	(%)
Germany	3 193	5 502	5 175	21,8	– 327	– 6	1 982	62
United Kingdom	1 345	3 943	4 202	17,7	259	7	2 857	212
France	1 626	3 519	3 668	15,5	149	4	2 042	126
Italy	1 734	3 104	3 386	14,3	282	9	1 652	95
Spain	851	1 993	2 080	8,8	87	4	1 229	144
Belgium	267	699	730	3,1	30	4	462	173
Finland	631	714	685	2,9	– 29	– 4	54	9
Greece	515	668	676	2,8	8	1	161	31
Sweden	451	569	625	2,6	56	10	174	39
Netherlands	376	633	621	2,6	– 12	– 2	245	65
Austria	307	564	558	2,4	– 5	– 1	252	82
Portugal	137	458	508	2,1	51	11	372	271
Denmark	150	372	384	1,6	12	3	234	157
Ireland	87	391	373	1,6	– 18	– 5	286	330
Luxembourg	12	43	51	0,2	8	18	39	311
EU-15	11 681	23 171	23 721	100,0	550	2	12 041	103

Figure 26 **Estimated share of petrol-engined cars with catalytic converters 1990 and 1998**

Source: Eurostat.



Between 1990 and 2000, all Member States increased emissions but there are substantial differences in growth rates. Whereas Ireland, Luxembourg, Portugal and the UK increased emissions by more than 200 % between 1990 and 2000, Finland limited its growth to 9 %.

Figure 26 shows the share of petrol-engined cars with catalytic converter for each EC Member State for 1990 and 1998. It shows that the penetration of the catalytic converter has made considerable progress in the 1990s. In some countries, 80 % of petrol-engined cars are equipped with catalytic converters. In Portugal and Spain however, the share of catalyst-fitted cars was 30 % or less in 1998.

3.2.5. Other sectors (CO_2) (small combustion including households)

CO_2 emissions from small combustion is the third largest source of greenhouse gas emissions in the EU. Reasons for emission reductions between 1990 and 2000 were efficiency increases in Germany and increased use of (biomass) district heating in some MS. In addition, temperature variations influence emissions.

In 1990:	636 Tg
In 2000:	619 Tg
Change 1990–2000:	– 16 Tg – 3 %
Share in total EU greenhouse gases: 15 %	

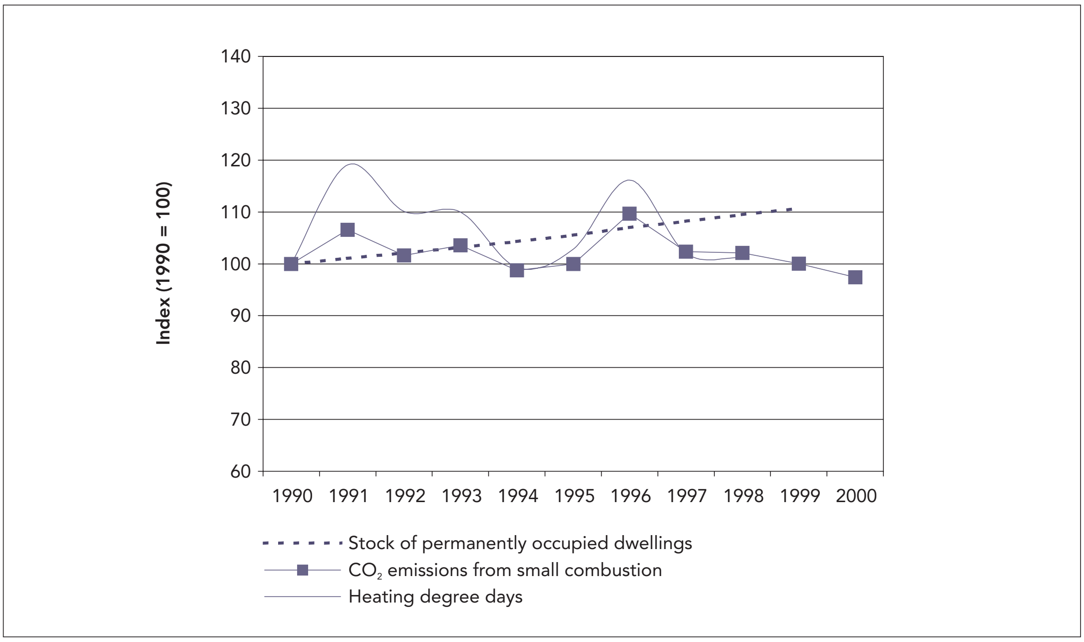
CO_2 emissions from small combustion are the third largest source of greenhouse gas emissions in the EU and accounted for 15 % of total greenhouse gas emissions in 2000. Small combustion includes fossil-fuel combustion from small commercial businesses (as opposed to industry), public institutions, households and agricultural businesses, with households being by far the largest sub-group in this category.

Between 1990 and 2000, CO_2 emissions from small combustion decreased by 3 % in the EU. Main factors influencing CO_2 emissions from small combustion are (1) number and size of dwellings, (2) building codes, (3) age distribution of the existing building stock, (4) fuel split for heating and warm water, and (5) climate. Figure 27 shows that the pattern of CO_2 emissions from small combustion follows very closely the pattern of heating degree days (13): the coldest years in the decade had the highest CO_2 emissions from small combustion. In 2000, the heating degree days were lower than in 1999 and 1998 in most Member States, which also corresponds with falling CO_2 emissions in these years. The stock of permanently occupied dwellings increased by 11 % between 1990 and 1999.

Member States' contribution

Table 9 shows the contribution of the EC Member States to the level and trend of total EU CO_2 emissions from small combustion. The largest emitter is Germany accounting for 27 % of total EC CO_2 emissions from small combustion, followed by the UK (19 %), France (16 %) and Italy (12 %).

CO_2 emissions from small combustion, number of permanently occupied dwellings and heating degree days Figure 27



Source: Eurostat, inventory submissions by the EC Member States (CRF tables, EEA (2002a); EC (2000b) for heating degree days.

Note: The index of permanently occupied dwellings includes estimates for Belgium and Luxembourg.

(13) Heating degree days are a measure for the need for heating due to cold temperatures. They are the sum of temperature differences between a certain constant indoor temperature and the daily average of outdoor temperature. Therefore, high heating degree days indicate low average temperatures and increased need for heating.

Table 9 **Member States contribution to CO_2 emissions from small combustion**

Source: Inventory submissions by the EC Member States (CRF tables), EEA (2002a).

Member State	Greenhouse gas emissions (Gg CO_2 equivalents)			Share in EU-15 emissions in 2000 (%)	Change 1999–2000		Change 1990–2000	
	1990	1999	2000		(Gg CO_2 equiva-lents)	(%)	(Gg CO_2 equiva-lents)	(%)
Germany	203 439	177 862	170 159	27,5	– 7 702	– 4	– 33 280	– 16
United Kingdom	112 538	117 674	118 322	19,1	647	1	5 784	5
France	94 375	100 945	97 258	15,7	– 3 688	– 4	2 883	3
Italy	75 914	81 345	76 197	12,3	– 5 148	– 6	282	0
Spain	25 953	32 676	34 436	5,6	1 760	5	8 484	33
Netherlands	34 643	32 981	32 935	5,3	– 46	0	– 1 708	– 5
Belgium	28 005	30 850	30 425	4,9	– 425	– 1	2 421	9
Austria	13 908	14 331	13 638	2,2	– 693	– 5	– 271	– 2
Ireland	9 726	9 903	10 364	1,7	462	5	638	7
Greece	5 341	7 914	8 530	1,4	617	8	3 190	60
Sweden	10 673	8 692	7 627	1,2	– 1 064	– 12	– 3 046	– 29
Denmark	8 959	8 095	7 482	1,2	– 614	– 8	– 1 477	– 16
Finland	7 571	6 369	5 796	0,9	– 573	– 9	– 1 775	– 23
Portugal	3 621	4 873	5 040	0,8	167	3	1 419	39
Luxembourg	1 277	1 515	1 268	0,2	– 248	– 16	– 10	– 1
EU-15	635 943	636 026	619 478	100,0	– 16 549	– 3	– 16 466	– 3

In 2000, large emission cuts were achieved in Germany, Italy and France, compared to 1999. Also, Sweden had a remarkable emission reduction of 12 %. Most MS reduced emission from small combustion which corresponds to the fact that the heating degree days decreased in most MS.

Between 1990 and 2000, the largest reduction in absolute terms was reported by Germany reducing emissions by 33 million tonnes. Efficiency improvements and fuel switch in eastern German households are one reason for these emission reductions. Also, the Nordic countries show large emission reductions. One reason for this seems to be increased use of district heating (see Box 4). As district heating replaces heating boilers in households, an increase in the share of district heating reduces CO_2 emissions from households (but increases emissions from energy industries if fossil fuels are used).

Greece, Portugal and Spain increased their emissions by more than 30 %. Spain and Portugal had large emission increases in the households and in the commercial/ institutional sector, whereas in Greece emissions grew mainly in the households sector.

Figure 28 shows the changes of CO_2 emissions from small combustion and of the stock of permanently occupied dwellings for each EC Member State between 1990 and 1999. It shows that, in all Member States, the number of dwellings increased between 1990 and 1999.

CO_2 intensity indicators

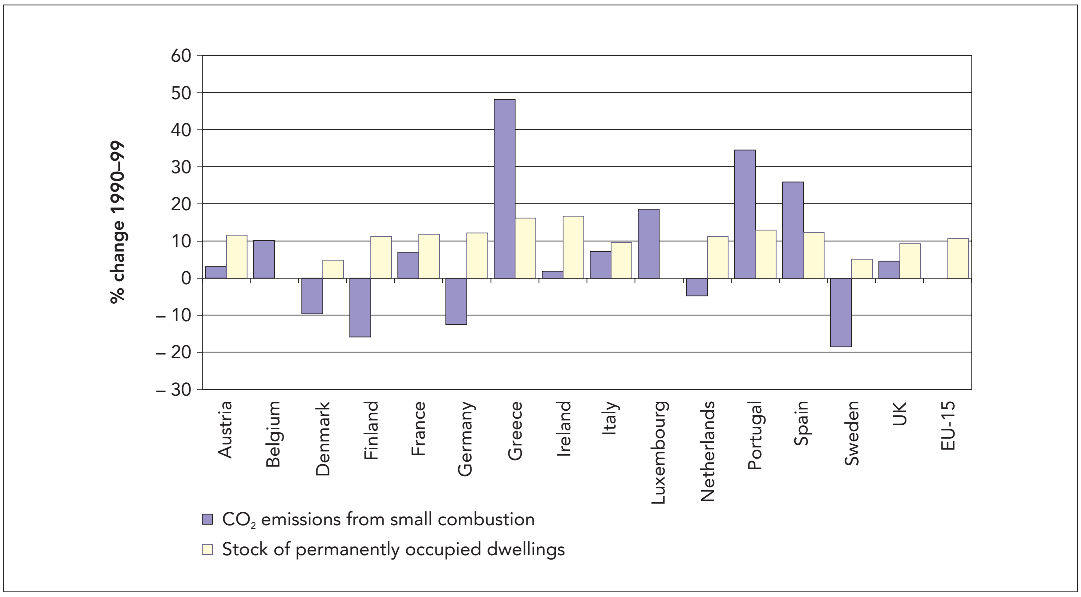
Figure 27 showed that CO_2 emissions from small combustion decoupled from the stock of permanently occupied dwellings. This means that overall CO_2 intensity of small combustion decreased in the 1990s. The households sector is the most important source of CO_2 emissions from small combustion, the services sector is a second important source.

Figure 29 shows CO_2 emissions, gross value added and CO_2 intensity of the services sector. CO_2 emissions were slightly below 1990 levels in 1999, whereas gross value added increased by 23 %. This means that CO_2 intensity of the services sector decreased by 20 %. The pattern of CO_2 emissions also follows closely the heating degree days, as a large share of the energy used in the sector is used for space heating.

In addition, the sector is characterised by a rapid growth of electricity consumption. Final energy consumption of the sector (including electricity use) increased by 18 % and, therefore, decoupled only to a small degree from gross value added.

Percentage change of CO_2 emissions from small combustion and of permanently occupied dwellings (1990–99)

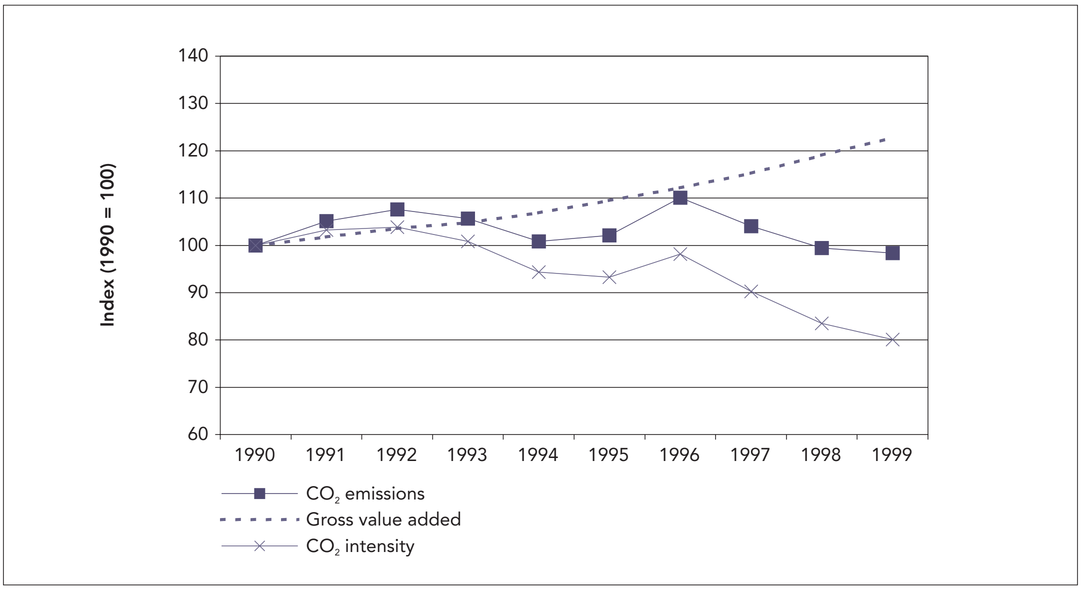
Figure 28



Source: Eurostat, inventory submissions by the EC Member States (CRF tables), EEA (2002a).

CO_2 emissions from the services sector, gross value added and CO_2 intensity of the services sector

Figure 29



Source: Eurostat, Eurostat estimates for gross value added.

Box 3: Success stories in solar thermal energy production in the 1990s

Austria's rapid increase in its use of solar energy for heating purposes demonstrates that solar thermal can provide an important source of energy even in less sunny regions.

In 1993:	24.9 ktoe
In 1999:	62.1 ktoe
Increase 1993–99:	37.1 ktoe
	+ 150 %

Solar thermal benefited during the 1980s from the establishment of a network of groups throughout the country which provided active support and advice to individuals wishing to install solar water heaters themselves. Austria now has a network of companies working in the field of solar collectors, as well as in other renewable energy technologies. Financial support for installing solar collectors is available through support programmes both at national level (targeting companies) and at the regional level (targeting households).

Success factors:
- Political: national and regional support towards development of renewable energy.
- Financial: loans and grants available through national and regional government.
- Fiscal: energy taxes favour renewable energy schemes.
- Administration: active local and regional support towards the installation of solar collectors.
- Technological development: support for indigenous solar collector manufacturers and installation industries.
- Information, education and training: positive dissemination and support for renewable energy use through the regional energy agencies.

Germany is leading the way on solar thermal energy. German municipalities are promoting successfully a greater use of solar energy for thermal requirements.

In 1993:	21.0 ktoe
In 1999:	75.4 ktoe
Increase 1993–99:	54.4 ktoe
	+ 260 %

Many German municipalities have seen a rapid increase in the uptake of thermal solar energy installations. GRS (guaranteed results from solar collectors) is an initiative established by several municipal utilities in 1993 to ensure that the annual amount of heat supplied by a solar collector was guaranteed by the manufacturer, thus allowing for precise cost–benefit calculations and ensuring that systems met customer needs. Its application has helped to boost consumer confidence in the quality of the new types of heating systems available in Germany.

Success factors:
- Political: national and regional support towards increasing use of solar thermal installations.
- Financial: federal government and private sector financial support to solar thermal installations.
- Administration: active support provided by municipalities for solar thermal installations.
- Technological development: quality standards provided to guarantee results from solar collectors.
- Information, education and training: active promotion of the benefits of solar thermal installations by municipalities, utilities and local energy agencies.

Source: EEA (2001b).

Box 4: Success stories in biomass district heating in the 1990s

Austria achieved significant increases in its level and rate of use of biomass for heat production in general and especially for district heating purposes.

In 1993:	77.1 ktoe
In 1998:	124.6 ktoe
Increase 1993–98:	47.5 ktoe
	+ 62 %

Austria's large biomass resources play an important role in increasing the use of renewable energy. Decentralised heat production from biomass is accepted and promoted by the local and regional authorities. Farmers and wood users such as sawmills are supportive of new biomass projects because of the additional income that will be generated. There is already a well-established local industry to meet the demand for new biomass district heating plants, including boiled and pipework manufacture, and installation services. By 2000, there were more than 500 district heating plants operating throughout Austria.

Success factors:
- Political: national and regional support to expand the use of biomass.
- Fiscal: energy taxes favour renewable energy schemes.
- Financial: public grants and subsidies for biomass installations.
- Administration: long history of public support for and use of biomass as a fuel resource.
- Technological development: indigenous manufacturing expertise.
- Information, education and training: long history of use of biomass as fuel, benefits to key local economic actors from biomass projects, promotion of benefits from biomass use by energy agencies.

Sweden: Forestry is one of the most important natural resources in Sweden, which has a long history of making use of this resource for fuel.

In 1993:	365.9 ktoe
In 1998:	571.3 ktoe
Increase 1993–98:	205.4 ktoe
	+ 56 %

District heating systems are widespread in Sweden, with over one third of the total domestic heat market supplied from district heating. There are nearly 200 plants, and biomass is one of the main fuel sources. Biomass as a fuel source for district heating plants has been increasing steadily over the past two decades, particularly to replace electricity for heating. Biomass resources now meet more than 50 % of the fuel supply to district heating networks. The increase in biomass district heating has also been greatly helped by the introduction of carbon and energy taxes as their application made other options, in particular coal-fired district heating plants, more expensive.

Success factors:
- Political: support for renewable energy use, especially biomass.
- Fiscal: tax system benefits biomass use.
- Technological development: active development and promotion of biomass technologies.
- Administrative: municipalities actively support the establishment of biomass district heating systems.

Source: EEA (2001b).

3.2.6. Fugitive emissions from solid fuels (CH_4)

Fugitive CH_4 emissions from solid fuels decreased sharply between 1990 and 2000 mainly due to a fall of coal mining in most MS.

In 1990:	50 Tg
In 2000:	21 Tg
Change 1990–2000:	– 30 Tg
	– 59 %
Share in total EU greenhouse gases	0.5 %

Fugitive CH_4 emissions from solid fuels account for 0.5 % of total EU greenhouse gas emissions. The most important sources of fugitive emissions from solid fuels is coal mining and handling and the transformation of coal.

EU CH_4 emissions from solid fuels declined almost steadily. In 2000, they were 59 % or 30 Tg of CO_2 equivalents below 1990 levels, which was one of the largest emission cuts of EC key sources in absolute terms. In 2000, fugitive CH_4 emissions from solid fuels decreased by 14 %. The most important driving force is coal mining, which reduced by 48 % between 1990 and 1999 (Figure 30).

Member States' contribution

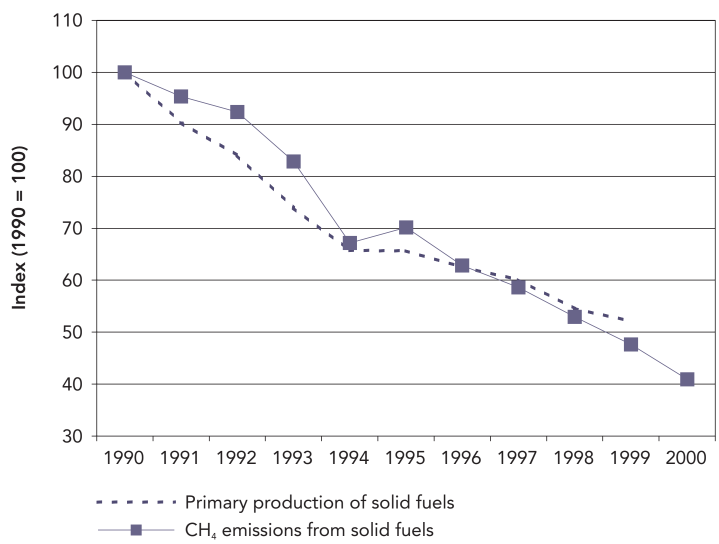
Table 10 shows the contribution of the EC Member States to the level and trend of total EU fugitive CH_4 emissions from solid fuels. Germany accounts for almost half of EC emissions. The UK and France account for 27 % and 12 % of EU emissions respectively.

In 2000, large emission decreases were achieved in Germany and the UK, compared to 1999. Six MS had no fugitive CH_4 emissions from solid fuels in 2000. Between 1990 and 2000, almost all Member States decreased emissions, only Greece had significant emission increases. Large cuts were achieved by Germany and the UK.

Figure 31 shows the changes of CH_4 emissions from solid fuels and of coal mining for each EC Member State between 1990 and 1999. It shows that, except for Greece, all Member States that reported background data in the CRF reduced coal mining the last decade. In all Member States, the emission trends followed closely the trends of coal mining. Sweden has very small emissions from solid fuel transformation.

Figure 30 **Fugitive CH_4 emissions from solid fuels and coal mining**

Source: Eurostat, inventory submissions by the EC Member States (CRF tables), EEA (2002a).

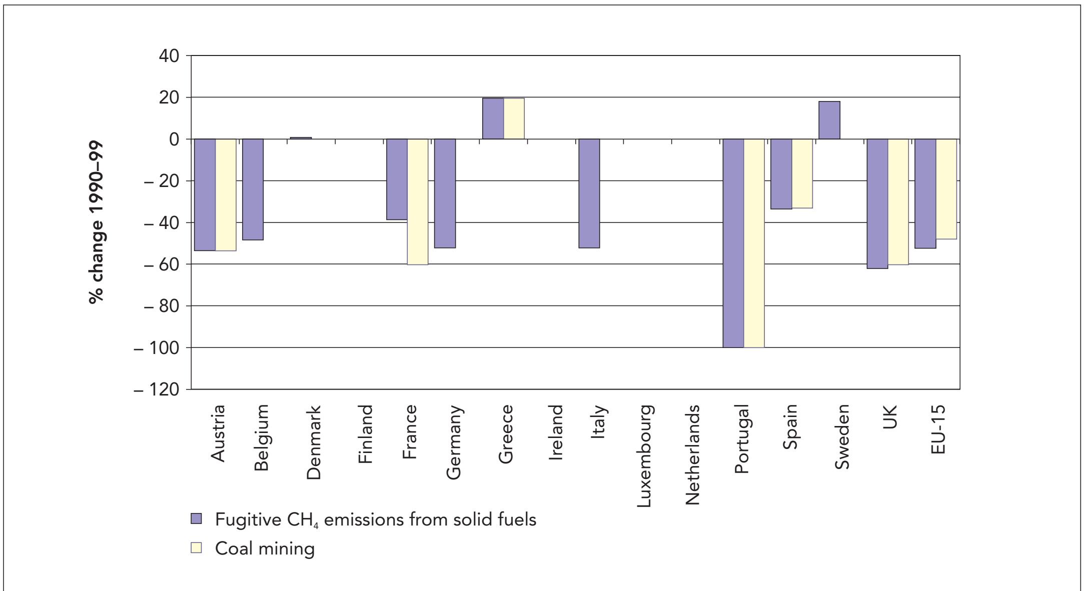


Member States contribution to fugitive CH_4 emissions from solid fuels Table 10

Member State	Greenhouse gas emissions ($Gg\ CO_2$ equivalents)			Share in EU-15 emissions in 2000 (%)	Change 1999–2000		Change 1990–2000	
	1990	1999	2000		($Gg\ CO_2$ equiva-lents)	(%)	($Gg\ CO_2$ equiva-lents)	(%)
Germany	25 767	12 325	9 968	48,4	– 2 357	– 19	– 15 799	– 61
United Kingdom	17 203	6 528	5 565	27,0	– 964	– 15	– 11 638	– 68
France	4 331	2 658	2 564	12,4	– 94	– 4	– 1 767	– 41
Spain	1 789	1 190	1 209	5,9	19	2	– 580	– 32
Greece	926	1 108	1 140	5,5	33	3	214	23
Denmark	69	70	70	0,3	0	0	1	1
Italy	111	53	51	0,2	– 2	– 4	– 60	– 54
Finland	21	21	21	0,1	0	0	0	0
Belgium	25	13	13	0,1	0	0	– 12	– 48
Sweden	0	0	0	0,0	0	– 4	0	14
Portugal	66	0	0	0,0	0	0	– 66	– 100
Ireland	0	0	0	0,0	0	0	0	0
Austria	0	0	0	0,0	0	0	0	– 54
Netherlands	0	0	0	0,0	0	0	0	0
Luxembourg	0	0	0	0,0	0	0	0	0
EU-15	50 310	23 965	20 601	100,0	– 3 364	– 14	– 29 708	– 59

Source: Inventory submissions by the EC Member States (CRF tables), EEA (2002a).

Percentage change of CH_4 emissions from solid fuels and of coal mining in the EC Member States 1990–99 Figure 31



Source: Eurostat (for EU coal mining), inventory submissions by the EC Member States (CRF tables), EEA (2002a).

3.3. Industrial processes

3.3.1. Mineral products (CO_2)

CO_2 emissions from mineral products were slightly below 1990 levels in 2000, but increased in recent years. Cement production is the most important single driving force.

In 1990:	112 Tg
In 2000:	111 Tg
Change 1990–2000:	– 1 Tg – 1 %
Share in total EU greenhouse gases: 2.7 %	

CO_2 emissions from industrial processes of mineral products were 111 Tg and accounted for 2.7 % of total EC greenhouse gas emissions in 2000. The main sectors in this category are cement production, lime production, limestone and dolomite use, soda ash production and use, asphalt roofing, and road paving with asphalt; cement production is by far the largest source of CO_2 emissions.

In 2000, CO_2 emissions from mineral products were 1 % below 1990 levels in the EU. They declined in the early 1990s, but increased again in recent years. The main driving force of CO_2 emissions from mineral products is cement production. In 1999, cement production was 2 % above 1990 levels. Figure 32 shows the close relationship between cement production and CO_2 emissions from mineral products.

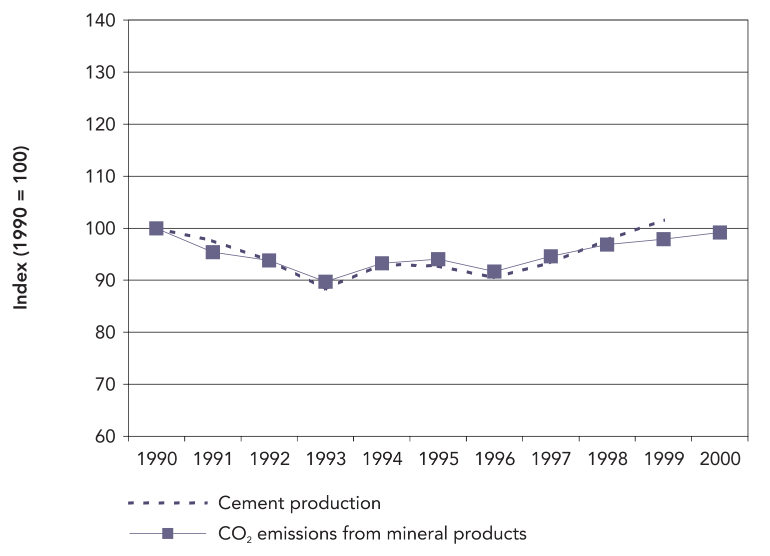
Member States' contribution
Table 11 shows the contribution of the EC Member States to the level and trend of total EU CO_2 emissions from mineral products. Germany is the largest emitter accounting for 21 % of EU emissions, followed by Italy (20 %) and Spain (16 %).

In 2000, CO_2 emissions from mineral products mainly increased in Ireland and Italy, whereas the UK had large emission reductions.

Between 1990 and 2000, the largest absolute reductions of CO_2 emissions from mineral products were reported by France, Germany, Italy and the UK, whereas Spain and Portugal had large increases. In relative terms, Austria and France reduced by 20 % or more, whereas Denmark, Portugal and Ireland had emission increases of more than 30 %.

However, these results should be interpreted with care as different criteria are used by Member States to decide whether particular emissions are allocated to fossil-fuel combustion or to the relevant industrial process (e.g. cement production).

Figure 32 CO_2 emissions from mineral products and cement production



Source: Eurostat, inventory submissions by the EC Member States (CRF tables), EEA (2002a).

Table 11

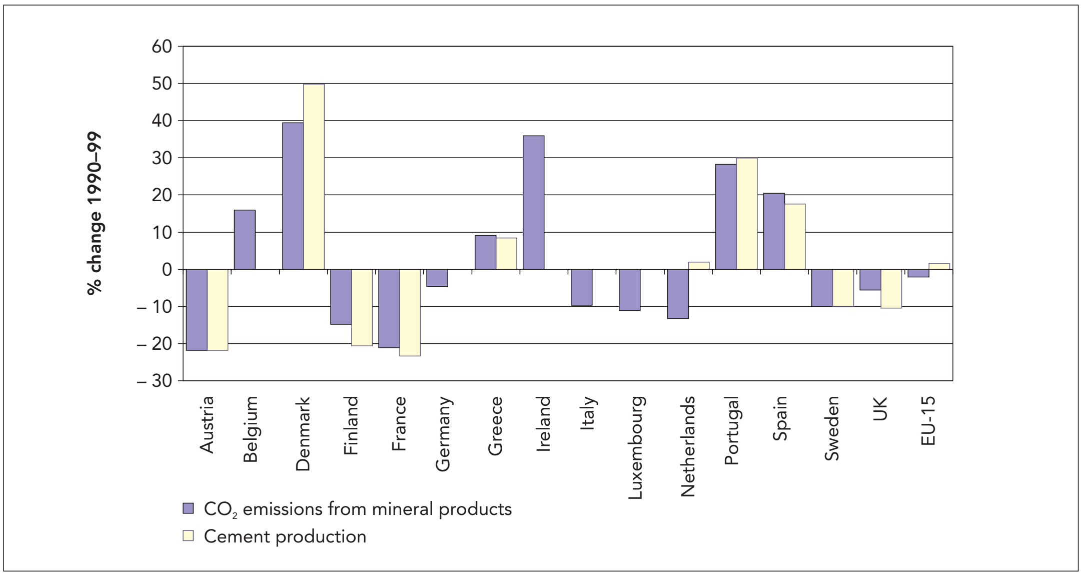
Member States contribution to CO_2 emissions from mineral products

Member State	Greenhouse gas emissions (Gg CO_2 equivalents)			Share in EU-15 emissions in 2000 (%)	Change 1999–2000		Change 1990–2000	
	1990	1999	2000		(Gg CO_2 equivalents)	(%)	(Gg CO_2 equivalents)	(%)
Germany	24 664	23 525	23 502	21,2	– 23	0	– 1 162	– 5
Italy	24 193	21 853	22 722	20,5	869	4	– 1 471	– 6
Spain	14 289	17 216	17 488	15,8	272	2	3 199	22
France	13 612	10 739	10 935	9,9	196	2	– 2 677	– 20
United Kingdom	9 629	9 091	8 534	7,7	– 557	– 6	– 1 095	– 11
Greece	6 984	7 619	7 625	6,9	6	0	641	9
Belgium	4 569	5 298	5 298	4,8	0	0	728	16
Portugal	3 426	4 392	4 511	4,1	119	3	1 085	32
Austria	3 975	3 108	3 056	2,8	– 52	– 2	– 919	– 23
Ireland	941	1 279	1 693	1,5	414	32	752	80
Sweden	1 765	1 590	1 592	1,4	2	0	– 173	– 10
Denmark	1 005	1 402	1 453	1,3	51	4	448	45
Finland	1 175	1 002	1 072	1,0	71	7	– 103	– 9
Netherlands	1 124	975	981	0,9	6	1	– 143	– 13
Luxembourg	585	520	547	0,5	27	5	– 38	– 6
EU-15	111 937	109 608	111 009	100,0	1401	1	– 928	– 1

Source: Inventory submissions by the EC Member States (CRF tables), EEA (2002a).

Figure 33

Percentage change of CO_2 emissions from mineral products and of cement production in EC Member States 1990–99



Source: Eurostat, inventory submissions by the EC Member States (CRF tables), EEA (2002a).

Figure 33 shows the changes of CO_2 emissions from mineral products and of cement production for each EC Member State between 1990 and 1999. It shows that several MS decoupled emissions from cement production to a certain extent, the Netherlands even achieved a strong decoupling (emission decreases despite of cement production increases). However, in some MS, cement production reduced more rapidly than emissions (e.g. the UK).

3.3.2. Chemical industry (N_2O)

N_2O emissions from chemical industry dropped sharply between 1997 and 1999 mainly due to emission-reduction measures in adipic acid production in France, Germany and the UK.

In 1990:	105 Tg
In 2000:	46 Tg
Change 1990–2000:	– 59 Tg – 56 %
Share in total EU greenhouse gases: 1.2 %	

N_2O emissions from the chemical industry account for 1.2 % of total EC greenhouse gas emissions. They were 46 Tg of CO_2 equivalents in 2000, 59 Tg below 1990 levels. This was the largest reduction of all EC greenhouse gas key source emissions in absolute terms.

Between 1990 and 2000, N_2O emissions from chemical industries dropped by 56 % in the EU. Most of the reductions were achieved between 1997 and 1999 due to emission-reduction measures in the German, French and UK adipic acid production (Figure 34). In 2000, N_2O emissions from chemical industries decreased by 2 %, compared to 1999.

Most N_2O emissions from chemical industries occur in the adipic and nitric acid production. Adipic acid is a raw material used mainly in the manufacture of 6.6 nylon, which is used in industrial carpets; some adipic acid is also used in the manufacture of engineering plastics and low-temperature lubricants. Nitric acid is a raw material mainly used as a feedstock in fertiliser production, but also in the production of adipic acid and explosives. Within the EU, about 80 % of nitric acid production is used for fertiliser production (EC, 2001a).

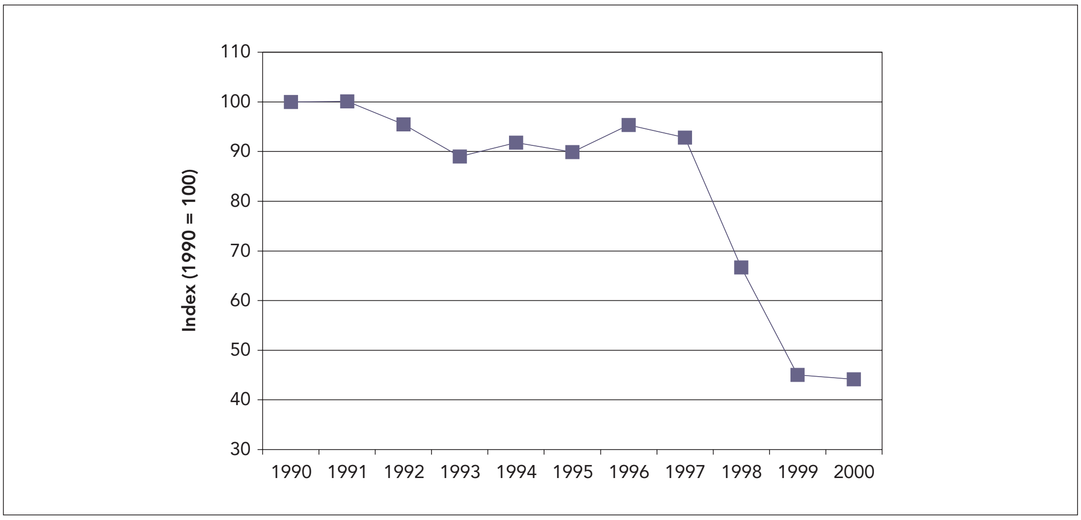
In the EU, adipic acid is produced only in four countries (Germany, France, Italy and the UK), whereas nitric acid is produced widely in the EU, with 13 countries having reported emissions from this process in 1990 (Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden and the United Kingdom) (EC, 2001a).

Table 12 shows that the largest emitters of N_2O emissions from chemical industries were France (21 %), Italy (17 %), the Netherlands (15 %), the UK (13 %) and Germany (11 %). In 1990, the UK and Germany were first and second but they achieved substantial cuts since then.

Between 1990 and 2000, the UK, Germany and France achieved large reductions, both in relative and absolute terms, primarily due to emission-reduction measures in the adipic acid production. The UK reduced emissions by 23 Tg of CO_2 equivalents (– 79 %), Germany reduced by 20 Tg (– 80 %) and France by 15 Tg (– 61 %). Italy had the largest increase in N_2O emissions from chemical industries.

Figure 34 — N_2O emissions from chemical industry

Source: Inventory submissions by the EC Member States (CRF tables), EEA (2002a).



Member States contribution to N_2O emissions from chemical industries Table 12

Member State	Greenhouse gas emissions ($Gg\ CO_2$ equivalents)			Share in EU-15 emissions in 2000 (%)	Change 1999–2000		Change 1990–2000	
	1990	1999	2000		($Gg\ CO_2$ equiva-lents)	(%)	($Gg\ CO_2$ equiva-lents)	(%)
France	24 745	11 093	9 662	20,8	– 1 432	– 13	– 15 083	– 61
Italy	6 748	7 264	7 804	16,8	540	7	1 056	16
Netherlands	7 554	7 187	7 119	15,3	– 69	– 1	– 435	– 6
United Kingdom	29 270	5 619	6 182	13,3	563	10	– 23 088	– 79
Germany	25 420	5 141	5 089	11,0	– 51	– 1	– 20 331	– 80
Belgium	3 559	4 463	4 130	8,9	– 333	– 7	571	16
Spain	2 884	2 348	2 307	5,0	– 41	– 2	– 577	– 20
Finland	1 595	1 325	1 321	2,8	– 4	0	– 274	– 17
Ireland	1 035	812	812	1,8	0	0	– 223	– 22
Sweden	814	756	643	1,4	– 113	– 15	– 171	– 21
Portugal	603	606	606	1,3	0	0	3	1
Greece	713	567	567	1,2	0	0	– 146	– 20
Austria	186	180	180	0,4	0	0	– 6	– 3
Denmark	0	0	0	0,0	0	0	0	0
Luxembourg	0	0	0	0,0	0	0	0	0
EU-15	105 126	47 362	46 422	100,0	– 939	– 2	– 58 704	– 56

Source: Inventory submissions by the EC Member States (CRF tables), EEA (2002a).

3.3.3. Consumption of halocarbons and SF_6 (HFC)

HFC emissions from consumption of halocarbons and SF_6 increased sharply between 1990 and 2000. They are replacing ozone-depleting chlorofluorocarbons after their phase out.

In 1990:	0.4 Tg
In 2000:	30 Tg
Change 1990–2000:	+ 29 Tg + 8 112 %
Share in total EU greenhouse gases: 0.7 %	

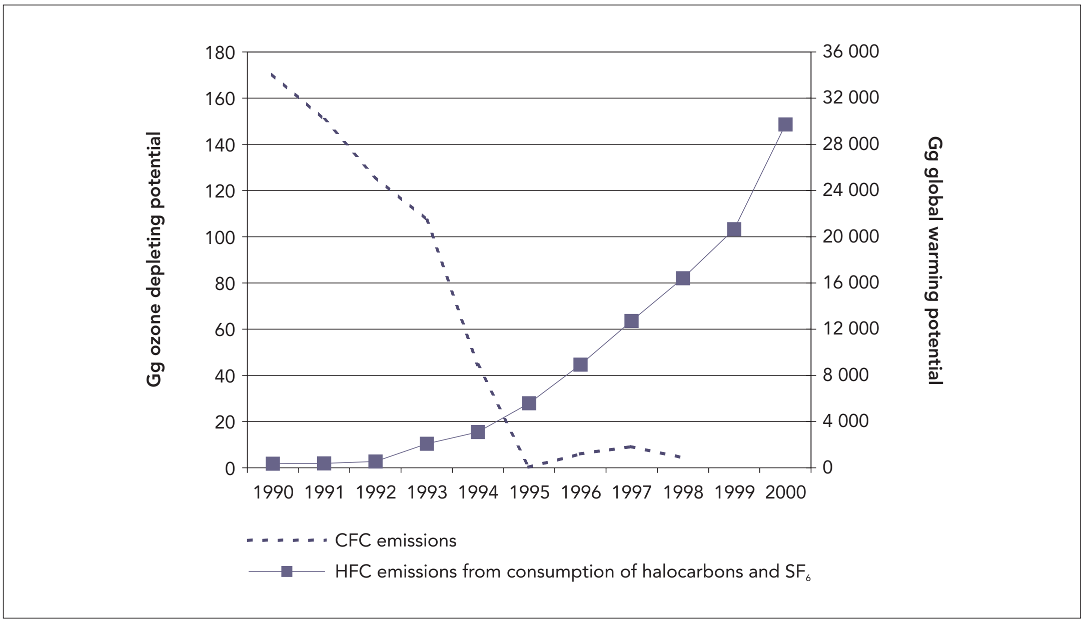
HFC emissions from consumption of halocarbons and SF_6 account for 0.7 % of total EC greenhouse gas emissions. With an increase of 29 Tg of CO_2 equivalents between 1990 and 2000 (from almost zero in 1990), they had the second largest increase of all EC key source emissions in absolute terms.

Between 1990 and 2000, EU HFC emissions from consumption of halocarbons and SF_6 grew by a factor of 80 in the EU. In 2000, they increased by 44 %, compared to 1999.

However, these figures overestimate the emission increase as Italy did not report a split of HFC emissions before 2000. The main driving force of HFC emissions is the phase-out of ozone-depleting chlorofluorocarbons (CFC). HFCs are replacing CFCs mainly in refrigeration and air conditioning, and as aerosol propellants and blowing agents for the production of thermal insulation foams. Figure 35 shows the phase-out of the use of CFCs in the first half of the 1990s and the increasing use of HFC.

Figure 35 HFC emissions from consumption of halocarbons and SF_6 (in CO_2 equivalents) and CFC emissions (ozone-depleting potentials)

Source: UNEP, inventory submissions by the EC Member States (CRF tables), EEA (2002a).



Member States' contribution

Table 13 shows the contribution of the EC Member States to the level and trend of total EU HFC emissions from consumption of halocarbons and SF_6. The largest emitters of HFCs from consumption of halocarbons and SF_6 are Germany (26 %), France (23 %), the UK (17 %) and Spain (12 %).

In 2000, HFC emissions from consumption of halocarbons and SF_6 increased in all MS that reported emissions from this source.

Between 1990 and 2000, all MS that reported data increased emissions. Several MS had very low or no emissions at all in 1990, therefore emission growth rates are very large or cannot be calculated. The 1990 figure for Belgium is supposed to overestimate emissions, as it is derived from data gap filling (the value of 1995 has been taken for 1990). Portugal, Ireland and Luxemburg did not report emissions from this source.

Member States contributions to HFC emissions from consumption of halocarbons and SF_6 Table 13

Member State	Greenhouse gas emissions (Gg CO_2 equivalents)			Share in EU-15 emissions in 2000 (%)	Change 1999–2000		Change 1990–2000	
	1990	1999	2000		(Gg CO_2 equiva-lents)	(%)	(Gg CO_2 equiva-lents)	(%)
Germany	0	5 250	7 700	25,9	2 450	47	7 700	– [1])
France	23	4 174	6 723	22,6	2 548	61	6 700	29 692
United Kingdom	1	4 279	5 000	16,8	720	17	4 999	748 064
Spain	0	2 574	3 483	11,7	909	35	3 483	– [1])
Italy	NE	NE	1 763	5,9	1 763	– (1)	1 763	– [1])
Netherlands	0	1 009	1 079	3,6	70	7	1 079	– [1])
Austria	4	870	1 033	3,5	163	19	1 030	27 900
Belgium	332	804	804	2,7	0	0	472	142
Denmark	0	616	730	2,5	114	19	730	– [1])
Greece	0	412	537	1,8	125	30	537	– [1])
Finland	0	317	502	1,7	185	58	501	164 306
Sweden	3	346	369	1,2	23	7	367	14 384
Portugal	NE	NE	NE	NE	NE	NE	NE	NE
Ireland	NE	NE	NE	NE	NE	NE	NE	NE
Luxembourg	NE	NE	NE	NE	NE	NE	NE	NE
EU-15	362	20 652	29 723	100,0	9 071	44	29 361	8 112

[1]) Division by 0.
NE: not estimated.

Source: Inventory submissions by the EC Member States (CRF tables), EEA (2002a).

3.4. Agriculture

3.4.1. Agricultural soils (N_2O)

N_2O emissions from agricultural soils is the fifth largest source of greenhouse gas emissions in the EU. Reasons for emission reductions between 1990 and 2000 were decreases in the use of synthetic fertilisers and organic manure.

In 1990:	198 Tg
In 2000:	190 Tg
Change 1990–2000:	– 8 Tg
	– 4 %
Share in total EU greenhouse gases: 4.7 %	

N_2O emissions from agricultural soils are the largest source category of N_2O emissions and accounts for 4.7 % of total EC greenhouse gas emissions in 2000. N_2O emissions from agricultural soils occur from the application of mineral nitrogen fertilisers and organic nitrogen from animal manure.

Between 1990 and 2000, N_2O emissions from agricultural soils declined by 4 % in the EU. In 2000, emissions were stable, compared to 1999. The main driving force of N_2O emissions from agricultural soils is the use of nitrogen fertiliser, which was 2 % below 1990 levels in 1999. Figure 36 shows the close relationship between N_2O emissions and fertiliser use.

The decrease of fertilise use is partly due to the effects of the 1992 reform of the common agricultural policy and the resulting shift from production-based support mechanisms to direct area payments in arable production. This has tended to lead to an optimisation and overall reduction in fertiliser use. In addition, reduction in fertiliser use is also due to directives such as the nitrates directive and to the extensification measures included in the agro-environment programmes (EC, 2001d).

Member States' contribution

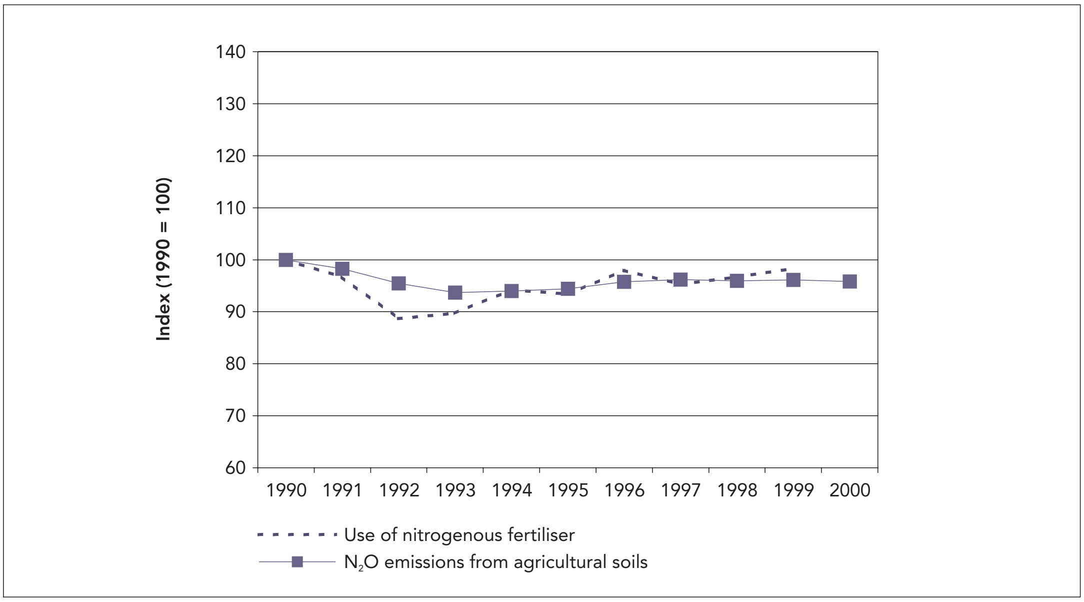
Table 14 shows the contribution of the EC Member States to the level and trend of total EU N_2O emissions from agricultural soils. The largest emitter is France accounting for 27 % of total EU emissions. Next are Germany (14 %), the UK (14 %) and Italy (11 %).

In 2000, Spain had large N_2O emissions increases, compared to 1999, whereas the UK had significant emission decreases.

Between 1990 and 2000, N_2O emission trends from agricultural soils vary considerably in the Member States: the largest reductions in absolute terms occurred in Germany and the UK, followed by Denmark and France, whereas Spain accounted for the largest

Figure 36 N_2O emissions from agricultural soils and nitrogen fertiliser use

Source: FAO, inventory submissions by the EC Member States (CRF tables), EEA (2002a).

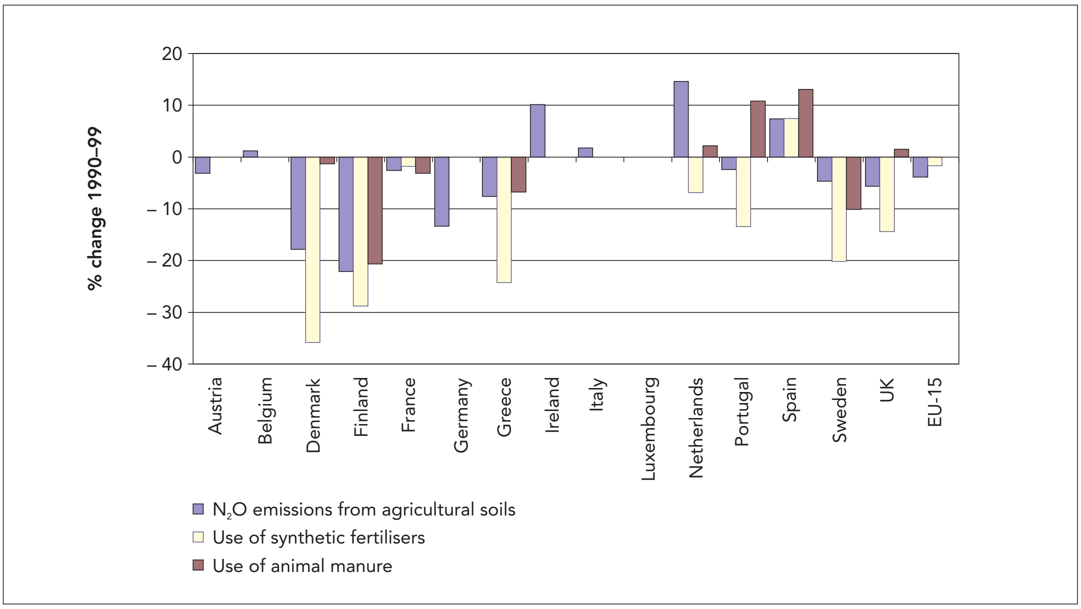


Member States contribution to N_2O emissions from agricultural soils — Table 14

Member State	Greenhouse gas emissions (Gg CO_2 equivalents)			Share in EU-15 emissions in 2000 (%)	Change 1999–2000		Change 1990–2000	
	1990	1999	2000		(Gg CO_2 equiva-lents)	(%)	(Gg CO_2 equiva-lents)	(%)
France	51 975	50 643	50 571	26,7	– 73	0	– 1 405	– 3
Germany	30 926	26 797	27 351	14,4	553	2	– 3 576	– 12
United Kingdom	30 353	28 644	26 829	14,1	– 1 815	– 6	– 3 524	– 12
Italy	20 337	20 692	20 554	10,8	– 138	– 1	216	1
Spain	16 023	17 209	18 570	9,8	1 361	8	2 547	16
Denmark	9 797	8 049	7 853	4,1	– 196	– 2	– 1 944	– 20
Netherlands	6 650	7 621	7 352	3,9	– 269	– 4	702	11
Ireland	6 445	7 099	6 666	3,5	– 433	– 6	221	3
Greece	6 501	6 005	6 370	3,4	365	6	– 131	– 2
Belgium	4 910	4 970	4 891	2,6	– 79	– 2	– 19	0
Portugal	4 791	4 677	4 634	2,4	– 43	– 1	– 158	– 3
Sweden	3 792	3 615	3 603	1,9	– 12	0	– 188	– 5
Finland	4 373	3 405	3 496	1,8	92	3	– 877	– 20
Austria	1 024	991	987	0,5	– 4	0	– 37	– 4
Luxembourg	146	0	0	0,0	0	0	– 146	– 100
EU-15	198 043	190 417	189 726	100,0	– 690	0	– 8 317	– 4

Source: Inventory submissions by the EC Member States (CRF tables), EEA (2002a).

Percentage change of N_2O emissions from agricultural soils and of the use of synthetic fertiliser and organic manure in the EC Member States 1990–99 — Figure 37



Source: FAO (nitrogenous fertiliser for the EU), inventory submissions by the EC Member States (CRF tables), EEA (2002a).

increases. In relative terms, Denmark, Finland, Germany and the UK reduced emissions by more than 10 % between 1990 and 2000, whereas Spain and the Netherlands had increases by more than 10 %.

The increase in the Netherlands is due to the phase-out of manure spreading on the land and the incorporation of manure into the soil, which is a measure to reduce ammonia emissions from manure, but which increases N_2O emissions as a negative side-effect (Olivier et al., 2002).

Trends should be interpreted with care, as methodological problems with estimating N_2O emissions from agricultural soils exist in a number of Member States.

N_2O emissions from agricultural land can be decreased by overall efficiency improvements of nitrogen uptake by crops, which should lead to lower fertiliser consumption on agricultural land. Figure 37 shows the changes of N_2O emissions from agricultural soils and of the use of synthetic fertiliser and organic manure for each EC Member State between 1990 and 1999. It shows that, in most Member States, the use of fertiliser and organic manure went down in the 1990s. The largest reductions occurred in Denmark, Finland, Greece and Sweden. The Netherlands, Portugal and the UK reduced the consumption of synthetic fertiliser, but increased the use of animal manure; Spain increased both.

3.4.2. Enteric fermentation (CH_4)

CH_4 emissions from enteric fermentation reduced between 1990 and 2000 mainly due to reductions in cattle numbers.

In 1990:	144 Tg
In 2000:	131 Tg
Change 1990–2000:	– 13 Tg – 9 %
Share in total EU greenhouse gases:	3.2 %

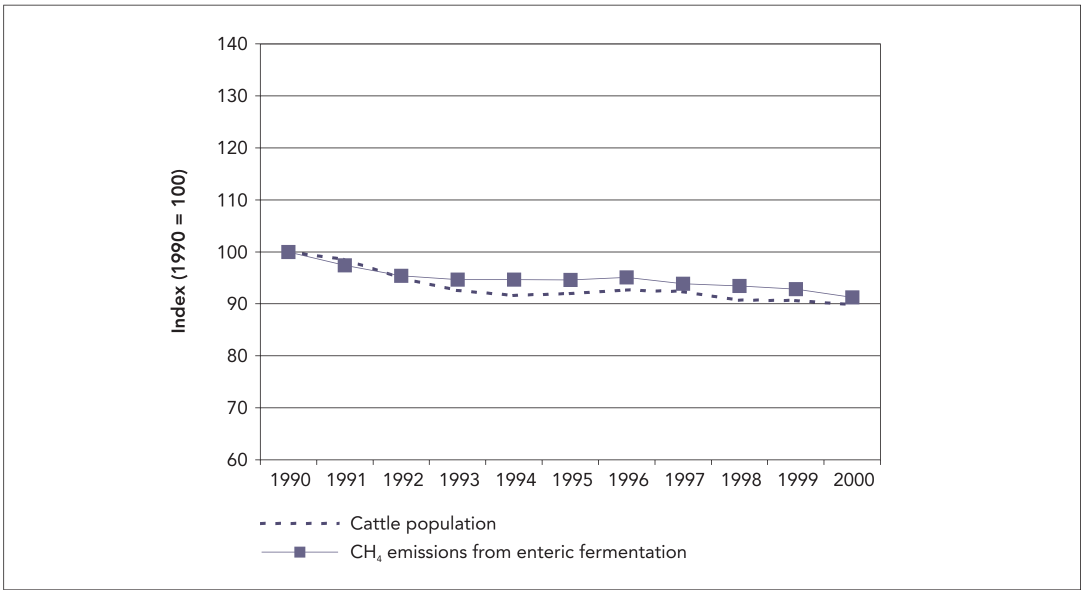
Enteric fermentation is the largest single source of CH_4 emissions in the EU accounting for 3.2 % of total greenhouse gas emissions in 2000. CH_4 emissions from enteric fermentation result from anaerobic fermentation of polysaccharides and other components of animal feeds in the stomach of ruminant animals by micro-organisms.

Between 1990 and 2000, CH_4 emissions from enteric fermentation declined by 9 % in the EU. In 2000, they decreased by 2 %, compared to 1999. The main driving force of CH_4 emissions from enteric fermentation is the number of cattle. Figure 38 shows that the number of cattle declined almost parallel with the CH_4 emissions from enteric fermentation. In 2000, the cattle population was 10 % below 1990 levels.

Member States' contribution
Table 15 shows the contribution of the EC Member States to the level and trend of total EU CH_4 emissions from enteric fermentation. France is the largest emitter of CH_4 from enteric fermentation accounting for 22 % of EU emissions, followed by Germany (16 %), the UK (14 %) and Spain (11 %). These Member States also account for more than 50 % of the EU cattle population. The UK and Spain have the largest sheep populations in the EU.

In 2000, CH_4 emissions from enteric fermentation decreased in almost all MS, compared to 1999. Large emission decreases had Germany, Ireland, the Netherlands and the UK. Between 1990 and 2000, all Member States except Ireland and Spain reduced emissions, in particular France, Germany and the Netherlands. Emission decreases of 20 % or more were reported by Austria, Germany and the Netherlands.

CH_4 emissions from enteric fermentation and cattle population — Figure 38



Source: FAO, inventory submissions by the EC Member States (CRF tables), EEA (2002a).

Table 15

Member States contribution to CH_4 emissions from enteric fermentation

Source: Inventory submissions by the EC Member States (CRF tables), EEA (2002a).

Member State	Greenhouse gas emissions ($Gg CO_2$ equivalents)			Share in EU-15 emissions in 2000 (%)	Change 1999–2000		Change 1990–2000	
	1990	1999	2000		($Gg CO_2$ equiva-lents)	(%)	($Gg CO_2$ equiva-lents)	(%)
France	30 836	29 125	29 133	22,2	9	0	– 1 702	– 6
Germany	28 035	21 477	20 890	15,9	– 587	– 3	– 7 145	– 25
United Kingdom	19 078	18 765	18 138	13,8	– 627	– 3	– 941	– 5
Spain	12 490	14 121	14 070	10,7	– 51	0	1 580	13
Italy	13 625	12 736	12 744	9,7	8	0	– 881	– 6
Ireland	9 506	10 142	9 664	7,4	– 477	– 5	159	2
Netherlands	8 439	7 012	6 708	5,1	– 304	– 4	– 1 731	– 21
Belgium	4 617	4 419	4 384	3,3	– 35	– 1	– 233	– 5
Sweden	3 219	3 083	2 995	2,3	– 88	– 3	– 224	– 7
Greece	2 976	2 923	2 920	2,2	– 3	0	– 56	– 2
Denmark	3 152	2 687	2 673	2,0	– 14	– 1	– 479	– 15
Austria	3 243	2 686	2 597	2,0	– 90	– 3	– 646	– 20
Portugal	2 606	2 595	2 581	2,0	– 14	– 1	– 24	– 1
Finland	1 824	1 554	1 543	1,2	– 11	– 1	– 281	– 15
Luxembourg	346	332	327	0,2	– 5	– 1	– 19	– 5
EU-15	143 991	133 656	131 367	100,0	– 2 290	– 2	– 12 625	– 9

Figure 39

Percentage change of CH_4 emissions from enteric fermentation and of cattle population in EC Member States, 1990–2000

Source: FAO (for cattle population of the EU), inventory submissions by the Member States (CRF tables), EEA (2002a).

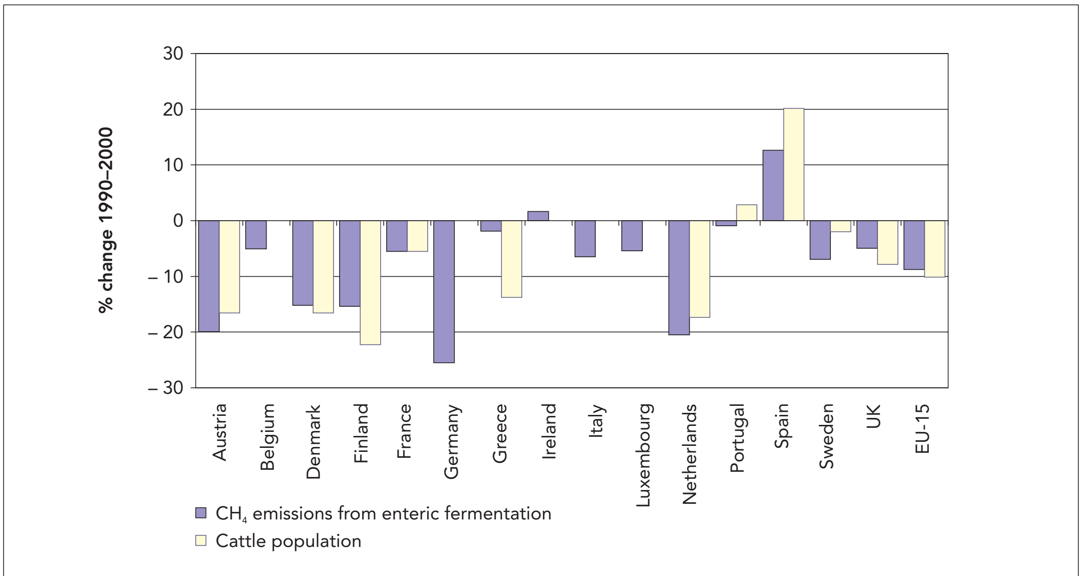


Figure 39 shows the changes of CH_4 emissions from enteric fermentation and of the cattle population for each EC Member State between 1990 and 2000. In several Member States, emissions decoupled to a certain extent from cattle population (e.g. Austria, the Netherlands, Spain, Sweden).

One reason for the decoupling might be that livestock may have shifted towards lower emissions per animal, for example larger fractions of relatively low emitting young animals, as in the case of cattle in the Netherlands.

3.5. Waste

3.5.1. Solid waste disposal on land (CH_4)

CH_4 emissions from waste disposal on land decreased between 1990 and 2000 mainly due to reductions in solid waste disposal on land and CH_4 recovery from landfills.

In 1990:	133 Tg
In 2000:	99 Tg
Change 1990–2000:	– 34 Tg
	– 26 %
Share in total EU greenhouse gases:	2.4 %

CH_4 emissions from solid waste disposal on land account for 2.4 % of total EC greenhouse gas emissions. CH_4 emissions occur in landfills due to the breakdown of biodegradable carbon compounds by anaerobic methanogenic bacteria. The resulting landfill gas does not only contain methane but also CO_2, since aerobic processes occur in landfills as well.

Between 1990 and 2000, CH_4 emissions from landfills declined by 26 % in the EU (Figure 40). In 2000, CH_4 emissions from landfills decreased by 1 %. The main driving force of CH_4 emissions from solid waste disposal on land is the amount of biodegradable waste going to landfills. In addition, CH_4 emissions from landfills are influenced by the amount of CH_4 recovered and utilised or flared.

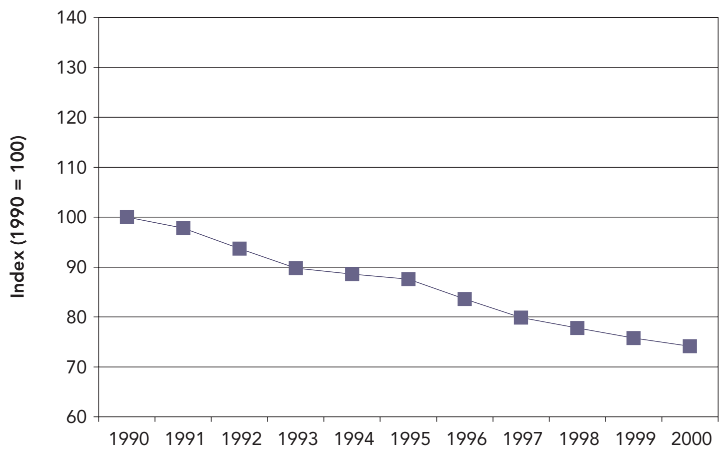
The emission reductions are partly due the (early) implementation of the landfill waste directive or similar legislation of the MS. The landfill waste directive was adopted in 1999 and requires the MS to reduce the amount of biodegradable waste disposed untreated to landfills and to install landfill gas recovery at all new sites.

Member States' contribution
Table 16 shows the contribution of the EC Member States to the level and trend of total EU CH_4 emissions from waste disposal on land. Germany and France are the largest emitters accounting for 17 % and 16 % of total EU CH_4 emissions from landfills respectively, followed by the UK (14 %) and Spain (10 %).

In 2000, CH_4 emissions from landfills mainly decreased in France and the UK, compared to 1999. Between 1990 and 2000, all Member States except Greece, Portugal and Spain reduced CH_4 emissions from solid waste disposal. By far the largest reductions had Germany (– 22 Tg), followed by the UK, the Netherlands, France and Finland, whereas Greece and Spain had large increases.

Figure 41 shows the changes of CH_4 emissions from solid waste disposal on land and of the amount of waste disposed in landfills for each EC Member State between 1990 and 2000. Several MS reduced total waste disposal on land between 1990 and 2000 (e.g. Austria, Denmark, Finland, the Netherlands and Sweden). France, Greece,

CH_4 emissions from waste disposal on land — Figure 40



Source: Inventory submissions by the EC Member States (CRF tables), EEA (2002a).

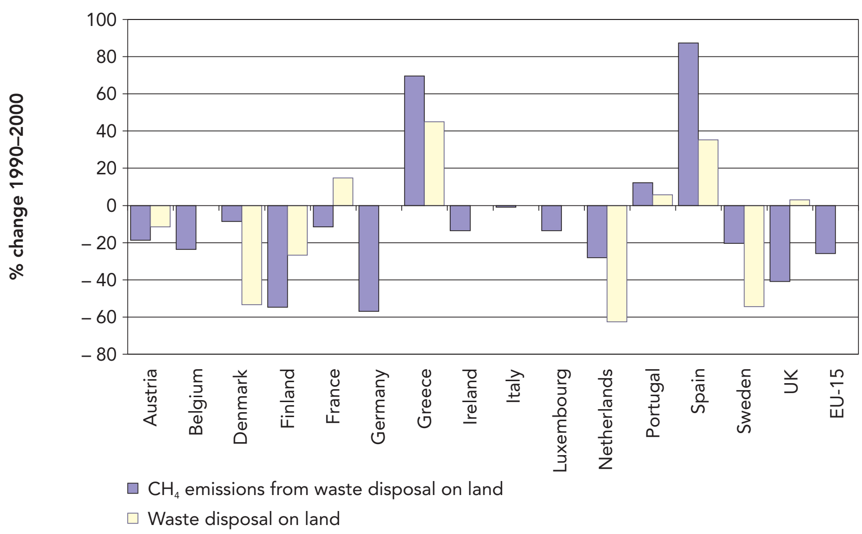
Table 16 **Member States contribution to CH_4 emissions from landfills**

Source: Inventory submissions by the EC Member States (CRF tables), EEA (2002a).

Member State	Greenhouse gas emissions ($Gg CO_2$ equivalents) 1990	1999	2000	Share in EU-15 emissions in 2000 (%)	Change 1999–2000 ($Gg CO_2$ equiva-lents)	(%)	Change 1990–2000 ($Gg CO_2$ equiva-lents)	(%)
Germany	38 678	16 674	16 674	16,9	0	0	– 22 004	– 57
France	17 819	17 080	15 768	16,0	– 1 313	– 8	– 2 051	– 12
United Kingdom	23 457	15 036	13 860	14,1	– 1 176	– 8	– 9 597	– 41
Spain	5 391	9 626	10 099	10,2	473	5	4 708	87
Italy	9 526	9 335	9 434	9,6	99	1	– 92	– 1
Netherlands	11 805	8 994	8 480	8,6	– 514	– 6	– 3 325	– 28
Portugal	5 550	6 102	6 224	6,3	122	2	674	12
Greece	2 811	4 497	4 767	4,8	270	6	1 957	70
Austria	5 438	4 424	4 424	4,5	0	0	– 1 015	– 19
Belgium	3 189	2 576	2 434	2,5	– 143	– 6	– 755	– 24
Sweden	2 554	2 147	2 034	2,1	– 113	– 5	– 519	– 20
Finland	3 643	1 620	1 650	1,7	30	2	– 1 993	– 55
Ireland	1 780	1 518	1 540	1,6	21	1	– 240	– 13
Denmark	1 310	1 110	1 197	1,2	87	8	– 113	– 9
Luxembourg	64	56	56	0,1	0	0	– 9	– 13
EU-15	133 016	100 796	98 641	100,0	– 2 155	– 2	– 34 374	– 26

Figure 41 **Percentage change of CH_4 emissions from solid waste disposal on land and of the amount of waste disposed in landfills in the EC Member States, 1990–2000**

Source: Inventory submissions by the EC Member States (CRF tables), EEA (2002a).



Portugal, Spain and the UK increased the total amount disposed in landfills. Emissions decoupled from the amount of waste disposed of in landfills in several MS. Reasons for this are the reduction of the share of biodegradable waste and increased recovery of CH_4 from landfills.

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Units and abbreviations

t	1 tonne (metric) = 1 megagram (Mg) = 10^6 g
Mg	1 megagram = 10^6 g = 1 tonne (t)
Gg	1 gigagram = 10^9 g = 1 kilotonne (kt)
Tg	1 teragram = 10^{12} g = 1 megatonne (Mt)

CH_4	methane
CHP	combined heat and power
CO_2	carbon dioxide
COP	conference of the parties
CRF	common reporting format
DTI	distance-to-target indicator
EEA	European Environment Agency
ETC/ACC	European Topic Centre on Air and Climate Change
FAO	Food and Agriculture Organisation of the United Nations
GDP	gross domestic production
GHG	greenhouse gas
HFCs	hydrofluorocarbons
IEA	International Energy Agency
F-gases	fluorinated gases (HFCs, PFCs, SF_6)
IPCC	Intergovernmental Panel on Climate Change
LUCF	land use change and forestry
N_2O	nitrous oxide
PFCs	perfluorocarbons
SF_6	sulphur hexafluoride
UNFCCC	United Nations Framework Convention on Climate Change

Annexes

Annex 1: Greenhouse gas emission indicators for the EC Member States and the EU as a whole 70

Austria 71

Belgium 75

Denmark 79

Finland 84

France 88

Germany 92

Greece 96

Ireland 100

Italy 104

Luxembourg 108

Netherlands 112

Portugal 116

Spain 120

Sweden 124

United Kingdom 128

European Union 132

Annex 2: Summary of EC and Member States greenhouse gas emissions data . . 134

Annex 3: Greenhouse gas emission trends in the candidate countries, 1990–1999 (2000) 139

Introduction 139

Distance-to-target assessment of 10 candidate countries 141

Bulgaria 146

Czech Republic 148

Estonia 150

Hungary 152

Latvia 154

Lithuania 156

Poland 158

Romania 160

Slovakia 162

Slovenia 164

Annex 4: Summary of candidate countries greenhouse gas emissions data 166

Annex 1: Greenhouse gas emission indicators for the EC Member States and the EU as a whole

This annex presents indicators for each EC Member State following the general outline of the analysis of EC greenhouse gas trends including: distance-to-target indicators, main driving force indicators, sectoral greenhouse gas indicators, and sectoral driving-force and intensity indicators.

For each Member State, four pages are presented with the following uniform structure:

- the first page describes the main trends of the indicators;
- the second page presents the three main figures (total emissions compared with targets; greenhouse gas emissions by gas; contribution of main driving forces to CO_2 emissions from fossil fuels);
- the third and fourth pages include the main indicators.

Finally, indicators for the EU as a whole referred to in Chapters 2 and 3 are presented including distance-to-target indicators, main driving-force indicators, sectoral greenhouse gas indicators, sectoral driving-force indicators and intensity indicators.

Note: The progress of the Member States towards their Kyoto target is analysed by calculating the distance-to-target indicator (DTI). This indicator measures the deviation of actual emissions in 2000 from the (hypothetical) linear target path between 1990 and 2010. This analysis assumes that the Member States meet their target entirely on the basis of domestic measures. See Section 1.2 for an explanation of the DTI.

Austria

Austria increased greenhouse gas emissions between 1990 and 2000 mainly due to substantial growth of CO_2 emissions from transport. Austria did not reach its CO_2 emission target for 2000.

In base year:	77.6 Tg
In 2000:	79.8 Tg
Change base year–2000:	+ 2.1 Tg
	+ 2.7 %
Share in total EU greenhouse gases:	2.0 %

Distance-to-target indicator (DTI)
Austria's greenhouse gas emissions were almost stable in 2000 compared to 1999, but higher than in the base year (1995 base year for fluorinated gases). In 2000, total greenhouse gas emissions were 80 Tg (CO_2 equivalents), which was 2.7 % above the base-year level. In the burden-sharing agreement under the Kyoto Protocol, Austria agreed to reduce its greenhouse gas emissions by 13 % by 2008–12, from the base-year level. Assuming a linear target path from 1990 to 2010, Austrian greenhouse gas emissions were 9.2 index points above this target path in 2000 (Figure 42).

For CO_2, Austria set a stabilisation target by 2000 on basis of the 1990 emissions. Figure 23 shows that Austria did not reach its target, but showed a 6.1 % increase of CO_2 emissions between 1990 and 2000.

Greenhouse gas emissions by gas
The share of CO_2 and N_2O emissions in total Austrian greenhouse gas emissions increased, whereas the share of methane and emissions of fluorinated gases reduced compared to the base year (Figure 43).

CO_2 emissions account for 83 % of total Austrian greenhouse gas emissions. In 2000, CO_2 emissions were stable compared to 1999. Emission increases in transport and manufacturing industries were offset by reductions in energy industries and small combustion. A similar pattern can be seen over the whole period 1990 to 2000: large CO_2 emission increases in transport (+ 42 %) and manufacturing industries (+ 26 %) were compensated partly by emission decreases in energy industries (– 16 %) and small combustion (– 2 %). A main reason for emission decreases from energy industry is the growth in hydropower production.

CH_4 emissions account for 12 % of total Austrian greenhouse gas emissions and decreased by 17 % between 1990 and 2000. Also, in 2000, emissions dropped compared to 1999. The main reasons for declining CH_4 emissions were reductions in solid waste disposal on land and falling cattle numbers.

N_2O emissions are responsible for 3 % of total greenhouse gas emissions and increased by 9 % between 1990 and 2000. In 2000, emissions decreased compared to 1999. The main reason for growing N_2O emissions was a considerable increase in transport in the first half of the 1990s due to the penetration of the catalytic converter.

Fluorinated gas emissions account for 2 % of total greenhouse gas emissions. The main source of fluorinated gas emissions in Austria is the consumption of halocarbons and SF_6. HFC emissions increased by a factor of 280 between 1990 and 2000 mainly due to the use in foam blowing and in stationary and mobile refrigeration. In 2000, they grew by 19 % compared to 1999.

Main driving forces of CO_2 emissions from fossil fuels
CO_2 emissions from fossil-fuel combustion account for 67 % of total Austrian greenhouse gas emissions. They increased by 9 % between 1990 and 1999. Figure 44 shows that the increase in GDP per capita and population growth are the main drivers of CO_2 emissions, whereas decreasing energy intensity of GDP partly offset emission increases. The fuel shift to lower carbon fuels or renewable energies did not play an important role in Austria over the whole period.

CO_2 emissions increased in both halves of the 1990s by about the same amount. The first half of the 1990s showed larger population growth and lower economic growth compared to the second half of the 1990s. Higher economic growth in the second half was partly offset by lower energy intensity of GDP.

Figure 42 **Austrian greenhouse gas emissions compared with targets for 2000 and 2008–12 (excl. LUCF)**

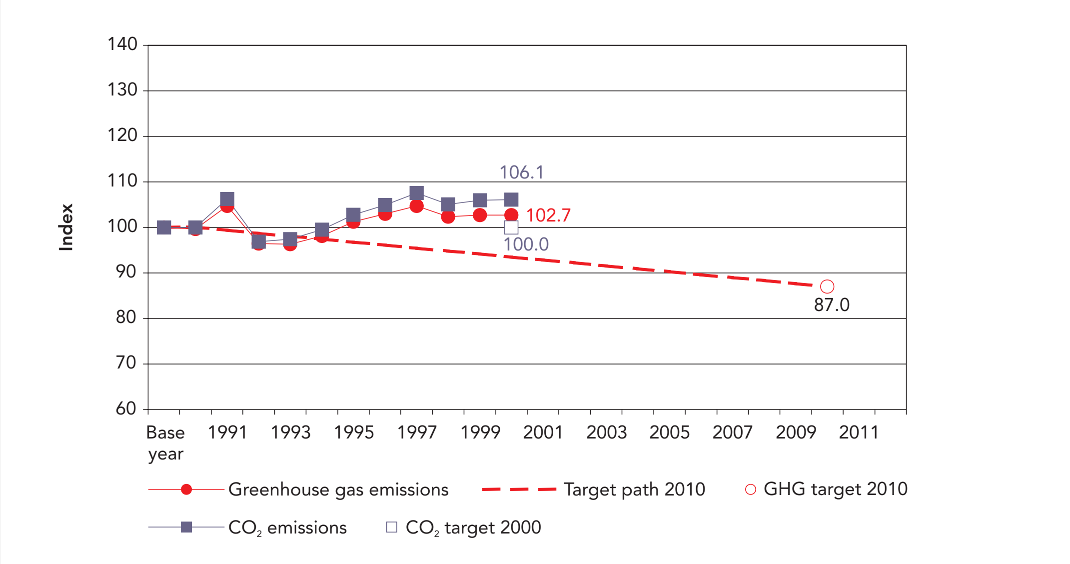
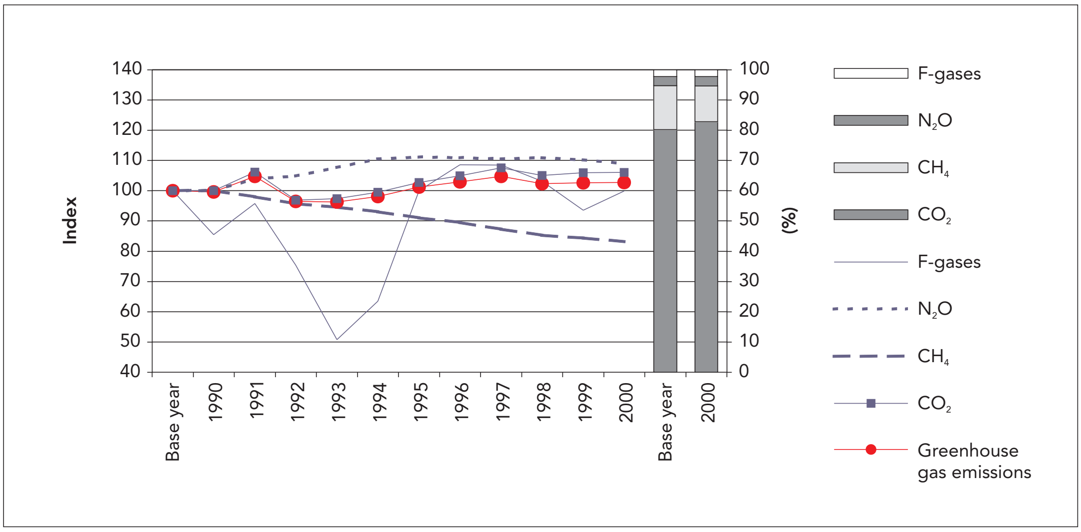


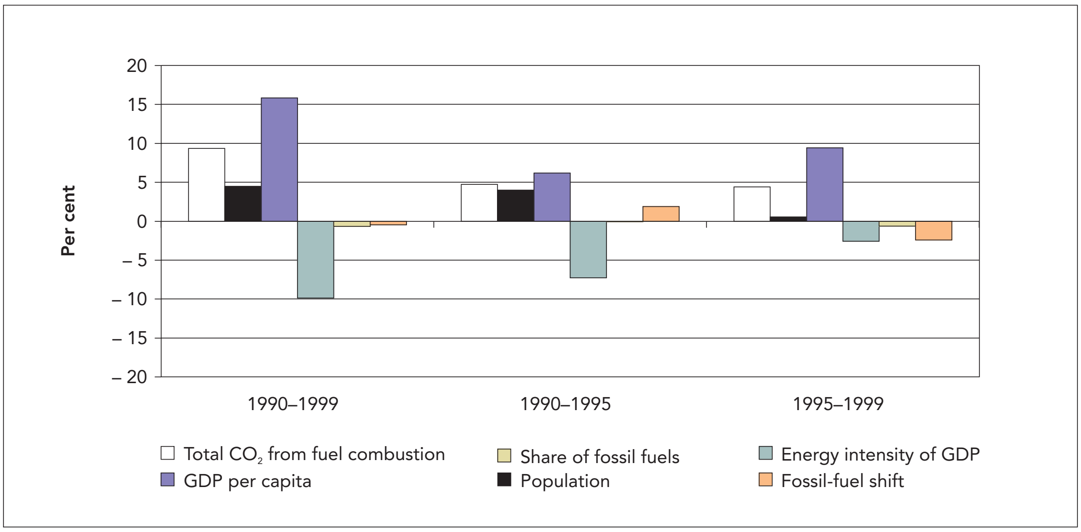
Figure 43 **Austrian greenhouse gas emissions by gas (excluding LUCF)**



Note: The left side of the figure shows the trend in GHG emissions as an index (base year = 100); the right side of the figure shows the percentage contribution of the main GHG to the total emissions in the base year and 2000.

Figure 44 **Change of Austrian CO_2 emissions from fossil-fuel combustion and the influence of main driving forces (population, GDP per capita, energy intensity of GDP, share of fossil fuels, shift within fossil fuels) in the 1990s**

Source: Eurostat, Member State inventory submission (CRF tables), EEA (2002a).



Greenhouse gases and distance-to-target indicators for Austria — Table A1.1

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Greenhouse gas emissions (without LUCF)	100,0	99,7	104,7	96,5	96,3	98,1	101,2	103,0	104,7	102,3	102,7	102,7
DTI 2010	0,0	– 0,3	5,4	– 2,2	– 1,7	0,7	4,5	6,9	9,3	7,5	8,5	9,2
CO_2 (without LUCF)	100,0	100,0	106,2	96,9	97,5	99,5	102,8	105,0	107,6	105,1	106,0	106,1
CH_4 (without LUCF)	100,0	100,0	98,1	95,7	94,6	93,0	91,1	89,6	87,4	85,3	84,4	83,2
N_2O (without LUCF)	100,0	100,0	104,0	104,9	107,7	110,5	111,2	111,0	110,6	111,0	110,2	109,0
F-gases	100,0	85,5	95,8	75,4	50,8	63,5	100,0	108,6	108,5	103,2	93,6	99,9

Source: Member State inventory submission (CRF tables), EEA (2002a).

Sectoral emission indicators (key sources) for Austria — Table A1.2

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1.A.1. Energy industries (CO_2)	100	108	84	79	81	91	97	100	94	90	84
1.A.2. Manufacturing industries and construction (CO_2)	100	93	95	93	91	101	116	119	127	118	126
1.A.3. Transport (CO_2)	100	112	112	115	122	115	115	119	127	134	142
1.A.3. Transport (N_2O)	100	125	142	157	176	180	177	176	185	184	182
1.A.4. Other sectors (CO_2)	100	118	108	113	110	112	111	106	96	103	98
1.A.4. Other sectors (CH_4)	100	87	76	85	81	89	85	71	68	66	60
1.A.4. Other sectors (N_2O)	100	100	98	101	99	103	102	99	96	96	92
1.A.5. Other (CO_2)	0	0	0	0	0	0	0	0	0	0	0
1.B.1. Fugitive emissions from solid fuels (CH_4)	100	85	71	69	56	53	45	46	47	46	46
1.B.2. Fugitive emissions from oil and natural gas (CH_4)	100	106	104	109	113	122	130	126	129	131	127
2.A. Mineral products (CO_2)	100	97	98	94	97	81	81	85	78	78	77
2.B. Chemical industry (N_2O)	100	101	92	97	95	91	94	92	95	97	97
2.B. Chemical industry (HFC)	0	0	0	0	0	0	0	0	0	0	0
2.C. Metal production (CO_2)	100	95	82	86	92	101	96	108	99	100	102
2.C. Metal production (PFC)	100	100	57	0	0	0	0	0	0	0	0
2.E. Production of halocarbons and SF_6 (HFC)	0	0	0	0	0	0	0	0	0	0	0
2.F. Consumption of halocarbons and SF_6 (HFC)	100	158	232	329	458	14.798	16.932	19.458	22.102	23.589	28.000
4.A. Enteric fermentation (CH_4)	100	98	93	92	91	88	86	85	85	83	80
4.B. Manure management (CH_4)	100	99	96	99	98	96	94	94	96	91	87
4.B. Manure management (N_2O)	0	0	0	0	0	0	0	0	0	0	0
4.D. Agricultural soils (N_2O)	100	100	101	101	100	99	99	99	98	97	96
6.A. Solid waste disposal on land (CH_4)	100	98	97	94	92	90	88	85	81	81	81

Note: The list of key sources in this table is the one identified for the EC and differs from the one defined by the Member States for their reporting under the UNFCCC.

Source: Member State inventory submission (CRF tables), EEA (2002a).

Main driving-force indicators for Austria — Table A1.3

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Population	100	101	102	103	104	104	104	104	105	105	:
GDP per capita	100	102	103	103	105	106	108	110	114	117	:
Energy intensity of GDP	100	102	95	94	92	93	97	97	95	91	:
Share of fossil fuels	100	102	98	98	100	100	98	99	100	99	:
Shift within fossil fuels (CO_2 intensity of fossil fuels)	100	102	101	102	101	102	101	100	97	100	:
GDP	100	103	106	106	109	111	113	115	119	122	126
Gross inland energy consumption	100	105	100	100	100	103	109	111	112	111	:
Heating degree days	:	:	:	:	:	100	108	97	98	95	89

Source: Eurostat, Member State inventory submission (CRF tables), EEA (2002a).

Table A1.4 **Sectoral driving-force indicators (Eurostat)**

Source: Eurostat.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Final electricity consumption	100	104	103	104	105	108	111	113	113	115	:
Gross value added in industry	100	103	104	103	107	111	114	118	122	126	:
Volume passenger transport	100	113	111	109	109	109	105	107	110	111	:
Volume freight transport	100	102	103	106	110	112	116	118	121	126	:
Stock of permanently occupied dwellings	100	102	103	104	106	107	109	109	110	112	:

Table A1.5 **Sectoral driving-force indicators (CRF)**

Source: Member State inventory submission (CRF tables), EEA (2002a).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Coal mining and handling	100	85	71	69	56	53	45	46	47	46	51
Cement production	100	103	103	104	102	82	81	84	78	78	77
Use of synthetic fertilisers	:	:	:	:	:	:	:	:	:	:	:
Use of animal manures	:	:	:	:	:	:	:	:	:	:	:
Cattle population	100	98	93	90	90	90	88	85	84	83	83
Waste disposal on land	100	97	95	91	87	86	87	87	88	88	88

Table A1.6 **Data basis for the CO_2 intensity indicators**

Source: Eurostat.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Value added of iron and steel industry	:	:	:	:	:	:	:	:	:	:	:
Crude steel production	100	98	92	97	103	116	104	121	123	121	:
CO_2 emissions from iron and steel industry	100	99	86	84	87	97	88	116	118	107	:
Value added of glass, pottery & building mat. industry	:	:	:	:	:	:	:	:	:	:	:
CO_2 emissions from glass, pottery & building mat. industry	100	95	97	91	88	93	108	103	85	77	:
Value added of the chemical industry	:	:	:	:	:	:	:	:	:	:	:
CO_2 emissions from the chemical industry	100	99	100	95	100	93	97	113	125	93	:
All output of autoproducer thermal power stations	100	103	107	127	142	165	193	182	179	183	:
CO_2 emissions from autoproducer thermal power stations	100	97	106	126	154	160	183	174	187	179	:
Freight traffic on road	100	79	103	121	117	107	115	122	138	147	:
CO_2 emissions from diesel consumption of freight traffic	100	79	103	121	117	107	115	122	138	147	:
Value added of the services sector	100	104	108	109	111	112	114	115	119	122	:
CO_2 emissions from the services sector	100	95	86	97	95	14	41	1.528	4.240	5.826	:

Belgium

Belgium stabilised its greenhouse gas emissions at a high level. Belgium did not reach its CO_2 emission target for 2000.

In base year:	143.0 Tg
In 2000:	151.9 Tg
Change base year–2000:	+ 8.9 Tg + 6.3 %
Share in total EU greenhouse gases:	3.7 %

Distance-to-target indicator (DTI)
Belgium's greenhouse gas emissions increased by 0.5 % in 2000 compared to 1999, and were above the base-year level (1995 for fluorinated gases). Total greenhouse gas emissions were 152 Tg (CO_2 equivalents) in 2000, which was 6.3 % above the level of its base year. In the burden-sharing agreement to the Kyoto Protocol, Belgium agreed to reduce its greenhouse gas emissions by 7.5 % by 2008–12, from the base-year levels. Assuming a linear target path from 1990 to 2010, Belgian greenhouse gas emissions were 10 index points above this target path in 2000 (Figure 45).

Belgian CO_2 emissions were 127 Tg in 2000, which was 7.7 % above 1990 levels. Therefore, Belgium was far from reaching its 5 % reduction target for 2000 ([1]).

Greenhouse gas emissions by gas
The share of CO_2 and fluorinated gas emissions in total Belgian greenhouse gas emissions increased, whereas the share of methane and nitrous oxide emissions reduced in the last decade (Figure 46).

CO_2 emissions account for 84 % of total Belgian greenhouse gas emissions. In 2000, CO_2 emissions increased by 1 %, compared to 1999. Emissions increased in energy industries, manufacturing industries (both energy and process related) and transport, only emissions from small combustion reduced slightly. Over the whole period 1990 to 2000, CO_2 emission increases in transport (+ 22 %) and small combustion (+ 9 %) were balanced by emission decreases in energy industries (– 4 %) and energy-related emissions from manufacturing industries (– 2 %). Also, process-related CO_2 emissions from industry increased considerably in absolute and relative terms.

N_2O emissions are responsible for 9 % of total greenhouse gas emissions. They reduced by 3 % in 2000, compared to 1999, but were 2 % higher than in 1990. Emission increases from the chemical industry and transport were not offset by reductions in energy-related emissions from industry and small combustion.

CH_4 emissions account for 7 % of total Belgian greenhouse gas emissions and decreased by 5 % between 1990 and 2000. Also, in 2000, emissions dropped compared to 1999. Emission reductions were achieved mainly from landfills and from enteric fermentation.

Fluorinated gas emissions account for 1 % of total Belgian greenhouse gas emissions. For recent years, Belgium reported only emissions from HFCs. (The constant values before 1995 are due to data gap filling by the ETC-ACC.) HFC emissions increased by 142 % between 1990 and 2000 and are entirely occurring from the consumption of halocarbons and SF_6.

Main driving forces of CO_2 emissions from fossil fuels
CO_2 emissions from fossil-fuel combustion account for 76 % of total Belgian greenhouse gas emissions. They increased by 4 % between 1990 and 1999. Figure 47 shows that the increase in GDP per capita and the shift towards less carbon-intensive fossil fuels are the main factors influencing CO_2 emissions. The share of fossil fuels, population growth and energy intensity of GDP are less significant. In contrast to several Member States, energy intensity of GDP increased in the 1990s. A comparison between the first and the second half of the decade shows that CO_2 emissions from fossil fuels increased in the first, and decreased in the second half of the 1990s. The shift in fossil fuels mainly took place in the second half of the decade.

(1) The reduction target is for temperature adjusted emissions, so temperature adjusted data should be compared with the target. However, due to the large difference between non-adjusted data and the target, it seems to be very unlikely that Belgium achieved its target with adjusted data.

Figure 45 **Belgian greenhouse gas emissions compared with targets for 2000 and 2008–12 (excl. LUCF)**

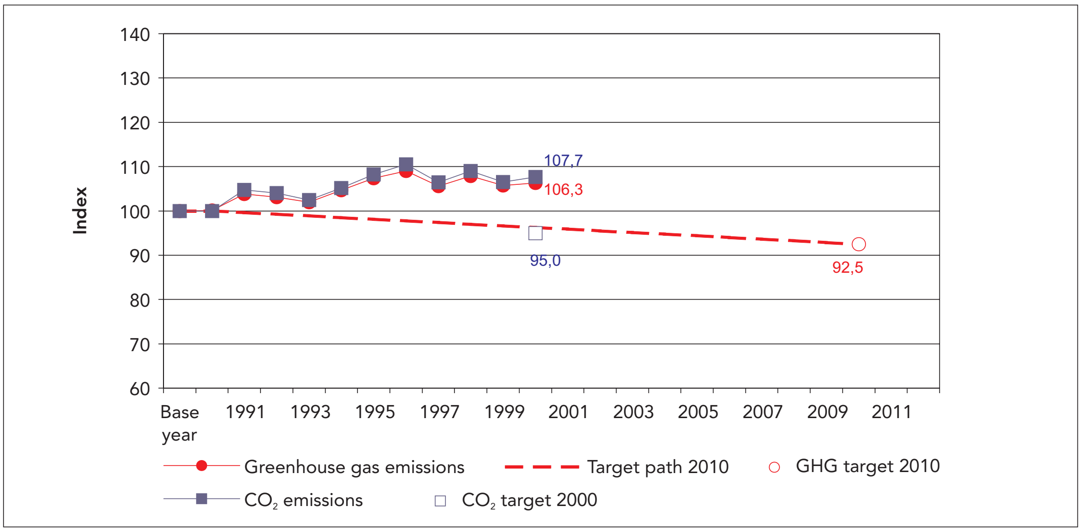
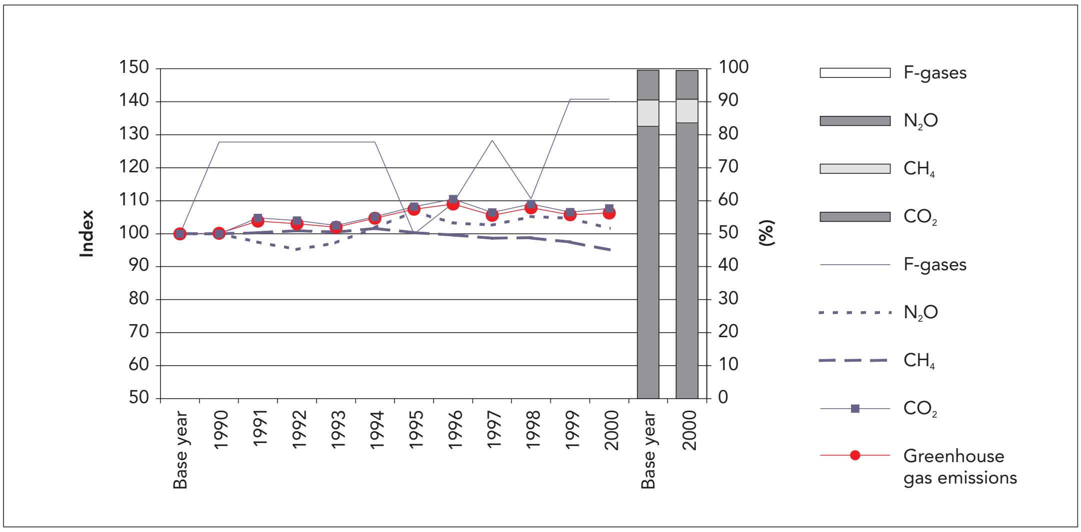


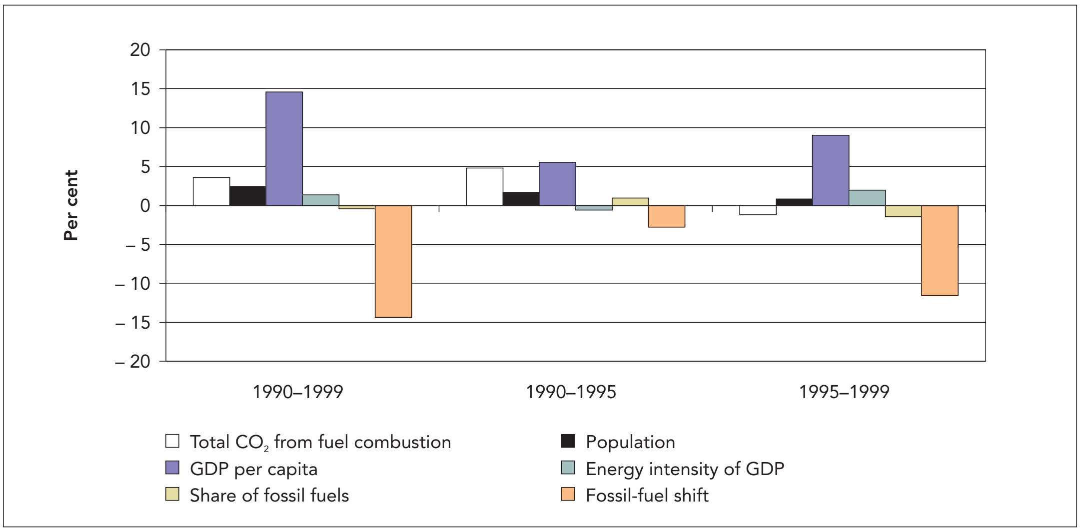
Figure 46 **Belgian greenhouse gas emissions by gas (excluding LUCF)**



Note: The left side of the figure shows the trend in GHG emissions as an index (base year = 100); the right side of the figure shows the percentage contribution of the main GHG to the total emissions in the base year and 2000.

Figure 47 **Change of Belgian CO_2 emissions from fossil-fuel combustion and the influence of main driving forces (population, GDP per capita, energy intensity of GDP, share of fossil fuels, shift within fossil fuels) in the 1990s**

Source: Eurostat, Member State submission (CRF tables), EEA (2002a).



Greenhouse gases and distance-to-target indicators for Belgium Table A1.7

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Greenhouse gas emissions (without LUCF)	100,0	100,1	103,8	103,1	101,9	104,7	107,4	109,0	105,6	107,9	105,8	106,3
DTI 2010	0,0	0,1	4,2	3,8	3,1	6,2	9,3	11,2	8,2	10,9	9,1	10,0
CO_2 (without LUCF)	100,0	100,0	104,8	104,0	102,5	105,2	108,2	110,5	106,5	109,0	106,5	107,7
CH_4 (without LUCF)	100,0	100,0	100,3	100,9	100,5	101,7	100,3	99,6	98,6	98,7	97,5	95,1
N_2O (without LUCF)	100,0	100,0	97,5	95,2	97,2	101,8	106,6	103,3	102,6	105,2	104,7	101,7
F-gases	100,0	127,8	127,8	127,8	127,8	127,8	100,0	109,3	128,3	110,5	140,8	140,8

Source: Member State submission (CRF tables), EEA (2002a).

Sectoral emission indicators (key sources) for Belgium Table A1.8

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1.A.1. Energy industries (CO_2)	100	105	105	103	99	104	103	98	105	94	96
1.A.2. Manufacturing industries and construction (CO_2)	100	98	91	88	96	97	90	93	96	95	98
1.A.3. Transport (CO_2)	100	104	111	110	110	111	113	117	119	122	122
1.A.3. Transport (N_2O)	100	115	131	154	171	187	202	215	226	262	273
1.A.4. Other sectors (CO_2)	100	108	108	109	108	110	129	112	113	110	109
1.A.4. Other sectors (CH_4)	100	110	112	108	101	100	111	94	87	84	83
1.A.4. Other sectors (N_2O)	100	109	111	107	106	111	82	76	74	75	70
1.A.5. Other (CO_2)	0	0	0	0	0	0	0	0	0	0	0
1.B.1. Fugitive emissions from solid fuels (CH_4)	100	100	79	73	69	69	69	52	54	52	52
1.B.2. Fugitive emissions from oil and natural gas (CH_4)	100	107	109	115	117	92	100	100	112	121	119
2.A. Mineral products (CO_2)	100	108	108	110	114	123	123	115	117	116	116
2.B. Chemical industry (N_2O)	100	97	88	95	110	120	131	126	132	125	116
2.B. Chemical industry (HFC)	0	0	0	0	0	0	0	0	0	0	0
2.C. Metal production (CO_2)	100	100	93	92	94	96	95	90	97	96	96
2.C. Metal production (PFC)	0	0	0	0	0	0	0	0	0	0	0
2.E. Production of halocarbons and SF_6 (HFC)	0	0	0	0	0	0	0	0	0	0	0
2.F. Consumption of halocarbons and SF_6 (HFC)	100	100	100	100	100	100	126	159	190	242	242
4.A. Enteric fermentation (CH_4)	100	100	99	100	100	100	99	96	97	96	95
4.B. Manure management (CH_4)	100	97	98	102	102	104	104	104	104	105	101
4.B. Manure management (N_2O)	100	100	100	100	100	100	100	98	98	100	100
4.D. Agricultural soils (N_2O)	100	98	97	98	97	98	97	99	100	101	100
6.A. Solid waste disposal on land (CH_4)	100	101	102	96	99	98	93	92	87	81	76

Source: Member State submission (CRF tables), EEA (2002a).

Note: The list of key sources in this table is the one identified for the EC and differs from the one defined by the Member States for their UNFCCC reporting.

Main driving-force indicators for Belgium Table A1.9

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Population	100	100	101	101	101	102	102	102	102	103	:
GDP per capita	100	101	103	101	103	106	107	110	112	116	:
Energy intensity of GDP	100	103	103	102	101	99	105	104	103	101	:
Share of fossil fuels	100	101	101	101	101	101	102	100	102	100	:
Shift within fossil fuels (CO_2 intensity of fossil fuels)	100	98	96	97	96	97	92	89	88	86	:
GDP	100	102	103	102	105	107	109	113	115	119	123
Gross inland energy consumption	100	105	106	103	105	107	114	117	119	120	:
Heating degree days	:	:	:	:	:	100	122	101	98	95	92

Source: Eurostat, Member State inventory submission (CRF tables), EEA (2002a).

Table A1.10 **Sectoral driving-force indicators (Eurostat)**

Source: Eurostat.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Final electricity consumption	100	104	108	109	115	118	120	124	128	128	:
Gross value added in industry	100	99	99	95	98	102	104	110	111	114	:
Volume passenger transport	100	103	105	108	111	121	121	123	127	130	:
Volume freight transport	100	137	114	121	141	147	140	144	140	150	:
Stock of permanently occupied dwellings	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	:

Note: Eurostat estimated data in italics.

Table A1.11 **Sectoral driving-force indicators (CRF)**

Source: Member State inventory submission (CRF tables), EEA (2002a).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Coal mining and handling	:	:	:	:	:	:	:	:	:	:	:
Cement production	:	:	:	:	:	:	:	:	:	:	:
Use of synthetic fertilisers	:	:	:	:	:	:	:	:	:	:	:
Use of animal manures	:	:	:	:	:	:	:	:	:	:	:
Cattle population	:	:	:	:	:	:	:	:	:	:	:
Waste disposal on land	:	:	:	:	:	:	:	:	:	:	:

Table A1.12 **Data basis for the CO_2 intensity indicators**

Source: Eurostat.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Value added of iron and steel industry	:	:	:	:	:	100	94	90	93	90	:
Crude steel production	100	99	90	89	99	101	94	94	100	96	:
CO_2 emissions from iron and steel industry	100	98	89	78	90	84	81	94	91	91	:
Value added of glass, pottery & building mat. industry	:	:	:	:	:	100	92	93	87	89	:
CO_2 emissions from glass, pottery & building mat. industry	100	99	114	95	120	107	103	96	92	95	:
Value added of the chemical industry	:	:	:	:	:	100	100	99	97	116	:
CO_2 emissions from the chemical industry	100	96	105	104	99	105	98	109	112	118	:
All output of autoproducer thermal power stations	100	101	108	103	109	109	110	91	98	97	:
CO_2 emissions from autoproducer thermal power stations	100	98	102	82	91	99	94	80	92	71	:
Freight traffic on road	100	106	113	124	144	147	133	143	:	:	:
CO_2 emissions from diesel consumption of freight traffic	100	79	103	121	117	107	115	122	138	147	:
Value added of the services sector	100	103	105	104	106	110	110	113	116	118	:
CO_2 emissions from the services sector	100	114	115	111	110	116	139	129	128	140	:

Denmark

Denmark reduced greenhouse gas emissions for the fourth consecutive year. Due to the importance of electricity trade, Danish CO_2 emission show large annual variations. Remarkable emission reductions were achieved in the 1990s from agricultural soils due to decreasing use of fertiliser and from small combustion.

In base year:	69.7 Tg
In 2000:	68.5 Tg
Change base year–2000:	– 1.2 Tg – 1.7 %
(Change adjusted for electricity trade)	(– 9.8 %)
Share in total EU greenhouse gases:	1.7 %

Distance-to-target indicator (DTI)
Danish greenhouse gas emissions reduced for the fourth consecutive year (6 % compared to 1999). In 2000, total greenhouse gas emissions were 69 Tg (CO_2 equivalents), which was 1.7 % below the base-year level. In the burden-sharing agreement to the Kyoto Protocol, Denmark agreed to reduce its greenhouse gas emissions by 21 % by 2008–12, from the base-year levels. However, this reduction target refers to electricity trade adjusted greenhouse gas emissions in 1990. The main reason for this adjustment is the specific situation of Denmark as swing producer of electricity in the Nordic electricity pool. If the greenhouse gas emissions of 1990 are adjusted for electricity trade, emissions in 2000 were 9.8 % below 1990 levels (Figure 48).

Therefore, for Denmark two distance-to-target indicators can be calculated: adjusted greenhouse gas emissions were 0.7 index points above the linear target path from 1990 to 2010 in 2000; non-adjusted data were 8.8 index points above the linear target path.

The same applies to the Danish 5 % reduction target for CO_2. Figure 29 shows that Denmark achieved its target if adjusted CO_2 emissions are considered in accordance with the conditions under which the CO_2 emission target in 2000 was set. If non-adjusted data are taken, Denmark's CO_2 emissions of 53 Tg in 2000 were 0.4 % above 1990 levels.

Figure 49 shows that Denmark also succeeded in bringing its total greenhouse gas emissions back to the 1990 level — both with and without adjusted data.

Greenhouse gas emissions by gas
The share of CO_2 and fluorinated gas emissions in total Danish greenhouse gas emissions increased, the share of methane was stable whereas the relative importance of nitrous oxide emissions reduced in the last decade (Figure 49).

CO_2 emissions account for 77 % of total Danish greenhouse gas emissions. They reduced by 8 %, compared to 1999, and were at 1990 levels in 2000. From 1999 to 2000, emissions decreased in all large energy-related sources, above all in energy industries. The large variations in Danish CO_2 emissions between 1990 and 2000 are mainly due to Denmark being a swing producer of electricity for the Nordic countries. Between 1990 and 2000, CO_2 emission increases in transport (+ 16 %) and industry (+ 4 % energy related; + 45 % process related) were offset by decreases in energy industries (– 4 %) and small combustion (– 16 %). The large emission reductions from small combustion might be partly due to increased use of district heating.

N_2O emissions are responsible for 13 % of total greenhouse gas emissions. They reduced by 3 % in 2000, compared to 1999, and were 16 % lower than in 1990. The large emission decreases from agricultural soils were only partly offset by increases of energy-related emissions.

CH_4 emissions account for 8 % of total Danish greenhouse gas emissions. They increased by 2 % in 2000, compared to 1999, but were still 2 % below 1990 level. Between 1990 and 2000, reductions from enteric fermentation and landfills were faced by increases from transport. In 2000, emissions from landfills rose for the first time since 1994.

Fluorinated gas emissions account for 1 % of total Danish greenhouse gas emissions. For recent years, Danish fluorinated gas emissions mainly occur from consumption of halocarbons and SF_6, with HFC emissions having sharply increased since 1991. In 2000, HFC emissions increased by 19 %, compared to 1999.

Main driving forces of CO_2 emissions from fossil fuels

CO_2 emissions from fossil-fuel combustion account for 74 % of total Danish greenhouse gas emissions. They increased by 7 % between 1990 and 1999. Figure 50 shows that the increase in GDP per capita and population growth are the main drivers of CO_2 emissions in the early 1990s, while this seems to be decoupled in the late 1990s. Also, the share of fossil fuels increased slightly and contributed to emission increases, especially in the first half of the 1990s. Energy intensity of GDP declined over the whole period, but increased in the first half of the 1990s. CO_2 emissions increased by 15 % between 1990 and 1995, but decreased by 7 % between 1995 and 1999. However, the results of this analysis have to be interpreted with care, as the annual changes of electricity exports strongly influence the parameters of this analysis.

Figure 48 **Danish greenhouse gas emissions compared with targets for 2000 and 2008–12 (excl. LUCF)**

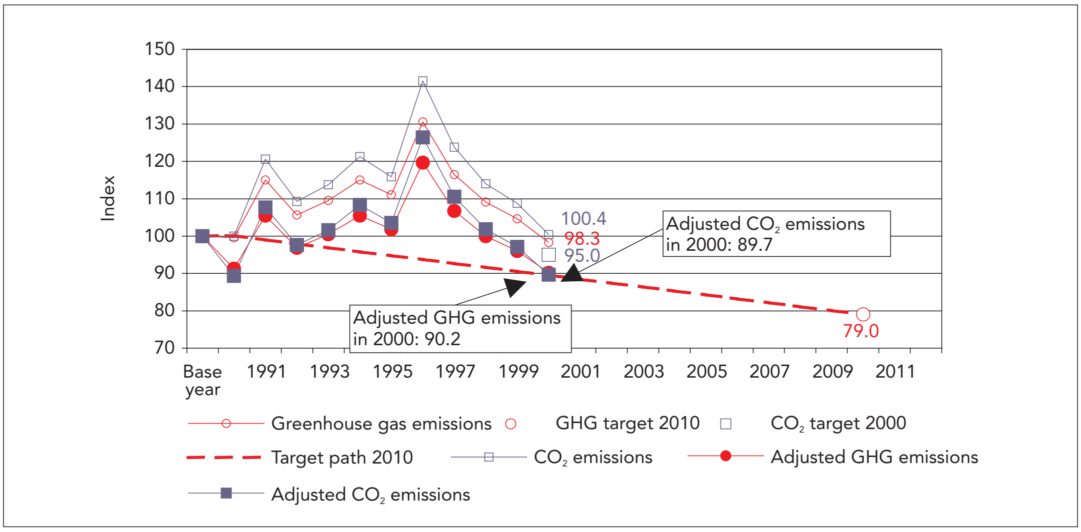
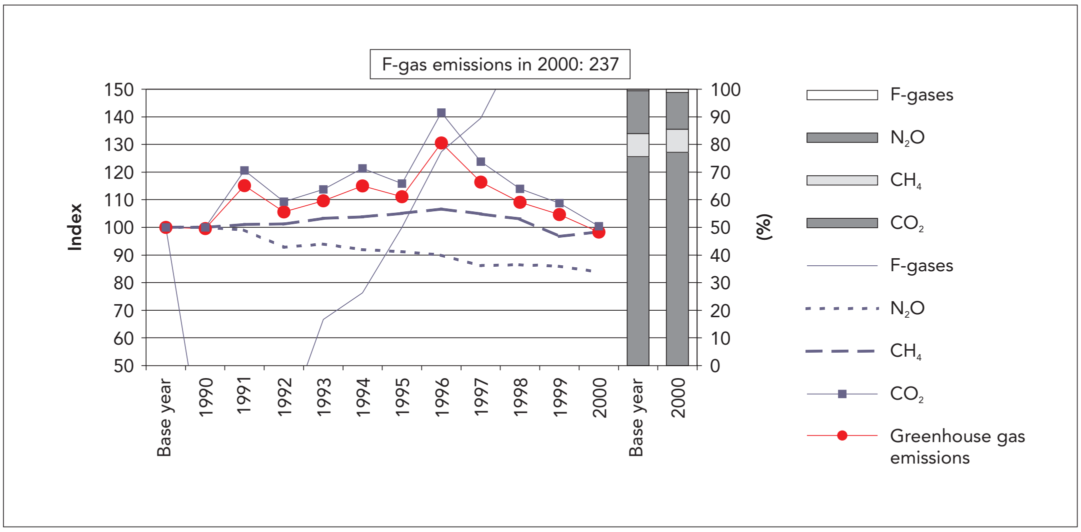
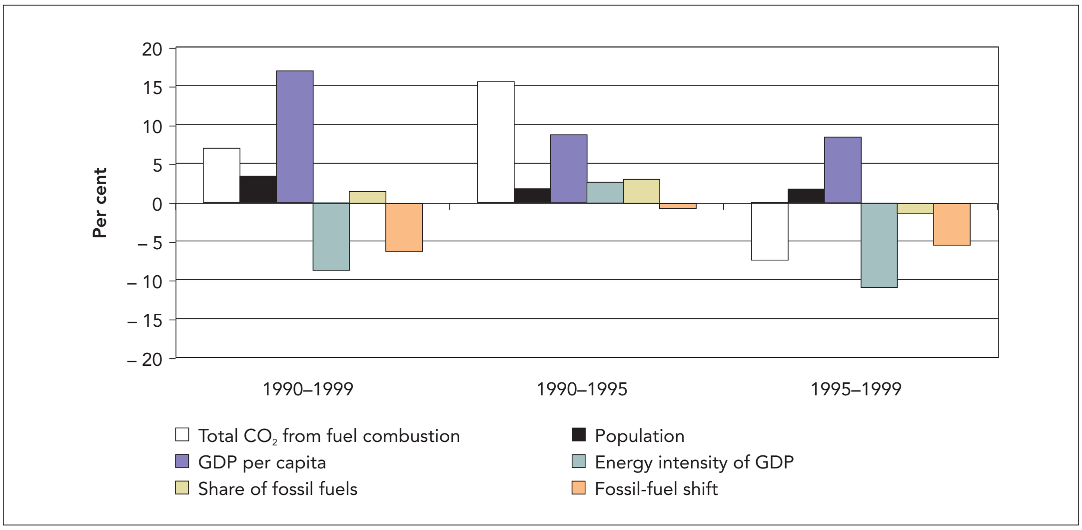


Figure 49 **Danish greenhouse gas emissions by gas (excluding LUCF)**



Note: The left side of the figure shows the trend in GHG emissions as an index (base year = 100); the right side of the figure shows the percentage contribution of the main GHG to the total emissions in the base year and 2000.

Change of Danish CO_2 emissions from fossil-fuel combustion and the influence of main driving forces (population, GDP per capita, energy intensity of GDP, share of fossil fuels, shift within fossil fuels) in the 1990s Figure 50



Source: Eurostat, Member State submission (CRF tables), EEA (2002a).

Sectoral emission indicators (key sources) for Denmark Table A1.13

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1.A.1. Energy industries (CO_2)	100	134	115	121	135	122	169	135	120	108	96
1.A.2. Manufacturing industries and construction (CO_2)	100	107	105	104	112	120	123	121	108	109	104
1.A.3. Transport (CO_2)	100	106	106	108	112	113	115	116	117	117	116
1.A.3. Transport (N_2O)	100	115	127	140	163	181	197	221	233	249	257
1.A.4. Other sectors (CO_2)	100	103	94	101	94	95	102	95	91	90	84
1.A.4. Other sectors (CH_4)	100	108	109	114	148	155	174	185	140	155	193
1.A.4. Other sectors (N_2O)	100	103	97	100	92	91	97	92	88	86	85
1.A.5. Other (CO_2)	100	241	118	199	211	212	148	144	171	153	93
1.B.1. Fugitive emissions from solid fuels (CH_4)	100	118	120	144	169	190	190	190	120	101	101
1.B.2. Fugitive emissions from oil and natural gas (CH_4)	100	108	108	106	124	121	122	127	123	138	129
2.A. Mineral products (CO_2)	100	117	129	130	131	130	138	153	143	139	145
2.B. Chemical industry (N_2O)	0	0	0	0	0	0	0	0	0	0	0
2.B. Chemical industry (HFC)	0	0	0	0	0	0	0	0	0	0	0
2.C. Metal production (CO_2)	0	0	0	0	0	0	0	0	0	0	0
2.C. Metal production (PFC)	0	0	0	0	0	0	0	0	0	0	0
2.E. Production of halocarbons and SF_6 (HFC)	0	0	0	0	0	0	0	0	0	0	0
2.F. Consumption of halocarbons and SF_6 (HFC)	0	0	100	2 625	3 873	6 500	10 315	11 011	13 794	16 900	20 94 037
4.A. Enteric fermentation (CH_4)	100	99	98	99	95	95	95	92	92	85	85
4.B. Manure management (CH_4)	100	101	103	109	104	104	103	103	106	94	96
4.B. Manure management (N_2O)	100	102	104	107	107	105	105	97	101	99	95
4.D. Agricultural soils (N_2O)	100	98	91	92	89	88	85	82	83	82	80
6.A. Solid waste disposal on land (CH_4)	100	102	104	104	105	100	100	95	89	85	91

Source: Member State submission (CRF tables), EEA (2002a).

Note: The list of key sources in this table is the one identified for the EC and differs from the one defined by the Member States for their UNFCCC reporting.

Table A1.14 **Greenhouse gases and distance-to-target indicators for Denmark**

Source: Member State submission (CRF tables), EEA (2002a).

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Greenhouse gas emissions (without LUCF)	100,0	99,6	115,1	105,6	109,6	115,1	111,1	130,5	116,4	109,1	104,7	98,3
DTI 2010 (non-adjusted)	0,0	– 0,4	16,1	7,7	12,7	19,3	16,3	36,8	23,8	17,5	14,1	8,8
DTI 2010 (adjusted for electricity trade)	0,0	– 8,7	6,6	– 1,0	3,6	9,7	7,1	26,0	14,1	8,4	5,4	0,7
CO_2 (without LUCF)	100,0	100,0	120,6	109,3	113,8	121,3	115,9	141,6	123,8	114,0	108,8	100,4
CH_4 (without LUCF)	100,0	100,0	101,0	101,2	103,2	103,8	105,1	106,7	104,8	103,1	96,7	98,4
N_2O (without LUCF)	100,0	100,0	99,0	92,8	94,0	91,9	91,3	90,0	86,1	86,5	86,0	83,8
F-gases	100,0	12,5	18,0	26,9	66,7	76,3	100,0	127,4	139,5	167,2	203,1	236,9

Table A1.15 **Main driving-force indicators for Denmark**

Source: Eurostat, Member State inventory submission (CRF tables), EEA (2002a).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Population	100	100	101	101	101	102	102	103	103	104	:
GDP per capita	100	101	101	101	106	108	110	113	116	118	:
Energy intensity of GDP	100	108	104	106	104	103	113	102	97	92	:
Share of fossil fuels	100	105	101	103	105	103	109	105	103	102	:
Shift within fossil fuels (CO_2 intensity of fossil fuels)	100	105	101	103	103	99	101	99	94	94	:
GDP	100	101	102	102	107	110	113	116	119	122	126
Gross inland energy consumption	100	109	106	108	111	113	128	119	116	112	:
Heating degree days	:	:	:	:	:	100	122	101	98	95	92

Table A1.16 **Sectoral driving-force indicators (Eurostat)**

Source: Eurostat.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Final electricity consumption	100	101	103	105	106	107	110	109	110	110	:
Gross value added in industry	100	100	100	94	102	108	108	113	115	115	:
Volume passenger transport	100	103	104	104	105	107	111	115	117	122	:
Volume freight transport	100	66	103	97	106	108	106	108	112	117	:
Stock of permanently occupied dwellings	100	101	101	102	102	103	103	104	104	105	:

Table A1.17 **Sectoral driving-force indicators (CRF)**

Source: Member State inventory submission (CRF tables), EEA (2002a).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Coal mining and handling	0	0	0	0	0	0	0	0	0	0	0
Cement production	100	123	137	139	138	140	149	166	156	150	155
Use of synthetic fertilisers	100	99	92	83	81	79	73	72	71	64	64
Use of animal manures	100	102	104	107	107	105	105	97	101	99	95
Cattle population	100	99	98	98	94	93	93	90	88	84	83
Waste disposal on land	100	96	91	87	82	62	79	66	63	46	47

Data basis for the CO_2 intensity indicators Table A1.18

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Value added of iron and steel industry	100	106	117	116	127	13	112	113	125	:	:
Crude steel production	100	104	97	99	118	107	121	129	130	120	:
CO_2 emissions from iron and steel industry	100	74	35	37	35	39	41	37	35	37	:
Value added of glass, pottery & building mat. industry	100	99	103	102	112	119	123	120	125	:	:
CO_2 emissions from glass, pottery & building mat. industry	100	102	89	93	103	101	111	115	107	106	:
Value added of the chemical industry	100	106	118	125	136	124	134	154	166	:	:
CO_2 emissions from the chemical industry	100	145	122	44	49	70	75	84	85	75	:
All output of autoproducer thermal power stations	100	116	262	243	247	302	433	626	857	1.001	:
CO_2 emissions from autoproducer thermal power stations	100	96	141	155	69	101	130	105	252	270	:
Freight traffic on road	100	97	101	93	102	100	101	103	106	111	:
CO_2 emissions from diesel consumption of freight traffic	100	79	103	121	117	107	115	122	138	147	:
Value added of the services sector	100	101	101	102	105	107	111	113	116	121	:
CO_2 emissions from the services sector	100	84	123	69	65	62	54	47	41	43	:

Source: Eurostat.

Finland

Finland reduced greenhouse gas emissions for the fourth consecutive year. Finland is the only MS where CO_2 emissions from transport did not increase in the 1990s.

In base year:	77.1 Tg
In 2000:	74.0 Tg
Change base year–2000:	– 3.1 Tg – 4.1 %
Share in total EU greenhouse gases:	1.8 %

Distance-to-target indicator (DTI)
In 2000, Finland's greenhouse gas emissions reduced for the fourth consecutive year. They were 74 Tg (CO_2 equivalents), which was 4.1 % below 1990 levels. In the burden-sharing agreement to the Kyoto Protocol, Finland agreed to stabilise its greenhouse gas emissions at base-year levels by 2008–12. Therefore, assuming a linear target path from 1990 to 2010, Finnish greenhouse gas emissions were 4.1 index points below this target path in 2000 (Figure 51).

Finnish CO_2 emissions were 62 Tg, which was 0.3 % below 1990 levels. For CO_2, Finland's target is to stop increases of CO_2 emissions from energy production and use by end of the 1990s. This target seems to have been reached taking into account that energy-related CO_2 emissions reduced for four consecutive years since 1996.

Greenhouse gas emissions by gas
The share of CO_2 and fluorinated gas emissions in total Finish greenhouse gas emissions increased, the share of methane and nitrous oxide emissions reduced in the last decade (Figure 52).

CO_2 emissions account for 84 % of total Finish greenhouse gas emissions. They reduced by 3 %, compared to 1999, and were at 1990 levels in 2000. From 1999 to 2000, emissions decreased in energy industries, transport and small combustion. Between 1990 and 2000, CO_2 emission increases in energy industries (+ 7 %) and energy use in industry (+ 11 %) were offset by decreases in small combustion (– 23 %) and agricultural soils. The 23 % decrease in CO_2 emissions from small combustion is the second largest percentage reduction in the EU, after Sweden. A reason for this might be the growing use of district heating. A second remarkable fact is that Finland is the only MS having decreased CO_2 emissions from transport between 1990 and 2000 (– 1 %). Explaining factors might be high per capita emissions from transport in 1990, relatively high petrol prices and economic circumstances (see Box 2).

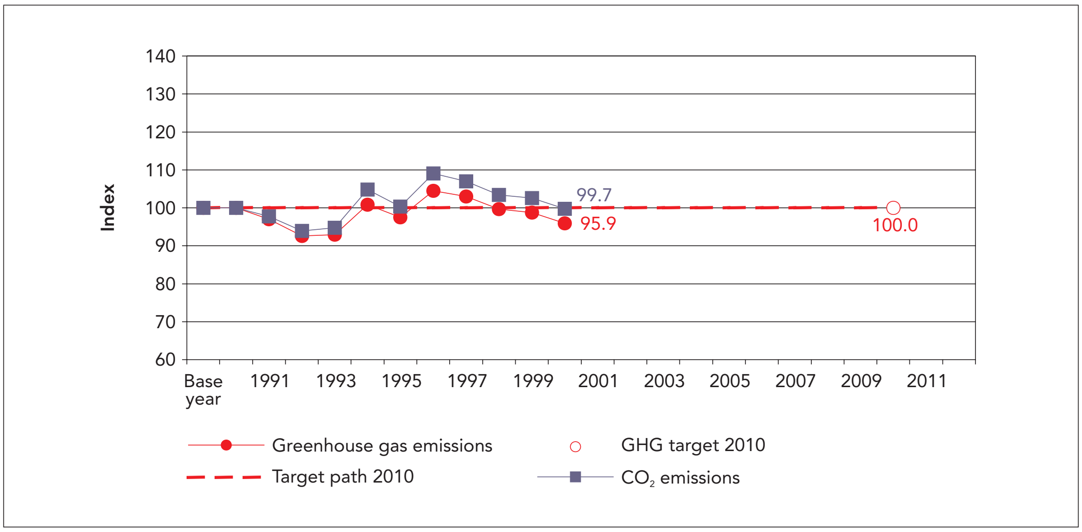
N_2O emissions are responsible for 10 % of total greenhouse gas emissions. They reduced by 7 % in 2000, compared to 1999, and were 15 % lower than in 1990. Emissions mainly decreased in agriculture and in chemical industries.

CH_4 emissions account for 5 % of total Finish greenhouse gas emissions. They were stable in 2000, compared to 1999, but were 36 % below 1990 level. Between 1990 and 2000, CH_4 emissions mostly decreased from landfills (– 55 %), but also from enteric fermentation (– 15 %).

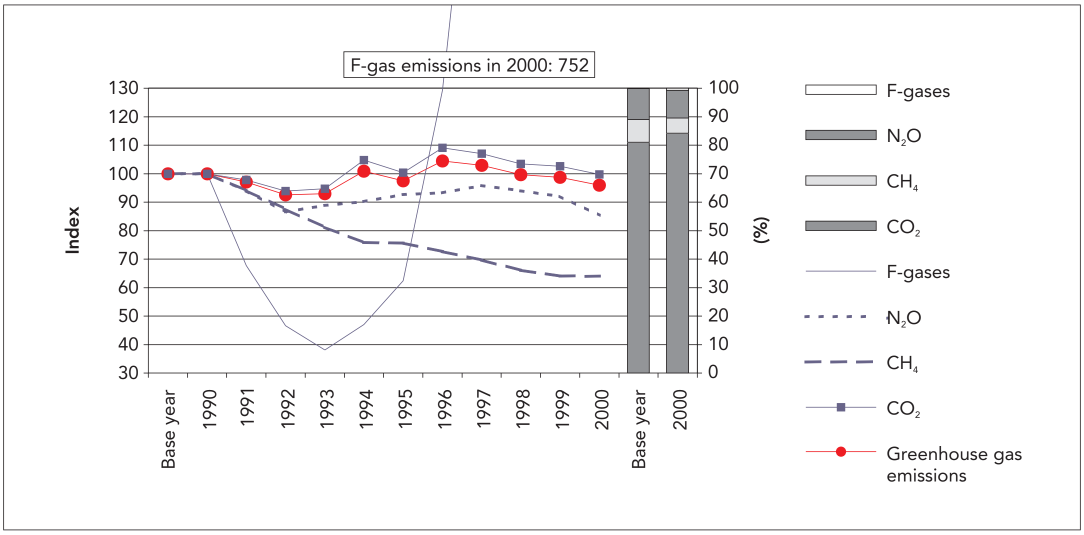
Fluorinated gas emissions account for 1 % of total Finish greenhouse gas emissions and show a sharp increase since 1993. All Finish fluorinated gas emissions occur from consumption of halocarbons and SF_6, with HFC emissions having by far the largest share in total fluorinated gas emissions. HFC emissions grew by 58 % in 2000, compared to 1999.

Main driving forces of CO_2 emissions from fossil fuels
CO_2 emissions from fossil-fuel combustion account for 74 % of total Finnish greenhouse gas emissions. They increased by 5 % between 1990 and 1999. Figure 53 shows that population growth and the increase in GDP per capita are the main drivers of CO_2 emissions, whereas the increase of non-fossil energies partly offset emission increases. CO_2 emissions increased in both halves of the 1990s, but the contributing factors changed considerably in the second half. In the first half, GDP per capita declined due to a strong recession, energy intensity of GDP increased and a shift towards high-carbon fossil fuels took place. In the second half of the decade, strong economic growth was a large driver of CO_2 emissions, but improvements in energy intensity of GDP, the share of non-fossil fuels and a shift within fossil fuels towards lower carbon fuels contributed to a small increase in CO_2 emissions from fossil fuels.

Finnish greenhouse gas emissions compared with targets for 2000 and 2008–12 (excl. LUCF) Figure 51

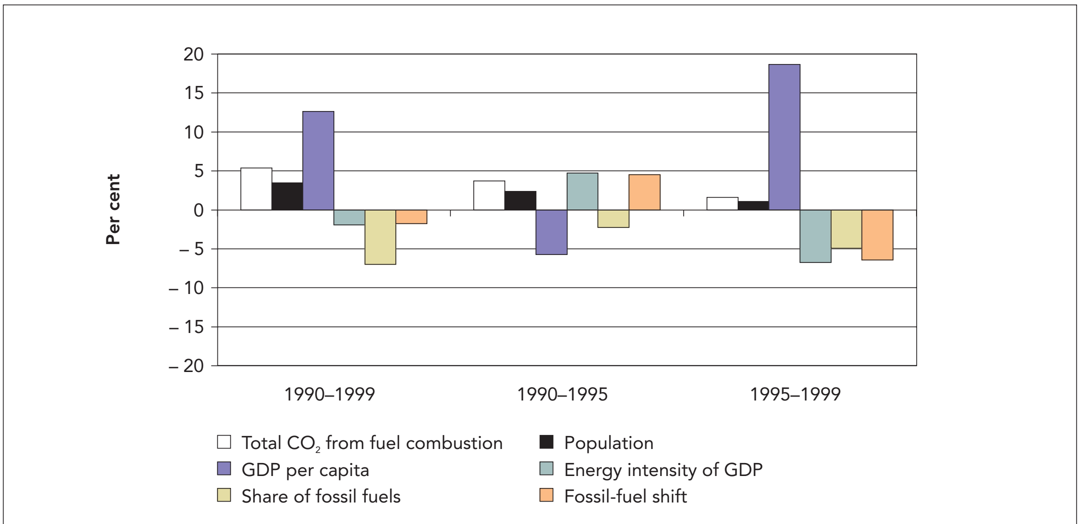


Finnish greenhouse gas emissions by gas (excluding LUCF) Figure 52



Note: The left side of the figure shows the trend in GHG emissions as an index (base year = 100); the right side of the figure shows the percentage contribution of the main GHG to the total emissions in the base year and 2000.

Change of Finnish CO_2 emissions from fossil-fuel combustion and the influence of main driving forces (population, GDP per capita, energy intensity of GDP, share of fossil fuels, shift within fossil fuels) in the 1990s Figure 53



Source: Eurostat, Member State submission (CRF tables), EEA (2002a).

Table A1.19 **Greenhouse gases and distance-to-target indicators for Finland**

Source: Member State submission (CRF tables), EEA (2002a).

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Greenhouse gas emissions (without LUCF)	100,0	100,0	97,0	92,6	93,0	100,9	97,5	104,5	103,0	99,7	98,8	95,9
DTI 2010	0,0	0,0	– 3,0	– 7,4	– 7,0	0,9	– 2,5	4,5	3,0	– 0,3	– 1,2	– 4,1
CO_2 (without LUCF)	100,0	100,0	97,8	93,9	94,7	104,8	100,3	109,1	107,0	103,4	102,6	99,7
CH_4 (without LUCF)	100,0	100,0	94,1	87,6	81,2	75,9	75,6	72,7	69,7	66,1	64,0	64,0
N_2O (without LUCF)	100,0	100,0	94,0	86,6	88,9	90,2	92,7	93,3	95,9	94,0	92,1	85,4
F-gases	100,0	100,0	67,8	46,6	38,1	47,1	62,4	129,3	257,8	360,4	525,4	751,7

Table A1.20 **Sectoral emission indicators (key sources) for Finland**

Source: Member State submission (CRF tables), EEA (2002a).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1.A.1. Energy industries (CO_2)	100	103	95	108	133	121	149	133	116	114	107
1.A.2. Manufacturing industries and construction (CO_2)	100	96	94	92	97	97	94	106	106	110	111
1.A.3. Transport (CO_2)	100	93	93	88	91	89	88	92	99	102	99
1.A.3. Transport (N_2O)	100	86	86	90	92	89	95	99	120	113	109
1.A.4. Other sectors (CO_2)	100	95	97	87	91	88	86	87	88	84	77
1.A.4. Other sectors (CH_4)	100	95	72	63	68	112	115	115	117	118	113
1.A.4. Other sectors (N_2O)	100	88	86	83	77	82	84	88	87	89	98
1.A.5. Other (CO_2)	100	134	134	135	149	181	278	187	182	83	101
1.B.1. Fugitive emissions from solid fuels (CH_4)	100	100	100	100	100	100	100	100	100	100	100
1.B.2. Fugitive emissions from oil and natural gas (CH_4)	100	118	118	118	118	118	346	241	355	207	218
2.A. Mineral products (CO_2)	100	88	80	67	71	71	73	75	78	85	91
2.B. Chemical industry (N_2O)	100	88	79	82	85	87	87	88	83	83	83
2.B. Chemical industry (HFC)	0	0	0	0	0	0	0	0	0	0	0
2.C. Metal production (CO_2)	0	0	0	0	0	0	0	0	0	0	0
2.C. Metal production (PFC)	0	0	0	0	0	0	0	0	0	0	0
2.E. Production of halocarbons and SF_6 (HFC)	0	0	0	0	0	0	0	0	0	0	0
2.F. Consumption of halocarbons and SF_6 (HFC)	100	111	128	126	2.231	9.840	25.562	55.042	80.778	103.865	164.406
4.A. Enteric fermentation (CH_4)	100	95	93	93	93	87	88	89	87	85	85
4.B. Manure management (CH_4)	100	95	93	92	93	109	109	113	110	106	105
4.B. Manure management (N_2O)	100	95	94	94	94	84	83	83	80	74	73
4.D. Agricultural soils (N_2O)	100	93	84	86	85	87	84	82	81	78	80
6.A. Solid waste disposal on land (CH_4)	100	93	85	75	65	63	58	52	47	44	45

Note: The list of key sources in this table is the one identified for the EC and differs from the one defined by the Member States for their UNFCCC reporting.

Table A1.21 **Main driving-force indicators for Finland**

Source: Eurostat, Member State inventory submission (CRF tables), EEA (2002a).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Population	100	101	101	102	102	102	103	103	103	104	:
GDP per capita	100	93	90	88	91	94	98	104	109	113	:
Energy intensity of GDP	100	108	108	114	116	105	108	107	103	98	:
Share of fossil fuels	100	102	99	99	103	98	104	100	98	93	:
Shift within fossil fuels (CO_2 intensity of fossil fuels)	100	95	98	96	97	105	101	97	94	98	:
GDP	100	94	91	90	93	97	101	107	113	117	124
Gross inland energy consumption	100	102	98	102	108	101	109	114	116	115	:
Heating degree days	:	:	:	:	:	100	108	101	106	98	92

Sectoral driving-force indicators (Eurostat) Table A1.22

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Final electricity consumption	100	100	101	106	110	111	113	119	124	126	:
Gross value added in industry	100	90	88	90	97	101	106	115	125	132	:
Volume passenger transport	100	99	108	106	106	107	108	111	114	117	:
Volume freight transport	100	94	94	95	98	88	92	97	101	105	:
Stock of permanently occupied dwellings	100	101	103	104	105	107	108	109	110	111	:

Source: Eurostat.

Sectoral driving-force indicators (CRF) Table A1.23

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Coal mining and handling	0	0	0	0	0	0	0	0	0	0	0
Cement production	100	81	69	51	52	55	59	70	75	79	86
Use of synthetic fertilisers	100	89	71	74	74	86	79	74	74	71	74
Use of animal manures	100	95	94	94	94	91	90	90	86	79	78
Cattle population	100	96	94	92	91	84	84	84	82	80	78
Waste disposal on land	100	94	86	79	70	66	59	53	56	69	73

Source: Member State inventory submission (CRF tables), EEA (2002a).

Data basis for the CO_2 intensity indicators Table A1.24

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Value added of iron and steel industry	100	100	121	116	121	153	130	133	123	117	:
Crude steel production	100	101	108	114	120	111	115	131	138	138	:
CO_2 emissions from iron and steel industry	100	94	94	98	101	96	102	116	116	120	:
Value added of glass, pottery & building mat. industry	100	76	53	45	54	52	56	68	71	80	:
CO_2 emissions from glass, pottery & building mat. industry	100	95	82	70	82	76	36	39	46	51	:
Value added of the chemical industry	100	79	77	70	83	82	81	87	88	105	:
CO_2 emissions from the chemical industry	100	101	94	94	94	91	60	69	72	130	:
All output of autoproducer thermal power stations	100	96	101	114	124	124	166	180	197	203	:
CO_2 emissions from autoproducer thermal power stations	100	87	102	119	132	128	129	147	160	160	:
Freight traffic on road	*100*	*100*	*100*	100	103	93	97	102	107	107	:
CO_2 emissions from diesel consumption of freight traffic	100	79	103	121	117	107	115	122	138	147	:
Value added of the services sector	100	95	90	91	92	96	100	105	109	114	:
CO_2 emissions from the services sector	:	:	100	57	79	143	2.616	1.243	1.294	1.269	:

Note: Eurostat estimated data in italics.

Source: Eurostat.

France

French greenhouse gas emissions were slightly below 1990 levels in 2000. Large emission cuts were achieved in N_2O from the adipic acid production due to emission-reduction measures. As in many other MS, CO_2 emissions from transport increased considerably in the 1990s.

In base year:	551.8 Tg
In 2000:	542.3 Tg
Change base year–2000:	– 9.5 Tg
	– 1.7 %
Share in total EU greenhouse gases:	13.4 %

Distance-to-target indicator (DTI)
French greenhouse gas emissions reduced by 1.1 % in 2000 and were slightly below the 1990 level. In 2000, total greenhouse gas emissions were 542 Tg (CO_2 equivalents), which was 1.7 % below 1990 levels. In the burden-sharing agreement to the Kyoto Protocol, France agreed to stabilise its greenhouse gas emissions at base-year levels by 2008–12. Therefore, assuming a linear target path from 1990 to 2010, French greenhouse gas emissions were 1.7 index points below this target path in 2000 (Figure 54).

Greenhouse gas emissions by gas
The share of CO_2 and fluorinated gas emissions in total French greenhouse gas emissions increased, the share of methane and nitrous oxide emissions reduced in the last decade (Figure 55).

CO_2 emissions account for 74 % of total French greenhouse gas emissions. One reason for the low share of CO_2 emissions is the high share of nuclear power production. CO_2 emissions reduced by 1 %, compared to 1999, but were 2 % above 1990 levels in 2000. From 1999 to 2000, emissions mostly decreased in small combustion and energy industries. Also, CO_2 emissions from transport decreased for the first time in the decade. Between 1990 and 2000, CO_2 emission increases in transport (+ 16 %) and, to a smaller extent, small combustion (+ 3 %), were not entirely offset by decreases in energy industries (– 8 %) and energy use in industry (– 5 %).

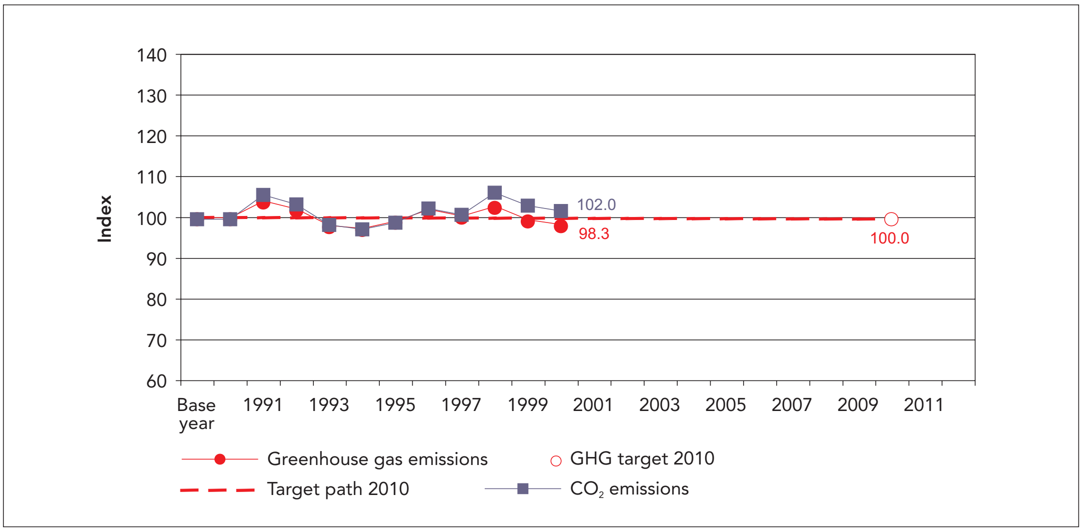
N_2O emissions are responsible for 13 % of total greenhouse gas emissions. They reduced by 2 % in 2000, compared to 1999, and were 17 % lower than in 1990. By far, the largest emission cuts were achieved in the chemical industry (– 61 %) due to reduction measures in the adipic acid production.

CH_4 emissions account for 11 % of total French greenhouse gas emissions. They reduced by 3 % in 2000, compared to 1999, and were 10 % below 1990 level. Between 1990 and 2000, CH_4 emissions mostly decreased from landfills (– 12 %), coal mining (– 41 %) and enteric fermentation (– 6 %). The emission reductions from landfills were mainly achieved through increased CH_4 recovery. CH_4 recovery has increased by a factor of 7 between 1990 and 2000; in 2000, about 55 % of CH_4 emissions from landfills were recovered.

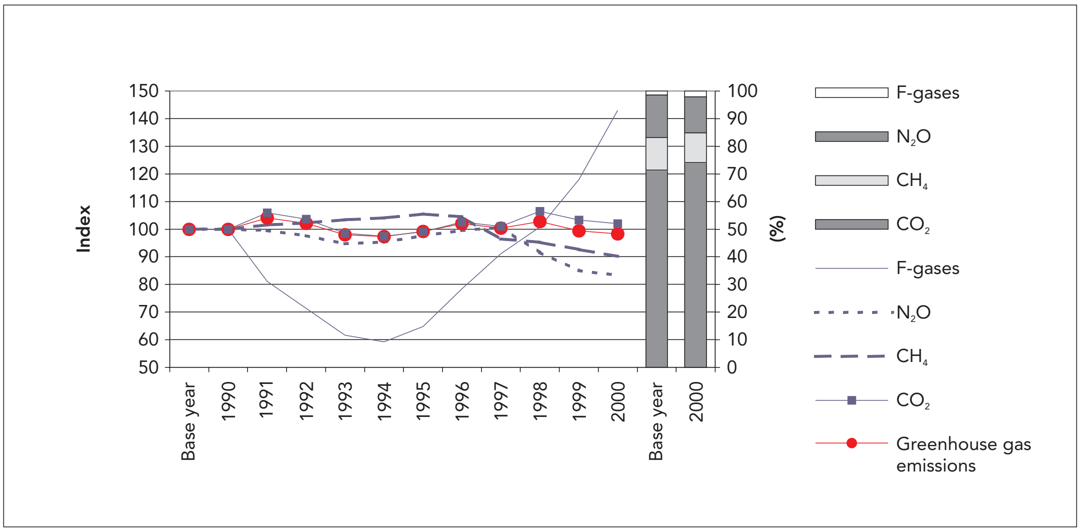
Fluorinated gas emissions account for 2 % of total French greenhouse gas emissions. They declined in the early 1990s mainly due to regulations on the manufacture of HCFC 23, but increased since 1994. HFC emissions have the largest share in total fluorinated gas emissions. HFC emissions mainly occur from consumption of halocarbons and SF_6. They increased by a factor of 300 between 1990 and 2000, and by 61 %, compared to 1999. Most of the emissions occur from refrigeration and air conditioning, especially rapidly growing air conditioning in cars, and aerosols and insulation foams (MIES, 2001).

Main driving forces of CO_2 emissions from fossil fuels
CO_2 emissions from fossil-fuel combustion account for 69 % of total French greenhouse gas emissions. They increased by 5 % between 1990 and 1999. Figure 56 shows that the increase in GDP per capita and the decrease in the share of fossil fuels are the main drivers of CO_2 emissions in the 1990s. In the first half of the 1990s, emissions were almost stable, GDP per capita increased slowly and the share of non-fossil fuels increased significantly (mainly due to the expansion of nuclear power, but also of renewable energies). In the second half of the 1990s, CO_2 emissions increased by 5 %; GDP growth was not offset by energy efficiency improvements and shifts towards lower carbon fossil fuels. The share of fossil fuels increased slightly from 1995 to 1999.

French greenhouse gas emissions compared with targets for 2000 and 2008–12 (excl. LUCF) Figure 54

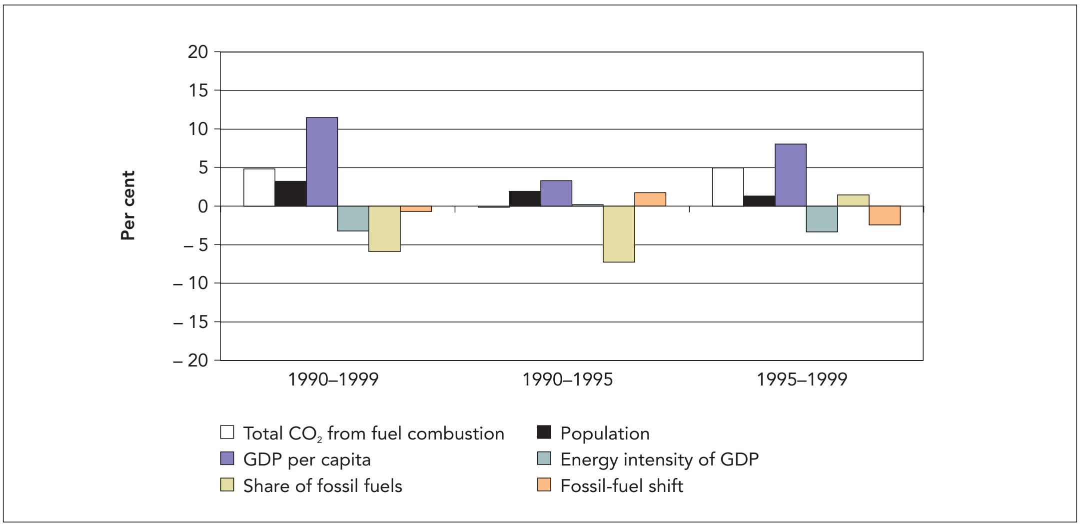


French greenhouse gas emissions by gas (excluding LUCF) Figure 55



Note: The left side of the figure shows the trend in GHG emissions as an index (base year = 100); the right side of the figure shows the percentage contribution of the main GHG to the total emissions in the base year and 2000.

Change of French CO_2 emissions from fossil-fuel combustion and the influence of main driving forces (population, GDP per capita, energy intensity of GDP, share of fossil fuels, shift within fossil fuels) in the 1990s Figure 56



Source: Eurostat, Member State submission (CRF tables), EEA (2002a).

Table A1.25 **Greenhouse gases and distance-to-target indicators for France**

Source: Member State submission (CRF tables), EEA (2002a).

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Greenhouse gas emissions (without LUCF)	100,0	100,0	104,1	102,1	98,0	97,4	99,1	102,0	100,3	102,7	99,4	98,3
DTI 2010	0,0	0,0	4,1	2,1	– 2,0	– 2,6	– 0,9	2,0	0,3	2,7	– 0,6	– 1,7
CO_2 (without LUCF)	100,0	100,0	105,9	103,6	98,6	97,5	99,1	102,6	101,1	106,4	103,3	102,0
CH_4 (without LUCF)	100,0	100,0	101,6	102,2	103,4	104,0	105,5	104,5	96,5	95,3	92,6	90,2
N_2O (without LUCF)	100,0	100,0	99,5	97,7	94,7	95,3	97,7	99,5	100,7	91,5	85,0	83,3
F-gases	100,0	100,0	81,1	71,3	61,7	59,2	64,8	78,4	91,2	100,9	118,1	143,0

Table A1.26 **Sectoral emission indicators (key sources) for France**

Source: Member State submission (CRF tables), EEA (2002a).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1.A.1. Energy industries (CO_2)	100	118	106	86	80	84	91	85	105	94	92
1.A.2. Manufacturing industries and construction (CO_2)	100	101	97	93	96	96	97	99	102	95	95
1.A.3. Transport (CO_2)	100	102	106	106	107	109	110	112	113	116	116
1.A.3. Transport (N_2O)	100	107	116	125	141	157	173	188	201	216	226
1.A.4. Other sectors (CO_2)	100	110	110	107	101	103	112	105	109	107	103
1.A.4. Other sectors (CH_4)	100	122	114	112	95	97	104	93	98	95	90
1.A.4. Other sectors (N_2O)	100	114	112	110	102	103	113	105	110	108	104
1.A.5. Other (CO_2)	0	0	0	0	0	0	0	0	0	0	0
1.B.1. Fugitive emissions from solid fuels (CH_4)	100	93	97	101	103	102	78	66	65	61	59
1.B.2. Fugitive emissions from oil and natural gas (CH_4)	100	96	93	89	85	82	78	78	78	77	78
2.A. Mineral products (CO_2)	100	95	87	81	83	81	80	77	82	79	80
2.B. Chemical industry (N_2O)	100	99	96	94	94	99	100	101	67	45	39
2.B. Chemical industry (HFC)	0	0	0	0	0	0	0	0	0	0	0
2.C. Metal production (CO_2)	100	77	72	70	86	101	75	86	84	75	67
2.C. Metal production (PFC)	100	71	60	42	33	29	28	30	39	51	37
2.E. Production of halocarbons and SF_6 (HFC)	100	67	47	35	27	24	20	20	24	29	11
2.F. Consumption of halocarbons and SF_6 (HFC)	100	110	121	162	932	3 406	7 744	11 771	14 268	18 498	29 792
4.A. Enteric fermentation (CH_4)	100	98	97	96	96	96	96	95	95	94	94
4.B. Manure management (CH_4)	100	100	100	101	101	102	104	104	104	103	103
4.B. Manure management (N_2O)	100	98	121	96	96	97	97	97	97	96	96
4.D. Agricultural soils (N_2O)	100	99	96	93	94	95	96	98	98	97	97
6.A. Solid waste disposal on land (CH_4)	100	107	113	118	124	128	129	107	102	96	88

Note: The list of key sources in this table is the one identified for the EC and differs from the one defined by the Member States for their UNFCCC reporting.

Table A1.27 **Main driving-force indicators for France**

Source: Eurostat, Member State inventory submission (CRF tables), EEA (2002a).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Population	100	100	101	101	102	102	102	103	103	103	:
GDP per capita	100	101	102	100	102	103	104	106	109	112	:
Energy intensity of GDP	100	105	102	104	98	100	105	100	100	97	:
Share of fossil fuels	100	100	98	94	93	93	94	93	96	94	:
Shift within fossil fuels (CO_2 intensity of fossil fuels)	100	102	102	100	104	102	99	101	100	99	:
GDP	100	101	103	102	104	105	107	109	112	116	120
Gross inland energy consumption	100	106	104	106	102	106	112	109	112	112	:
Heating degree days	:	:	:	:	:	100	114	96	102	96	93

Sectoral driving-force indicators (Eurostat) Table A1.28

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Final electricity consumption	100	106	109	110	111	113	118	118	122	124	:
Gross value added in industry	100	101	102	97	100	104	103	104	108	110	:
Volume passenger transport	100	102	105	108	111	113	115	117	121	119	:
Volume freight transport	100	73	104	100	111	122	120	125	129	137	:
Stock of permanently occupied dwellings	100	101	102	103	104	106	107	108	110	112	:

Source: Eurostat.

Sectoral driving-force indicators (CRF)s Table A1.29

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Coal mining and handling	100	95	86	80	70	66	63	53	44	40	27
Cement production	100	95	85	79	80	79	77	74	79	77	78
Use of synthetic fertilisers	100	98	92	85	88	91	95	98	97	98	100
Use of animal manures	100	99	97	97	97	98	98	98	98	97	97
Cattle population	100	99	96	96	96	96	96	95	96	94	94
Waste disposal on land	100	103	106	108	110	104	106	109	112	115	115

Source: Member State inventory submission (CRF tables), EEA (2002a).

Data basis for the CO_2 intensity indicators Table A1.30

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Value added of iron and steel industry	100	93	89	82	97	107	105	37	21	19	:
Crude steel production	100	97	95	90	95	95	93	104	106	106	:
CO_2 emissions from iron and steel industry	100	98	87	81	89	102	97	102	93	84	:
Value added of glass, pottery & building mat. industry	100	98	95	92	98	99	95	95	99	102	:
CO_2 emissions from glass, pottery & building mat. industry	100	98	98	85	59	57	61	52	61	73	:
Value added of the chemical industry	100	100	105	110	122	130	128	132	136	144	:
CO_2 emissions from the chemical industry	100	80	71	78	72	77	81	60	62	59	:
All output of autoproducer thermal power stations	100	101	89	101	95	94	98	105	113	118	:
CO_2 emissions from autoproducer thermal power stations	100	100	79	89	78	70	71	82	93	89	:
Freight traffic on road	100	102	104	100	106	114	115	117	122	133	:
CO_2 emissions from diesel consumption of freight traffic	100	79	103	121	117	107	115	122	138	147	:
Value added of the services sector	100	101	103	103	105	105	107	109	112	115	:
CO_2 emissions from the services sector	100	112	119	116	110	115	128	119	127	127	:

Source: Eurostat.

Germany

The reduction of German greenhouse gas emissions slowed down in 2000, mainly due to increased use of coal in German power stations. A 4 % decline in CO_2 emissions from small combustion (partly due to warmer weather) and a remarkable 2 % cut in CO_2 emissions from transport offset emission increases from the energy industries.

In base year:	1 225.0 Tg
In 2000:	991.4 Tg
Change base year–2000:	– 233.6 Tg – 19.1 %
Share in total EU greenhouse gases:	24.4 %

Distance-to-target indicator (DTI)
German greenhouse gas emissions reduced slightly in 2000, compared to 1999, and were well below the base-year level (1995 for fluorinated gases). In 2000, total greenhouse gas emissions were 991 Tg (CO_2 equivalents), which was 19.1 % below the base-year level. In the burden-sharing agreement to the Kyoto Protocol, Germany agreed to reduce its greenhouse gas emissions by 21 % by 2008–12. Assuming a linear target path from 1990 to 2010, German greenhouse gas emissions were 8.6 index points below this target path in 2000 (Figure 57).

Greenhouse gas emissions by gas
The share of the CO_2 and fluorinated gases in total German greenhouse gas emissions increased in the 1990s, whereas the share of CH_4 and N_2O decreased (Figure 58).

CO_2 emissions account for 87 % of total German greenhouse gas emissions. In 2000, CO_2 emissions were stable compared to 1999, but were 15 % below the 1990 levels. In 2000, emissions from small combustion decreased, partly due to warmer outdoor temperature, but emissions from energy industries increased (due to increased use of coal in power production). CO_2 emissions from transport decreased for the first time since 1994. Over the whole period 1990 to 2000, large emission reductions were achieved from energy industry (– 18 %) and energy use in manufacturing industries (– 29 %) as well as from small combustion (– 16 %), while emissions from transport increased (+ 13 %). A large part of these reductions are the result of energy efficiency improvements and fuel shifts after the German reunification. Eichhammer et al (2001) estimate that about 50 % of total German greenhouse gas emissions reductions since 1990 can be attributed to the German reunification.

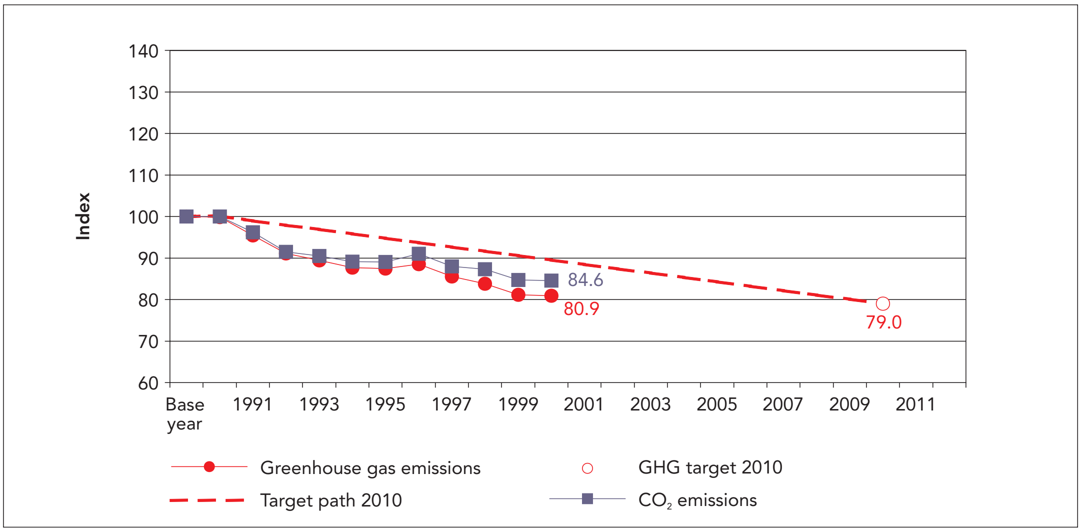
CH_4 emissions account for 6 % of total German greenhouse gas emissions and decreased by 45 % between 1990 and 2000. Also, in 2000, emissions dropped by 5 % compared to 1999. The main reasons for declining CH_4 emissions during the past decade were reductions in solid waste disposal on land, fugitive emissions from fuels and in enteric fermentation.

N_2O emissions are responsible for 6 % of total greenhouse gas emissions and decreased by 32 % between 1990 and 2000. In 2000, emissions were stable compared to 1999. The main reasons for decreasing N_2O emissions were considerable reductions in chemical industry and agriculture (manure management, agricultural soils).

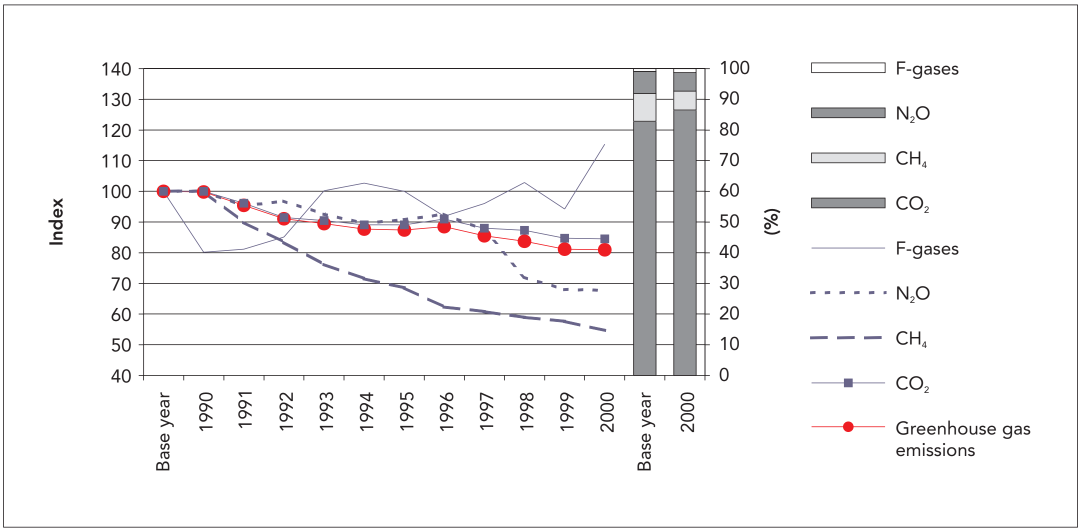
Fluorinated gas emissions account for 1 % of total greenhouse gas emissions. The main source of fluorinated gas emissions in Germany is consumption of halocarbons and SF_6. HFC emissions from consumption of halocarbons and SF_6 increased by a factor of 60 since 1992. In 2000, they grew by 47 % compared to 1999. In contrast to this, SF_6 emissions decreased considerably in recent years.

Main driving forces of CO_2 emissions from fossil fuels
CO_2 emissions from fossil-fuel combustion account for 84 % of total German greenhouse gas emissions. They decreased by 16 % between 1990 and 1999. Figure 59 shows that the increase in GDP per capita and population growth are the main drivers of CO_2 emissions, whereas the other factors overcompensate the emission increases throughout the decade. In particular, energy intensity of GDP decreased considerably and made the largest contribution to declining CO_2 emissions. CO_2 emissions and energy intensity of GDP decreased less in the second half of the 1990s. This was due to the fact that the largest energy efficiency improvements were achieved in the first years after the German reunification. In recent years, the reduction of the share of fossil fuels became a more important factor for reducing CO_2 emissions from fossil-fuel combustion.

German greenhouse gas emissions compared with targets for 2000 and 2008–12 (excl. LUCF) Figure 57



German greenhouse gas emissions by gas (excluding LUCF) Figure 58



Note: The left side of the figure shows the trend in GHG emissions as an index (base year = 100); the right side of the figure shows the percentage contribution of the main GHG to the total emissions in the base year and 2000.

Change of German CO_2 emissions from fossil-fuel combustion and the influence of main driving forces (population, GDP per capita, energy intensity of GDP, share of fossil fuels, shift within fossil fuels) in the 1990s Figure 59

Source: Eurostat, Member State submission (CRF tables), EEA (2002a).

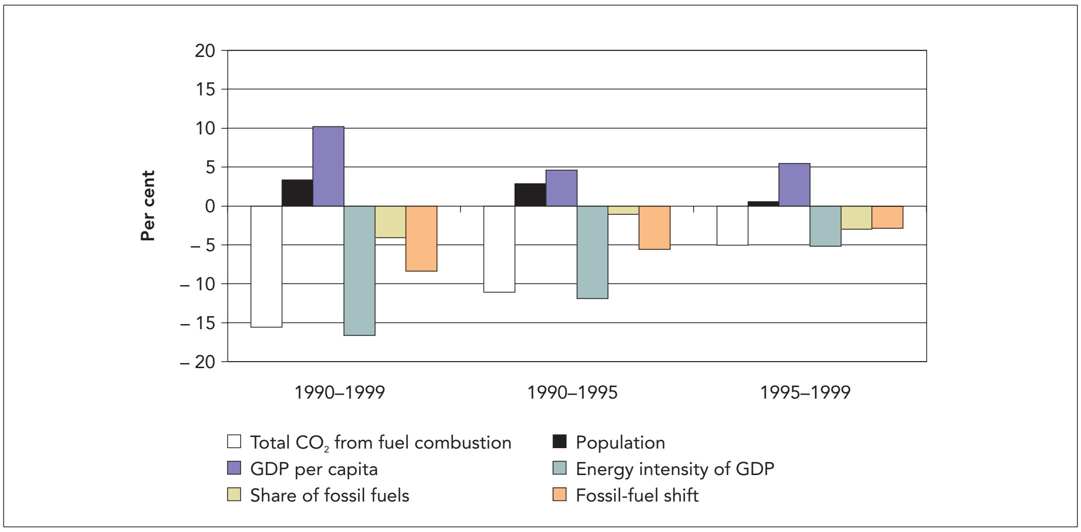


Table A1.31 **Greenhouse gases and distance-to-target indicators for Germany**

Source: Member State submission (CRF tables), EEA (2002a).

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Greenhouse gas emissions (without LUCF)	100,0	99,8	95,4	91,1	89,5	87,7	87,4	88,5	85,6	83,8	81,1	80,9
DTI 2010	0,0	– 0,2	– 3,5	– 6,8	– 7,4	– 8,1	– 7,3	– 5,2	– 7,1	– 7,8	– 9,4	– 8,6
CO_2 (without LUCF)	100,0	100,0	96,2	91,5	90,5	89,1	89,1	91,0	88,0	87,3	84,7	84,6
CH_4 (without LUCF)	100,0	100,0	89,9	83,4	76,2	71,5	68,6	62,3	60,8	58,9	57,7	54,7
N_2O (without LUCF)	100,0	100,0	95,3	96,9	92,6	89,6	90,8	92,6	87,4	72,0	68,0	67,8
F-gases	100,0	80,2	81,2	85,2	100,2	102,7	100,0	91,9	96,0	102,9	94,2	115,4

Table A1.32 **Sectoral emission indicators (key sources) for Germany**

Source: Member State submission (CRF tables), EEA (2002a).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1.A.1. Energy industries (CO_2)	100	97	91	89	88	85	85	82	82	80	82
1.A.2. Manufacturing industries and construction (CO_2)	100	88	81	75	76	80	77	76	74	70	71
1.A.3. Transport (CO_2)	100	102	106	109	107	109	109	109	111	115	113
1.A.3. Transport (N_2O)	100	119	139	158	158	170	174	176	175	172	162
1.A.4. Other sectors (CO_2)	100	101	93	97	92	94	106	99	95	87	84
1.A.4. Other sectors (CH_4)	100	77	62	59	56	27	26	30	25	25	22
1.A.4. Other sectors (N_2O)	100	100	83	83	83	37	40	38	33	34	31
1.A.5. Other (CO_2)	100	71	54	43	40	26	20	21	20	17	15
1.B.1. Fugitive emissions from solid fuels (CH_4)	100	91	88	75	66	68	60	56	52	48	39
1.B.2. Fugitive emissions from oil and natural gas (CH_4)	100	105	116	128	122	107	112	109	108	106	105
2.A. Mineral products (CO_2)	100	91	94	94	100	96	89	92	94	95	95
2.B. Chemical industry (N_2O)	100	101	113	102	99	100	106	90	36	20	20
2.B. Chemical industry (HFC)	100	100	100	100	100	50	0	0	0	0	0
2.C. Metal production (CO_2)	100	93	82	75	68	78	78	77	83	86	87
2.C. Metal production (PFC)	100	86	77	71	59	62	59	43	47	47	47
2.E. Production of halocarbons and SF_6 (HFC)	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
2.F. Consumption of halocarbons and SF_6 (HFC)	0	0	100	1 085	1 262	1 508	1 985	2 654	3 291	4 038	5 923
4.A. Enteric fermentation (CH_4)	100	88	84	82	82	82	81	79	77	77	75
4.B. Manure management (CH_4)	100	87	85	83	82	81	81	83	80	80	78
4.B. Manure management (N_2O)	100	87	84	83	82	81	81	81	80	80	78
4.D. Agricultural soils (N_2O)	100	92	88	85	79	84	84	83	84	87	88
6.A. Solid waste disposal on land (CH_4)	100	90	78	66	60	56	43	43	43	43	43

Note: The list of key sources in this table is the one identified for the EC and differs from the one defined by the Member States for their UNFCCC reporting.

Table A1.33 **Main driving-force indicators for Germany**

Source: Eurostat, Member State inventory submission (CRF tables), EEA (2002a).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Population	100	101	102	102	103	103	103	103	103	103	:
GDP per capita	100	102	103	101	103	105	105	106	109	110	:
Energy intensity of GDP	100	96	92	92	90	88	91	88	87	84	:
Share of fossil fuels	100	100	99	99	99	99	99	98	98	96	:
Shift within fossil fuels (CO_2 intensity of fossil fuels)	100	98	96	95	95	95	93	92	91	92	:
GDP	*100*	102	105	103	106	108	109	110	112	114	118
Gross inland energy consumption	100	98	96	96	95	95	98	97	97	96	:
Heating degree days	:	:	:	:	:	100	118	99	95	90	85

Eurostat estimated data in italics.

Sectoral driving-force indicators (Eurostat) Table A1.34

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Final electricity consumption	100	97	96	95	96	101	103	103	104	105	:
Gross value added in industry	:	100	99	94	97	97	94	96	97	96	:
Volume passenger transport	100	102	105	107	105	107	107	108	108	110	:
Volume freight transport	100	134	138	138	149	153	154	165	173	187	:
Stock of permanently occupied dwellings	100	101	102	103	104	106	108	109	111	112	:

Source: Eurostat.

Sectoral driving-force indicators (CRF) Table A1.35

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Coal mining and handling	:	:	:	:	:	:	:	:	:	:	:
Cement production	:	:	:	:	:	:	:	:	:	:	:
Use of synthetic fertilisers	:	:	:	:	:	:	:	:	:	:	:
Use of animal manures	:	:	:	:	:	:	:	:	:	:	:
Cattle population	:	:	:	:	:	:	:	:	:	:	:
Waste disposal on land	:	:	:	:	:	:	:	:	:	:	:

Source: Member State inventory submission (CRF tables), EEA (2002a).

Data basis for the CO_2 intensity indicators Table A1.36

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Value added of iron and steel industry	100	100	98	94	91	106	87	90	90	85	:
Crude steel production	100	110	103	98	106	109	104	117	115	109	:
CO_2 emissions from iron and steel industry	100	92	85	78	86	85	81	85	85	81	:
Value added of glass, pottery & building mat. industry	100	106	109	110	117	122	114	107	108	113	:
CO_2 emissions from glass, pottery & building mat. industry	100	88	87	88	90	94	92	86	84	81	:
Value added of the chemical industry	100	103	106	108	114	121	120	116	115	120	:
CO_2 emissions from the chemical industry	100	79	77	73	69	66	53	49	42	40	:
All output of autoproducer thermal power stations	100	96	90	86	81	87	76	74	71	67	:
CO_2 emissions from autoproducer thermal power stations	100	102	92	88	84	68	60	52	47	44	:
Freight traffic on road	*100*	101	104	103	112	115	116	124	130	141	:
CO_2 emissions from diesel consumption of freight traffic	*100*	79	103	121	117	107	115	122	138	147	:
Value added of the services sector	:	100	104	105	107	111	114	116	120	124	:
CO_2 emissions from the services sector	100	84	86	86	79	72	78	77	67	63	:

Eurostat estimated data in italics.

Source: Eurostat.

Greece

After the decline in 1999, mainly due to reductions of fuel combustion in the manufacturing industries, greenhouse gas emissions increased again in 2000. Between 1990 and 2000, the largest emission increases were reported from energy industries, transport and small combustion. Greece did not meet its CO_2 target for 2000.

In base year:	107.0 Tg
In 2000:	129.7 Tg
Change base year–2000:	+ 22.6 Tg + 21.2 %
Share in total EU greenhouse gases:	3.2 %

Distance-to-target indicator (DTI)
After a decline in 1999, Greek greenhouse gas emissions increased by 4.8 % in 2000. Total greenhouse gas emissions were 130 Tg (CO_2 equivalents), which was 21.2 % above base-year levels. In the burden-sharing agreement to the Kyoto Protocol, Greece agreed to limit its greenhouse gas emissions to a 25 % increase by 2008–12. Assuming a linear target path from 1990 to 2010, Greek greenhouse gas emissions were 8.7 index points above this target path in 2000 (Figure 60).

CO_2 emissions were 104 Tg in 2000, which was 23 % above 1990 levels. For CO_2, Greece set a limitation target of + 15 % between 1990 and 2000, which was not met.

Greenhouse gas emissions by gas
The share of the CO_2 emissions in total Greek greenhouse gas emissions increased in the last decade, whereas the share of N_2O emissions decreased. The importance of CH_4 and fluorinated gas emissions was stable. (Figure 61).

CO_2 emissions account for 80 % of total Greek greenhouse gas emissions. In 2000, emissions increased by 5 %, compared to 1999, which was mainly the result of a strong emission increase from energy industries. Between 1990 and 2000, emissions grew in all major sectors related to fuel combustion: energy industries (+ 27 %), transport (+ 20 %), small combustion (+ 60 %) and energy use in manufacturing industries (+ 6 %).

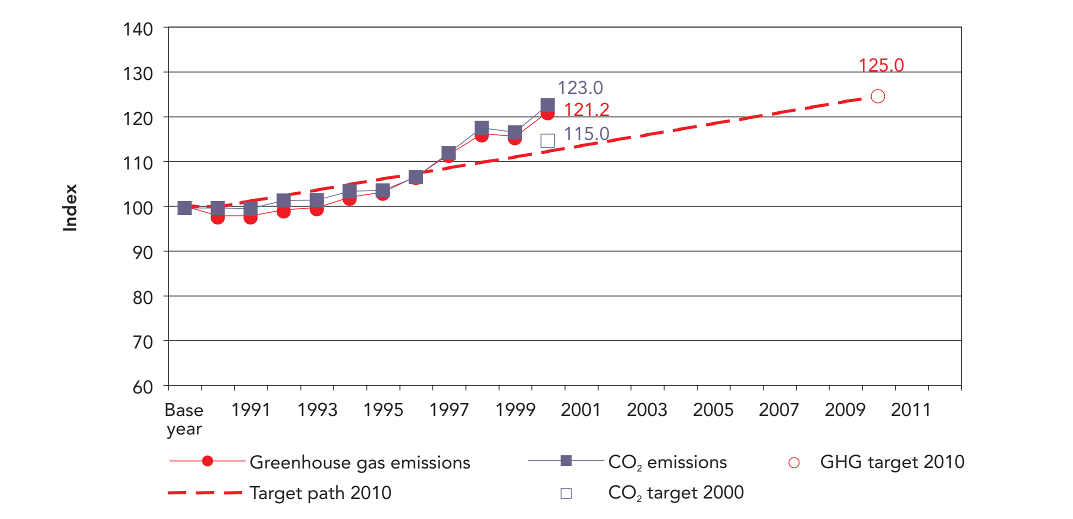
CH_4 emissions account for 8 % of total Greek greenhouse gas emissions and increased by 22 % between 1990 and 2000. In 2000, emissions also slightly increased compared to 1999. The main reason for increasing CH_4 emissions during the past decade were increases in solid waste disposal on land.

N_2O emissions are responsible for 8 % of total greenhouse gas emissions and increased by 3 % between 1990 and 2000. In 2000, emissions increased by 5 % compared to 1999. The main reason for increasing N_2O emissions was fuel combustion in energy industries, transport and small combustion.

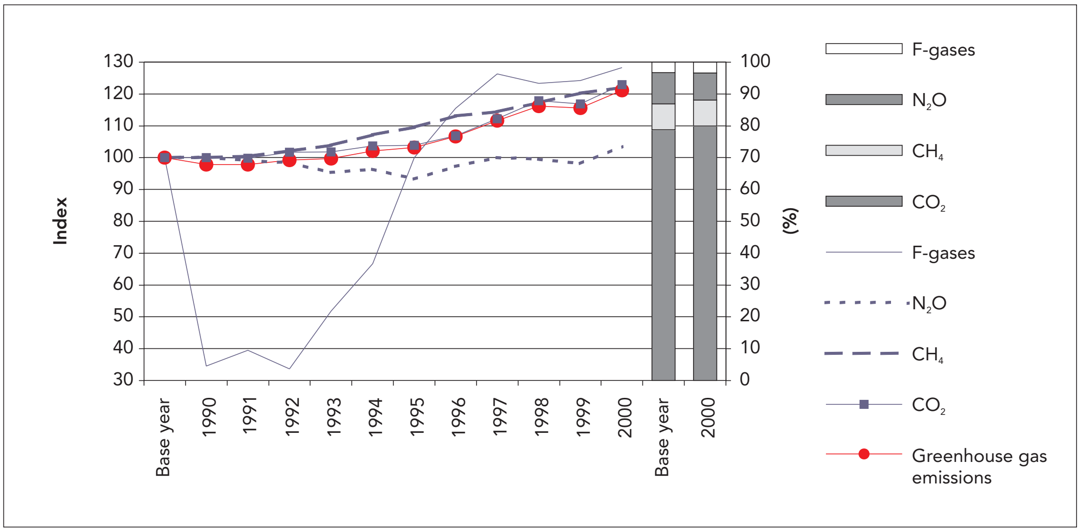
Fluorinated gas emissions account for 3 % of total greenhouse gas emissions. The main sources of fluorinated gas emissions in Greece is the production of halocarbons and SF_6. HFC emissions from production of halocarbons increased by 300 % between 1990 and 2000.

Main driving forces of CO_2 emissions from fossil fuels
CO_2 emissions from fossil-fuel combustion account for 74 % of total Greek greenhouse gas emissions. They increased by 18 % between 1990 and 1999. Figure 62 shows that the increase to a large extent was driven by increases in GDP per capita, whereas decreases in energy intensity of GDP, the share of fossil fuels and the fuel shift within fossil fuels did not play a major role. CO_2 emission increase was stronger in the second half due to higher economic growth. In contrast to the first half of the 1990s, energy intensity of GDP decreased in the late 1990s. Fossil-fuel use shifted towards higher carbon fuels in the second half of the decade, whereas a shift towards lower carbon fuels could be observed in the beginning of the decade.

Greek greenhouse gas emissions compared with targets for 2000 and 2008–12 (excl. LUCF) Figure 60

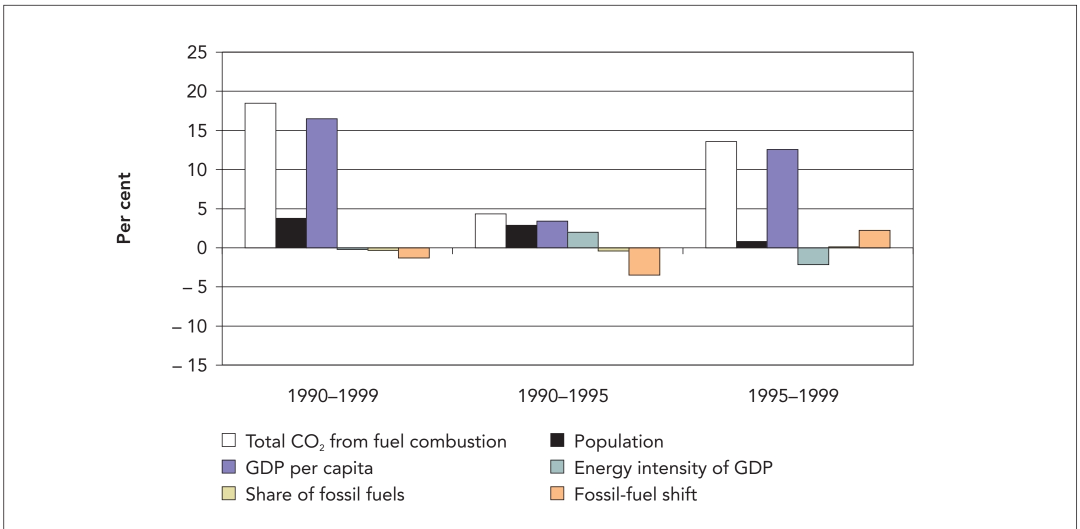


Greek greenhouse gas emissions by gas (excluding LUCF) Figure 61



Note: The left side of the figure shows the trend in GHG emissions as an index (base year = 100); the right side of the figure shows the percentage contribution of the main GHG to the total emissions in the base year and 2000.

Change of Greek CO_2 emissions from fossil-fuel combustion and the influence of main driving forces (population, GDP per capita, energy intensity of GDP, share of fossil fuels, shift within fossil fuels) in the 1990s Figure 62



Source: Eurostat, Member State submission (CRF tables), EEA (2002a).

Table A1.37 **Greenhouse gases and distance-to-target indicators for Greece**

Source: Member State submission (CRF tables), EEA (2002a).

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Greenhouse gas emissions (without LUCF)	100,0	97,9	97,9	99,2	99,7	102,1	103,2	106,7	111,7	116,2	115,6	121,2
DTI 2010	0,0	– 2,1	– 3,4	– 3,3	– 4,0	– 2,9	– 3,1	– 0,8	2,9	6,2	4,3	8,7
CO_2 (without LUCF)	100,0	100,0	99,9	101,7	101,8	103,7	103,9	106,9	112,3	117,9	116,9	123,0
CH_4 (without LUCF)	100,0	100,0	100,4	102,1	103,9	107,2	109,5	113,1	114,4	117,3	120,3	122,0
N_2O (without LUCF)	100,0	100,0	99,1	98,4	95,4	96,4	93,3	97,3	100,0	99,5	98,2	103,5
F-gases	100,0	34,6	39,5	33,6	51,9	66,7	100,0	115,5	126,3	123,3	124,2	128,3

Table A1.38 **Sectoral emission indicators (key sources) for Greece**

Source: Member State submission (CRF tables), EEA (2002a).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1.A.1. Energy industries (CO_2)	100	97	102	102	107	104	102	110	116	116	127
1.A.2. Manufacturing industries and construction (CO_2)	100	99	95	93	91	98	106	108	110	98	106
1.A.3. Transport (CO_2)	100	106	107	108	108	108	110	114	123	127	120
1.A.3. Transport (N_2O)	100	110	110	113	115	113	117	123	128	130	131
1.A.4. Other sectors (CO_2)	100	104	101	100	101	106	141	145	152	148	160
1.A.4. Other sectors (CH_4)	100	102	102	103	88	88	131	130	130	127	128
1.A.4. Other sectors (N_2O)	100	104	101	99	95	98	134	137	141	139	147
1.A.5. Other (CO_2)	0	0	0	0	0	0	0	0	0	0	0
1.B.1. Fugitive emissions from solid fuels (CH_4)	100	102	106	106	109	111	115	113	117	120	123
1.B.2. Fugitive emissions from oil and natural gas (CH_4)	100	100	87	67	47	42	47	94	312	497	708
2.A. Mineral products (CO_2)	100	100	101	104	101	106	109	109	108	109	109
2.B. Chemical industry (N_2O)	100	82	86	82	80	79	90	80	79	80	80
2.B. Chemical industry (HFC)	0	0	0	0	0	0	0	0	0	0	0
2.C. Metal production (CO_2)	100	102	102	99	92	87	87	89	98	107	109
2.C. Metal production (PFC)	100	100	98	59	36	32	28	64	79	51	58
2.E. Production of halocarbons and SF_6 (HFC)	100	118	97	172	229	348	401	424	400	400	400
2.F. Consumption of halocarbons and SF_6 (HFC)	0	0	0	100	208	371	543	749	988	1 319	1 717
4.A. Enteric fermentation (CH_4)	100	99	98	98	98	99	99	99	99	98	98
4.B. Manure management (CH_4)	100	98	98	98	98	97	97	97	96	95	95
4.B. Manure management (N_2O)	100	97	96	94	94	94	94	93	91	89	88
4.D. Agricultural soils (N_2O)	100	100	95	93	94	89	92	95	93	92	98
6.A. Solid waste disposal on land (CH_4)	100	102	108	114	122	128	134	140	149	160	170

Note: The list of key sources in this table is the one identified for the EC and differs from the one defined by the Member States for their UNFCCC reporting.

Table A1.39 **Main driving-force indicators for Greece**

Source: Eurostat, Member State inventory submission (CRF tables), EEA (2002a).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Population	100	101	102	102	103	103	103	103	104	104	:
GDP per capita	100	102	102	100	102	103	106	109	113	116	:
Energy intensity of GDP	100	98	100	99	102	102	105	102	104	100	:
Share of fossil fuels	100	99	100	100	100	100	99	99	100	100	:
Shift within fossil fuels (CO_2 intensity of fossil fuels)	100	100	99	101	99	97	95	99	99	99	:
GDP	100	103	104	102	104	106	109	113	117	121	126
Gross inland energy consumption	100	101	104	102	106	109	114	115	121	120	:
Heating degree days	:	:	:	:	:	100	107	108	101	92	96

Sectoral driving-force indicators (Eurostat) Table A1.40

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Final electricity consumption	100	103	108	110	115	120	125	130	138	144	:
Gross value added in industry	:	:	:	:	:	100	102	101	108	111	:
Volume passenger transport	100	102	104	110	115	121	126	132	139	150	:
Volume freight transport	100	110	109	119	118	136	146	152	156	163	:
Stock of permanently occupied dwellings	100	102	104	106	109	111	113	115	115	116	:

Source: Eurostat.

Sectoral driving-force indicators (CRF) Table A1.41

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Coal mining and handling	100	102	106	106	109	111	115	113	117	120	123
Cement production	100	100	101	104	100	105	108	108	108	108	108
Use of synthetic fertilisers	100	96	84	79	80	67	73	82	79	76	88
Use of animal manures	100	98	97	97	96	96	96	95	94	93	93
Cattle population	100	96	94	93	92	92	93	91	90	88	86
Waste disposal on land	100	101	106	110	115	120	124	128	134	139	145

Source: Member State inventory submission (CRF tables), EEA (2002a).

Data basis for the CO_2 intensity indicators Table A1.42

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Value added of iron and steel industry	100	70	63	62	51	91	74	150	129	:	:
Crude steel production	100	98	92	98	85	94	85	102	111	95	:
CO_2 emissions from iron and steel industry	100	15	82	79	75	46	24	28	47	60	:
Value added of glass, pottery & building mat. industry	100	66	109	105	105	101	114	198	193	:	:
CO_2 emissions from glass, pottery & building mat. industry	100	103	103	106	104	108	105	107	104	90	:
Value added of the chemical industry	100	83	70	75	77	70	75	99	99	:	:
CO_2 emissions from the chemical industry	100	63	60	68	66	64	104	121	137	85	:
All output of autoproducer thermal power stations	100	107	106	97	94	100	101	111	104	106	:
CO_2 emissions from autoproducer thermal power stations	100	106	123	119	135	92	80	94	81	24	:
Freight traffic on road	100	96	100	96	97	99	103	*104*	*106*	*107*	:
CO_2 emissions from diesel consumption of freight traffic	100	79	103	121	117	107	115	122	*138*	*147*	:
Value added of the services sector	:	:	:	:	:	100	102	108	111	115	:
CO_2 emissions from the services sector	100	565	534	509	528	567	683	665	656	651	:

Eurostat estimated data in italics.

Source: Eurostat.

Ireland

Ireland's greenhouse gas emissions increased for the seventh consecutive year. Emissions increased in the 1990s mainly in the energy industries and in transport. With a 39 % increase in CO_2 emissions between 1990 and 2000, Ireland clearly missed its target to limit emission growth to 20 %.

In base year:	53.4 Tg
In 2000:	66.3 Tg
Change base year–2000:	+ 12.8 Tg + 24.0 %
Share in total EU greenhouse gases:	1.6 %

Distance-to-target indicator (DTI)
Irish greenhouse gas emissions increased by 1.5 % in 2000, compared to 1999. In 2000, total greenhouse gas emissions were 66 Tg (CO_2 equivalents), which was 24 % above 1990 levels. In the burden-sharing agreement to the Kyoto Protocol, Ireland agreed to limit its greenhouse gas emission growth to a 13 % increase by 2008–12. Assuming a linear target path from 1990 to 2010, Irish greenhouse gas emissions were 17.5 index points above this target path in 2000 (Figure 63).

In 2000, Irish CO_2 emissions were 44 Tg, which was 39 % above 1990 levels. For CO_2, Ireland aimed at limiting emission growth to 20 % between 1990 and 2000. Figure 44 shows that this target has been clearly missed.

Greenhouse gas emissions by gas
The share of the CO_2 emissions increased in total Irish greenhouse gas emissions between 1990 and 2000, whereas the share of both CH_4 and N_2O decreased (Figure 64).

CO_2 emissions account for 66 % of total Irish greenhouse gas emissions, which is the lowest share of the EC MS. In 2000, CO_2 emissions increased by 5 %, compared to 1999. Between 1990 and 2000, emissions increased in all four main fuel combustion-related sectors (transport: + 104 %, energy industries: + 45 %; energy use in manufacturing industries: + 24 %, and small combustion: + 7 %) and in mineral products (+ 80 %). The increase in CO_2 emissions from transport was the largest in the EU. Ireland had dynamic economic growth rates in the 1990s and low starting points in terms of transport volumes and per capita emissions from transport.

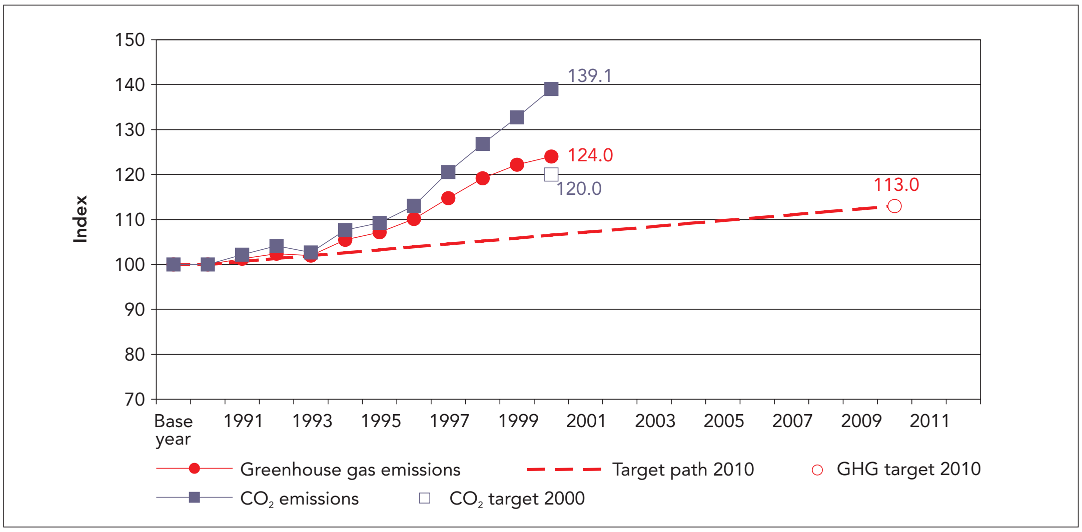
CH_4 emissions account for 19 % of total Irish greenhouse gas emissions, which is the highest share within the EU. This reflects the importance of agriculture for the Irish economy. In 2000, CH_4 emissions dropped by 4 % to 1990 levels. The main reasons for the CH_4 reduction in 2000 was a sharp decline in emissions from enteric fermentation (– 5 %) and — to a smaller extent — from manure management. Over the whole period 1990–2000, emission increases in agriculture were offset by emission reductions from landfills.

N_2O emissions are responsible for 15 % of total greenhouse gas emissions and increased by 6 % between 1990 and 2000. In 2000, emissions decreased by 5 %, compared to 1999. Agricultural soils are the most important source of N_2O; in 2000, emissions from agricultural soils decreased by 6 %, but were still 3 % above 1990 levels. Transport is a rapidly increasing source of N_2O emissions.

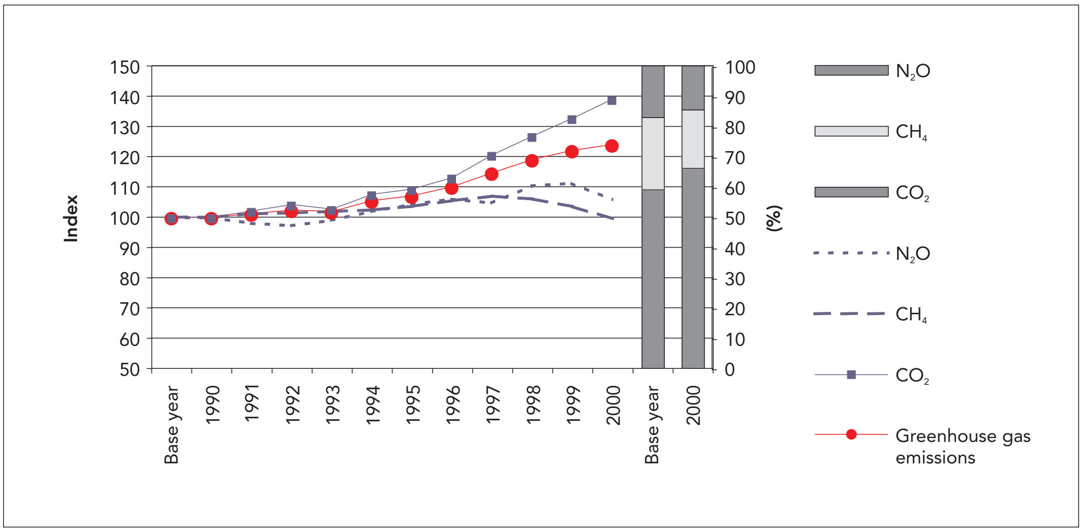
Fluorinated gas emissions were not reported by Ireland.

Main driving forces of CO_2 emissions from fossil fuels
CO_2 emissions from fossil-fuel combustion account for 62 % of total Irish greenhouse gas emissions. They increased by 34 % between 1990 and 1999. Figure 65 shows that the increase in GDP per capita and population growth are the main drivers of CO_2 emissions, whereas decreasing energy intensity of GDP partly offset emission increases. CO_2 emissions increased in the late 1990s more rapidly than at the beginning of the decade. This was due to a stronger economic growth. The share of fossil fuels stayed constant.

Irish greenhouse gas emissions compared with targets for 2000 and 2008–12 (excl. LUCF) Figure 63



Irish greenhouse gas emissions by gas (excluding LUCF) Figure 64



Note: The left side of the figure shows the trend in GHG emissions as an index (base year = 100); the right side of the figure shows the percentage contribution of the main GHG to the total emissions in the base year and 2000.

Change of Irish CO_2 emissions from fossil-fuel combustion and the influence of main driving forces (population, GDP per capita, energy intensity of GDP, share of fossil fuels, shift within fossil fuels) in the 1990s Figure 65

Source: Eurostat, Member State submission (CRF tables), EEA (2002a).

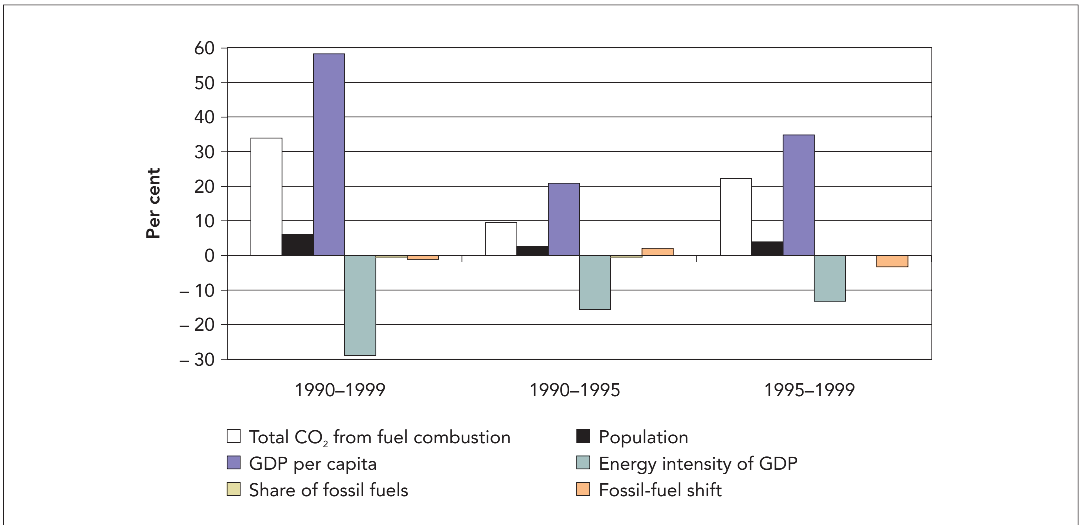


Table A1.43 **Greenhouse gases and distance-to-target indicators for Ireland**

Source: Member State submission (CRF tables), EEA (2002a).

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Greenhouse gas emissions (without LUCF)	100,0	100,0	101,2	102,4	101,9	105,5	107,1	110,1	114,7	119,1	122,2	124,0
DTI 2010	0,0	0,0	0,6	1,1	0,0	2,9	3,9	6,2	10,2	13,9	16,3	17,5
CO_2 (without LUCF)	100,0	100,0	102,1	104,2	102,7	107,6	109,3	113,1	120,6	126,8	132,7	139,1
CH_4 (without LUCF)	100,0	100,0	101,2	101,5	102,0	102,5	103,7	105,6	107,1	106,2	103,7	99,7
N_2O (without LUCF)	100,0	100,0	98,2	97,5	99,3	102,3	104,6	106,3	105,1	110,8	111,6	106,3
F-gases	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE

Table A1.44 **Sectoral emission indicators (key sources) for Ireland**

Source: Member State submission (CRF tables), EEA (2002a).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1.A.1. Energy industries (CO_2)	100	104	111	111	115	120	126	132	136	142	145
1.A.2. Manufacturing industries and construction (CO_2)	100	100	94	94	97	92	92	104	102	111	124
1.A.3. Transport (CO_2)	100	105	113	113	117	127	142	155	177	196	204
1.A.3. Transport (N_2O)	100	107	118	157	189	196	246	296	364	450	430
1.A.4. Other sectors (CO_2)	100	99	97	93	98	96	93	97	103	102	107
1.A.4. Other sectors (CH_4)	100	93	82	72	63	58	53	66	66	55	59
1.A.4. Other sectors (N_2O)	100	102	98	93	97	94	94	98	104	108	114
1.A.5. Other (CO_2)	0	0	0	0	0	0	0	0	0	0	0
1.B.1. Fugitive emissions from solid fuels (CH_4)	0	0	0	0	0	0	0	0	0	0	0
1.B.2. Fugitive emissions from oil and natural gas (CH_4)	100	96	92	87	83	80	78	76	67	71	69
2.A. Mineral products (CO_2)	100	98	102	99	115	113	115	126	127	136	180
2.B. Chemical industry (N_2O)	100	78	78	78	78	78	78	78	78	78	78
2.B. Chemical industry (HFC)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.C. Metal production (CO_2)	0	0	0	0	0	0	0	0	0	0	0
2.C. Metal production (PFC)	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
2.E. Production of halocarbons and SF_6 (HFC)	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
2.F. Consumption of halocarbons and SF_6 (HFC)	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
4.A. Enteric fermentation (CH_4)	100	101	101	102	102	103	105	108	109	107	102
4.B. Manure management (CH_4)	100	101	103	104	105	107	110	113	114	112	108
4.B. Manure management (N_2O)	100	101	102	103	104	106	109	112	113	111	105
4.D. Agricultural soils (N_2O)	100	100	99	101	104	107	108	105	111	110	103
6.A. Solid waste disposal on land (CH_4)	100	102	104	105	106	107	108	103	90	85	87

Note: The list of key sources in this table is the one identified for the EC and differs from the one defined by the Member States for their UNFCCC reporting.

Table A1.45 **Main driving-force indicators for Ireland**

Source: Eurostat, Member State inventory submission (CRF tables), EEA (2002a).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Population	100	101	101	102	102	103	103	104	106	107	:
GDP per capita	100	101	104	106	112	122	131	144	154	169	:
Energy intensity of GDP	100	98	94	93	93	85	84	80	78	75	:
Share of fossil fuels	100	100	100	100	99	100	100	100	100	100	:
Shift within fossil fuels (CO_2 intensity of fossil fuels)	100	102	105	103	101	102	100	101	101	99	:
GDP	100	102	105	108	114	126	136	150	163	181	202
Gross inland energy consumption	100	100	99	100	107	108	114	119	127	136	:
Heating degree days	:	:	:	:	:	100	109	95	98	99	104

Sectoral driving-force indicators (Eurostat) Table A1.46

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Final electricity consumption	100	105	111	114	119	125	134	141	149	158	:
Gross value added in industry	:	:	:	:	:	:	:	:	:	:	:
Volume passenger transport	100	106	109	114	120	128	139	150	157	171	:
Volume freight transport	100	100	100	99	102	105	107	107	115	119	:
Stock of permanently occupied dwellings	100	101	103	105	107	109	111	113	115	117	:

Source: Eurostat.

Sectoral driving-force indicators (CRF) Table A1.47

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Coal mining and handling	:	:	:	:	:	:	:	:	:	0	0
Cement production	:	:	:	:	:	:	:	:	:	100	140
Use of synthetic fertilisers	:	:	:	:	:	:	:	:	:	100	92
Use of animal manures	:	:	:	:	:	:	:	:	:	100	95
Cattle population	:	:	:	:	:	:	:	:	:	100	95
Waste disposal on land	:	:	:	:	:	:	:	:	:	100	101

Source: Member State inventory submission (CRF tables), EEA (2002a).

Data basis for the CO_2 intensity indicators Table A1.48

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Value added of iron and steel industry	:	:	:	:	:	:	:	:	:	:	:
Crude steel production	100	90	79	100	87	95	104	103	110	103	:
CO_2 emissions from iron and steel industry	100	102	94	81	52	38	24	32	33	33	:
Value added of glass, pottery & building mat. industry	100	98	89	99	112	113	124	150	154	182	:
CO_2 emissions from glass, pottery & building mat. industry	100	93	56	73	45	54	65	50	52	44	:
Value added of the chemical industry	100	110	142	168	184	188	218	331	437	543	:
CO_2 emissions from the chemical industry	100	100	97	80	91	94	77	120	128	138	:
All output of autoproducer thermal power stations	100	95	100	105	115	121	136	179	236	181	:
CO_2 emissions from autoproducer thermal power stations	100	84	90	148	175	187	119	106	142	138	:
Freight traffic on road	100	100	100	99	102	107	111	111	115	137	:
CO_2 emissions from diesel consumption of freight traffic	100	79	103	121	117	107	115	122	138	147	:
Value added of the services sector	:	:	:	:	:	:	:	:	:	:	:
CO_2 emissions from the services sector	100	104	106	118	128	143	126	138	131	139	:

Source: Eurostat.

Italy

After stable greenhouse gas emissions up to the mid-1990s, Italian greenhouse gases have been growing in the recent years. This way Italy surpassed France and has become the third largest emitter of greenhouse gas in the EU. Italy did not meet its CO_2 stabilisation target for 2000.

In base year:	522.9 Tg
In 2000:	543.5 Tg
Change base year–2000:	+ 20.6 Tg + 3.9 %
Share in total EU greenhouse gases:	13.4 %

Distance-to-target indicator (DTI)
Italian greenhouse gas emissions increased by in 2000, compared to 1999. Total greenhouse gas emissions were 543 Tg (CO_2 equivalents), which was 3.9 % above the base-year level (1995 for fluorinated gases). In the burden-sharing agreement to the Kyoto Protocol, Italy agreed to a 6.5 % reduction of greenhouse gas emissions by 2008–12. Assuming a linear target path from 1990 to 2010, Italian greenhouse gas emissions were 7.2 index points above this target path in 2000 (Figure 66).

CO_2 emissions were 462 Tg in 2000, which was 4.7 % above 1990 levels. Therefore, Italy did not meet its target, to stabilise CO_2 emissions at 1990 levels by 2000.

Greenhouse gas emissions by gas
The share of the CO_2 in total Italian greenhouse gas emissions increased in the last decade. CH_4 emissions lost importance whereas the share of N_2O in greenhouse gas emissions remained stable (Figure 67).

CO_2 emissions account for 85 % of total Italian greenhouse gas emissions. In 2000, CO_2 emissions increased slightly, compared to 1999, and were 5 % above the 1990 levels. In the period 1990 to 2000, Italy reported large emission increases from transport (+ 19 %) and energy industries (6 %), but emissions decreases from energy use in manufacturing industries (– 5 %).

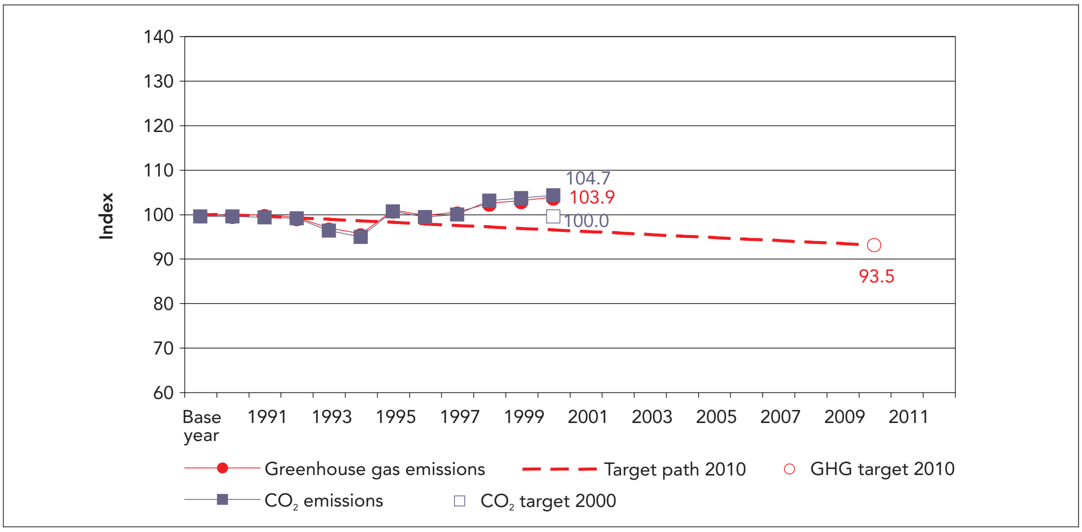
CH_4 emissions account for 7 % of total Italian greenhouse gas emissions and decreased by 4 % between 1990 and 2000. In 2000, emissions remained stable compared to 1999. The main reasons for declining CH_4 emissions during the past decade were emission reductions from oil and gas and from enteric fermentation.

N_2O emissions are responsible for 8 % of total greenhouse gas emissions and increased by 2 % between 1990 and 2000. In 2000, emissions increased by 2 % compared to 1999. The main reasons for increasing N_2O emissions between 1990 and 2000 were emission from transport and chemical industry.

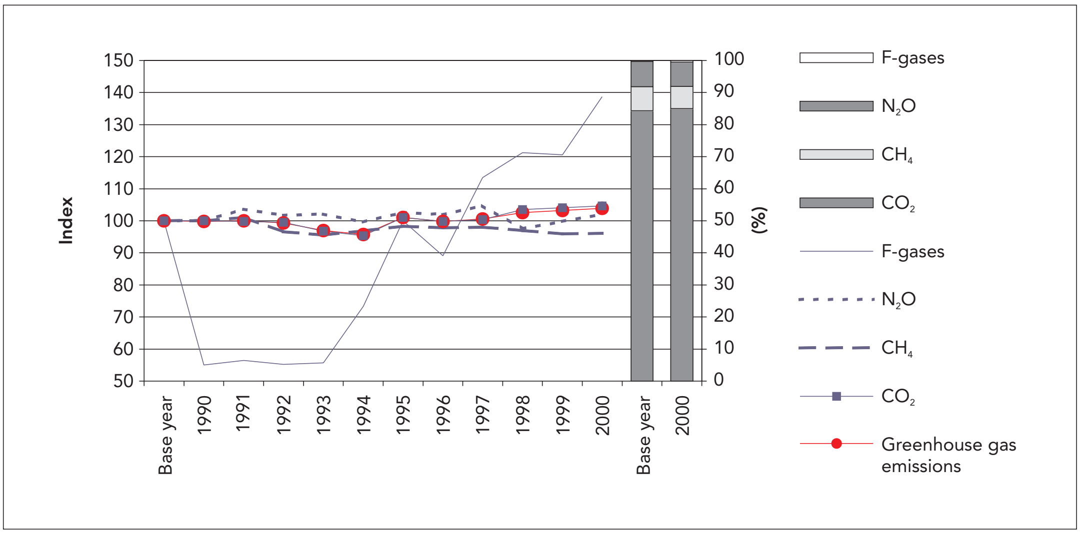
Fluorinated gas emissions account for less than 1 % of total greenhouse gas emissions. The main source of fluorinated gas emissions in Italy is consumption of the halocarbons and SF_6. HFC emissions increased by a factor of 5 between 1990 and 2000. In 2000, they grew by 15 % compared to 1999.

Main driving forces of CO_2 emissions from fossil fuels
CO_2 emissions from fossil-fuel combustion account for 80 % of total Italian greenhouse gas emissions. They increased by 5 % between 1990 and 1999. Figure 68 shows that the increase in GDP per capita and population growth are main drivers of CO_2 emissions, whereas decreasing share of fossil fuels and fuel switch to lower carbon fuels partly offset emission increases. Energy intensity of GDP did not improve over the whole period. CO_2 emissions increased in both halves of the 1990s by about the same amount. A shift towards lower carbon fuels within fossil fuels took place in both parts of the 1990s, whereas the share of non-carbon energies mainly increased in the second half of the decade.

Italian greenhouse gas emissions compared with targets for 2000 and 2008–12 (excl. LUCF) Figure 66

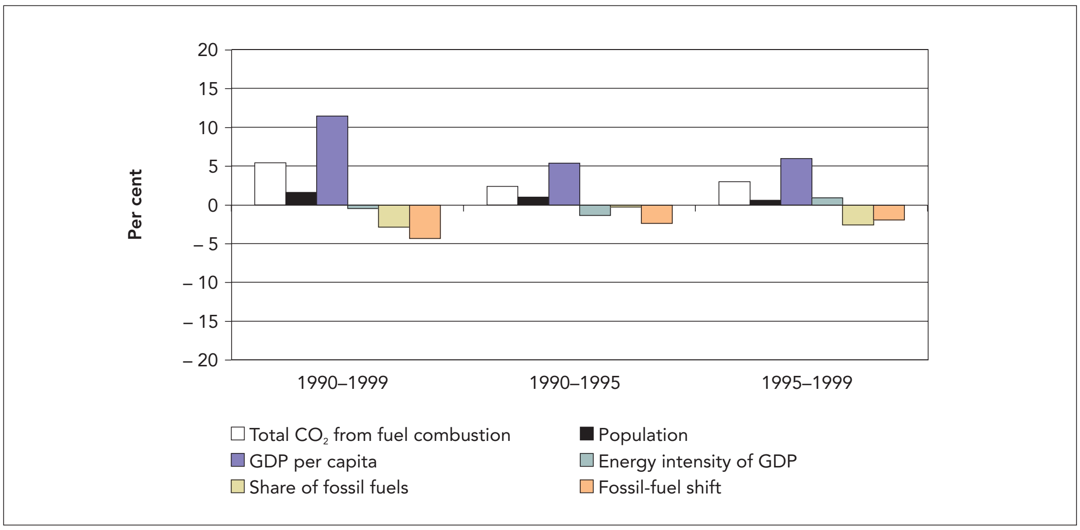


Italian greenhouse gas emissions by gas (excluding LUCF) Figure 67



Note: The left side of the figure shows the trend in GHG emissions as an index (base year = 100); the right side of the figure shows the percentage contribution of the main GHG to the total emissions in the base year and 2000.

Change of Italian CO_2 emissions from fossil-fuel combustion and the influence of main driving forces (population, GDP per capita, energy intensity of GDP, share of fossil fuels, shift within fossil fuels) in the 1990s Figure 68



Source: Eurostat, Member State submission (CRF tables), EEA (2002a).

Table A1.49 **Greenhouse gases and distance-to-target indicators for Italy**

Source: Member State submission (CRF tables), EEA (2002a).

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Greenhouse gas emissions (without LUCF)	100,0	99,9	100,0	99,4	97,0	95,7	101,0	99,8	100,6	102,6	103,2	103,9
DTI 2010	0,0	– 0,1	0,4	0,0	– 2,1	– 3,0	2,6	1,7	2,8	5,2	6,1	7,2
CO_2 (without LUCF)	100,0	100,0	99,8	99,6	96,8	95,3	101,1	99,8	100,4	103,5	104,1	104,7
CH_4 (without LUCF)	100,0	100,0	101,0	96,5	95,5	96,8	98,3	97,8	98,0	97,0	96,0	96,0
N_2O (without LUCF)	100,0	100,0	103,6	101,7	102,1	99,6	102,7	101,9	104,7	97,5	99,8	102,0
F-gases	100,0	55,1	56,4	55,2	55,7	73,3	100,0	89,1	113,5	121,2	120,6	138,7

Table A1.50 **Sectoral emission indicators (key sources) for Italy**

Source: Member State submission (CRF tables), EEA (2002a).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1.A.1. Energy industries (CO_2)	100	96	96	89	90	98	94	93	106	103	106
1.A.2. Manufacturing industries and construction (CO_2)	100	97	95	95	97	103	101	106	90	93	95
1.A.3. Transport (CO_2)	100	103	107	108	108	110	111	113	118	119	119
1.A.3. Transport (N_2O)	100	101	104	108	116	126	136	146	165	179	195
1.A.4. Other sectors (CO_2)	100	107	101	101	90	99	101	98	102	107	100
1.A.4. Other sectors (CH_4)	100	111	119	115	123	127	125	135	134	151	149
1.A.4. Other sectors (N_2O)	100	101	96	96	85	92	93	90	65	69	47
1.A.5. Other (CO_2)	100	115	115	128	134	135	114	109	93	104	74
1.B.1. Fugitive emissions from solid fuels (CH_4)	100	98	82	72	64	58	55	54	50	48	46
1.B.2. Fugitive emissions from oil and natural gas (CH_4)	100	98	95	92	90	86	85	84	84	83	83
2.A. Mineral products (CO_2)	100	100	101	86	84	86	84	84	87	90	94
2.B. Chemical industry (N_2O)	100	106	98	98	92	106	102	103	105	108	116
2.B. Chemical industry (HFC)	:	:	:	:	:	:	:	:	:	:	0
2.C. Metal production (CO_2)	100	93	83	85	85	92	92	92	90	82	88
2.C. Metal production (PFC)	:	:	:	:	:	:	:	:	:	:	100
2.E. Production of halocarbons and SF_6 (HFC)	:	:	:	:	:	:	:	:	:	:	100
2.F. Consumption of halocarbons and SF_6 (HFC)	:	:	:	:	:	:	:	:	:	:	100
4.A. Enteric fermentation (CH_4)	100	102	97	96	97	98	97	97	95	93	94
4.B. Manure management (CH_4)	100	100	97	96	94	97	97	99	99	98	98
4.B. Manure management (N_2O)	100	104	100	97	100	103	104	104	104	103	100
4.D. Agricultural soils (N_2O)	100	104	105	106	105	102	101	106	102	102	101
6.A. Solid waste disposal on land (CH_4)	100	102	92	92	96	100	101	102	100	98	99

Note: The list of key sources in this table is the one identified for the EC and differs from the one defined by the Member States for their UNFCCC reporting.

Table A1.51 **Main driving-force indicators for Italy**

Source: Eurostat, Member State inventory submission (CRF tables), EEA (2002a).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Population	100	100	100	101	101	101	101	101	102	102	:
GDP per capita	100	101	102	101	103	105	106	108	110	112	:
Energy intensity of GDP	100	100	100	100	96	99	97	99	100	100	:
Share of fossil fuels	100	99	99	99	99	100	99	97	97	97	:
Shift within fossil fuels (CO_2 intensity of fossil fuels)	100	99	98	98	98	98	97	96	97	96	:
GDP	100	101	102	101	103	107	108	110	112	114	117
Gross inland energy consumption	100	101	103	101	100	105	105	109	111	113	:
Heating degree days	:	:	:	:	:	100	100	93	98	97	87

Sectoral driving-force indicators (Eurostat) Table A1.52

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Final electricity consumption	100	102	104	105	108	111	112	116	119	122	:
Gross value added in industry	100	100	101	97	101	105	104	106	108	108	:
Volume passenger transport	100	103	115	115	115	118	120	122	123	127	:
Volume freight transport	100	103	104	101	105	109	111	116	124	131	:
Stock of permanently occupied dwellings	100	101	101	102	103	104	106	107	109	110	:

Source: Eurostat.

Sectoral driving-force indicators (CRF) Table A1.53

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Coal mining and handling	:	:	:	:	:	:	:	:	100	79	546
Cement production	:	:	:	:	:	:	:	:	100	104	108
Use of synthetic fertilisers	:	:	:	:	:	:	:	:	100	100	94
Use of animal manures	:	:	:	:	:	:	:	:	100	103	98
Cattle population	:	:	:	:	:	:	:	:	:	100	97
Waste disposal on land	:	:	:	:	:	:	:	:	100	104	105

Source: Member State inventory submission (CRF tables), EEA (2002a).

Data basis for the CO_2 intensity indicators Table A1.54

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Value added of iron and steel industry	100	97	88	64	89	102	90	98	91	:	:
Crude steel production	100	99	98	101	102	109	95	101	101	97	:
CO_2 emissions from iron and steel industry	100	98	99	97	101	104	92	98	92	84	:
Value added of glass, pottery & building mat. industry	100	98	98	80	79	74	79	76	78	:	:
CO_2 emissions from glass, pottery & building mat. industry	100	98	96	87	85	85	84	86	70	101	:
Value added of the chemical industry	100	980	100	91	92	88	99	91	91	:	:
CO_2 emissions from the chemical industry	100	95	89	90	84	93	87	87	54	71	:
All output of autoproducer thermal power stations	100	108	118	132	148	162	176	221	243	266	:
CO_2 emissions from autoproducer thermal power stations	100	113	114	130	136	152	164	198	220	239	:
Freight traffic on road	100	103	104	101	105	98	99	97	108	114	:
CO_2 emissions from diesel consumption of freight traffic	100	79	103	121	117	107	115	122	138	147	:
Value added of the services sector	100	101	102	103	105	107	109	111	113	115	:
CO_2 emissions from the services sector	100	491	520	505	496	494	452	477	125	243	:

Source: Eurostat.

Luxembourg

Between 1994 and 1998, Luxembourg achieved large cuts in emissions from energy use in manufacturing industries and from energy industries. Luxembourg clearly achieved its CO_2 target for 2000.

In base year:	10.8 Tg
In 2000:	5.9 Tg
Change base year–2000:	– 4.9 Tg – 45.1 %
Share in total EU greenhouse gases:	0.1 %

Distance-to-target indicator (DTI)
Luxembourg's greenhouse gas emissions increased in 2000, compared to 1999, but were still far below 1990 levels. In 2000, total greenhouse gas emissions were 5.9 Tg (CO_2 equivalents), which was 45 % below 1990 levels. In the burden-sharing agreement to the Kyoto Protocol, Luxembourg agreed to reduce its greenhouse gas emissions by 28 % by 2008–12, from base-year levels. Assuming a linear target path from 1990 to 2010, Luxembourg's greenhouse gas emissions were 31.1 index points below this target path in 2000 (Figure 69).

In 1999, CO_2 emissions were 5.4 Tg, which was 46.8 % below 1990 levels. Therefore, Luxembourg clearly met its CO_2 stabilisation target for 2000.

Greenhouse gas emissions by gas
The share of the CO_2 emissions in total greenhouse gas emissions of Luxembourg decreased between 1990 and 2000, whereas the relative importance of CH_4 increased (Figure 70).

CO_2 emissions account for 91 % of Luxembourg's total greenhouse gas emissions. In 2000, CO_2 emissions decreased slightly, compared to 1999, and were 47 % below the 1990 levels. In the period 1990 to 2000, large emission reductions were achieved from energy industry (– 80 %) and industry (energy use in manufacturing industries: – 67 %; process-related emissions from metal production: – 85 %), whereas the emissions from transport increased by 67 %.

The main reasons for the decline of Luxembourg's CO_2 emissions from energy industries were reductions in thermal power production and increases in electricity imports and hydropower production. The main reason for large emission cuts in industry was a sharp decrease in coke consumption after the conversion of the steel industry to electric arc furnaces.

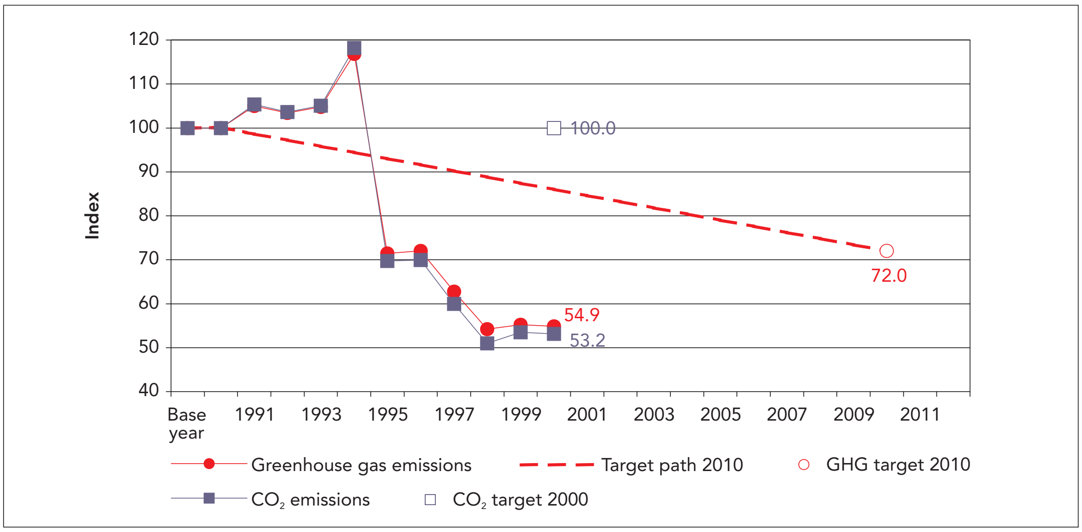
CH_4 emissions account for 8 % of Luxembourg's total greenhouse gas emissions and decreased by 4 % between 1990 and 2000. Also, in 2000, emissions dropped compared to 1999. The main reasons for declining CH_4 emissions during the past decade were reductions from enteric fermentation and from landfills. Fugitive emissions from oil and gas use increased.

N_2O emissions are responsible for 1 % of total greenhouse gas emissions. This share seems to underestimate the importance of N_2O emissions: the time series of emissions from agricultural soils, which is by far the largest source of N_2O, seems to be inconsistent (with a sudden drop in 1999).

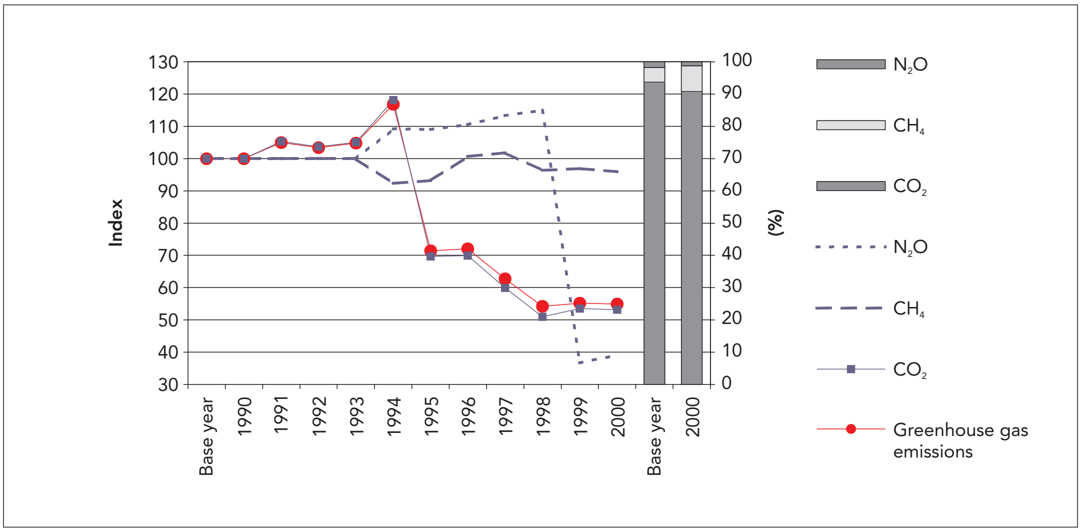
Data on fluorinated gas emissions were not reported by Luxembourg.

Main driving forces of CO_2 emissions from fossil fuels
CO_2 emissions from fossil-fuel combustion account for 79 % of Luxembourg's total greenhouse gas emissions. They decreased by 45 % between 1990 and 1999. Figure 71 shows that the decreases in energy intensity of GDP and shifts towards the use lower carbon fuels overcompensated growth in population and in GDP per capita. Also, the share of fossil fuels decreased and contributed to CO_2 emission reductions. CO_2 emissions decreased in both halves of the 1990s. The decrease in energy intensity of GDP was more important in the first half of the decade, whereas the shift towards lower carbon fossil fuels was the most important factor in the late 1990s.

Luxembourg's greenhouse gas emissions compared with targets for 2000 and 2008–12 (excl. LUCF) Figure 69

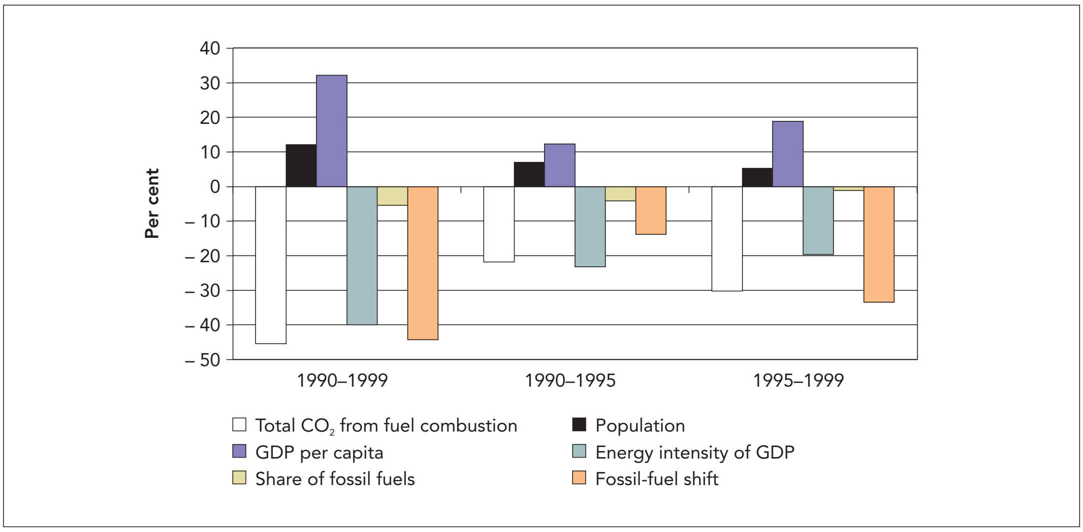


Luxembourg's greenhouse gas emissions by gas (excluding LUCF) Figure 70



Note: The left side of the figure shows the trend in GHG emissions as an index (base year = 100); the right side of the figure shows the percentage contribution of the main GHG to the total emissions in the base year and 2000.

Change of Luxembourg's CO_2 emissions from fossil-fuel combustion and the influence of main driving forces (population, GDP per capita, energy intensity of GDP, share of fossil fuels, shift within fossil fuels) in the 1990s Figure 71



Source: Eurostat, Member State submission (CRF tables), EEA (2002a).

Table A1.55 **Greenhouse gases and distance-to-target indicators for Luxembourg**

Source: Member State submission.

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Greenhouse gas emissions (without LUCF)	100,0	100,0	105,0	103,4	104,8	116,8	71,5	72,0	62,8	54,2	55,2	54,9
DTI 2010	0,0	0,0	6,4	6,2	9,0	22,4	– 21,5	– 19,6	– 27,4	– 34,6	– 32,2	– 31,1
CO_2 (without LUCF)	100,0	100,0	105,3	103,6	105,1	118,2	69,7	69,9	59,9	51,0	53,5	53,2
CH_4 (without LUCF)	100,0	100,0	100,0	100,0	100,0	92,4	93,2	100,7	101,9	96,3	96,9	96,0
N_2O (without LUCF)	100,0	100,0	100,0	100,0	100,0	109,2	109,0	110,5	113,3	115,0	36,7	39,1
F-gases	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE

Table A1.56 **Sectoral emission indicators (key sources) for Luxembourg**

Source: Member State submission.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1.A.1. Energy industries (CO_2)	100	106	104	106	83	64	58	32	5	8	20
1.A.2. Manufacturing industries and construction (CO_2)	100	106	104	106	104	66	65	45	32	34	33
1.A.3. Transport (CO_2)	100	106	104	106	424	136	143	142	146	154	167
1.A.3. Transport (N_2O)	100	100	100	100	243	268	275	325	350	350	411
1.A.4. Other sectors (CO_2)	100	106	104	106	101	97	108	111	129	119	99
1.A.4. Other sectors (CH_4)	100	100	100	100	90	83	85	84	84	81	74
1.A.4. Other sectors (N_2O)	100	100	100	100	95	95	110	100	100	100	93
1.A.5. Other (CO_2)	0	0	0	0	:	100	96	0	0	0	0
1.B.1. Fugitive emissions from solid fuels (CH_4)	0	0	0	0	0	0	0	0	0	0	0
1.B.2. Fugitive emissions from oil and natural gas (CH_4)	100	100	100	100	117	134	142	146	147	157	161
2.A. Mineral products (CO_2)	100	100	100	100	IE	-	-	62	62	89	94
2.B. Chemical industry (N_2O)	0	0	0	0	0	0	0	0	0	0	0
2.B. Chemical industry (HFC)	:	:	:	:	:	:	:	:	:	:	:
2.C. Metal production (CO_2)	100	100	100	100	IE	31	27	31	16	17	15
2.C. Metal production (PFC)	:	:	:	:	:	:	:	:	:	:	:
2.E. Production of halocarbons and SF_6 (HFC)	:	:	:	:	:	:	:	:	:	:	:
2.F. Consumption of halocarbons and SF_6 (HFC)	:	:	:	:	:	:	:	:	:	:	:
4.A. Enteric fermentation (CH_4)	100	100	100	100	96	96	100	100	96	96	95
4.B. Manure management (CH_4)	100	100	100	100	94	94	97	97	94	95	93
4.B. Manure management (N_2O)	0	0	0	0	0	0	0	0	0	0	0
4.D. Agricultural soils (N_2O)	100	100	100	100	101	101	102	102	102	0	0
6.A. Solid waste disposal on land (CH_4)	100	100	100	100	73	73	107	107	87	87	87

Note: The list of key sources in this table is the one identified for the EC and differs from the one defined by the Member States for their UNFCCC reporting.

Table A1.57 **Main driving-force indicators for Luxembourg**

Source: Eurostat, Member State inventory submission (CRF tables), EEA (2002a).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Population	100	101	103	104	106	107	109	110	112	113	:
GDP per capita	100	103	106	108	111	113	115	124	129	135	:
Energy intensity of GDP	100	102	98	96	90	78	76	69	64	63	:
Share of fossil fuels	100	100	101	101	99	96	97	96	94	95	:
Shift within fossil fuels (CO_2 intensity of fossil fuels)	100	100	97	97	127	87	85	69	61	59	:
GDP	*100*	*105*	*108*	*113*	*117*	121	125	137	145	153	165
Gross inland energy consumption	100	106	107	108	106	94	96	94	92	97	:
Heating degree days	:	:	:	:	:	100	116	99	99	93	87

Eurostat estimated data in italics.

Sectoral driving-force indicators (Eurostat) Table A1.58

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Final electricity consumption	100	102	103	107	113	121	119	124	128	134	:
Gross value added in industry	:	:	:	:	:	100	103	108	111	118	:
Volume passenger transport	100	104	108	113	115	118	120	123	125	125	:
Volume freight transport	100	31	129	141	135	147	148	149	164	180	:
Stock of permanently occupied dwellings	100	100	100	100	100	100	100	100	100	100	:

Source: Eurostat.

Sectoral driving-force indicators (CRF) Table A1.59

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Coal mining and handling	:	:	:	:	:	:	:	:	:	:	:
Cement production	:	:	:	:	:	:	:	:	:	:	:
Use of synthetic fertilisers	:	:	:	:	:	:	:	:	:	:	:
Use of animal manures	:	:	:	:	:	:	:	:	:	:	:
Cattle population	:	:	:	:	:	:	:	:	:	:	:
Waste disposal on land	:	:	:	:	:	:	:	:	:	:	:

Source: Member State inventory submission (CRF tables), EEA 2002a.

Data basis for the CO_2 intensity indicators Table A1.60

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Value added of iron and steel industry	100	85	78	81	83	83	82	86	:	:	:
Crude steel production	100	95	86	93	86	73	70	72	70	73	:
CO_2 emissions from iron and steel industry	100	96	86	90	77	44	41	27	10	13	:
Value added of glass, pottery & building mat. industry	100	104	90	95	109	114	121	130	:	:	:
CO_2 emissions from glass, pottery & building mat. industry	100	78	94	78	105	83	92	81	75	77	:
Value added of the chemical industry	100	120	180	201	193	148	225	234	:	:	:
CO_2 emissions from the chemical industry	100	137	100	111	105	61	74	21	21	18	:
All output of autoproducer thermal power stations	100	104	100	101	84	68	70	78	86	86	:
CO_2 emissions from autoproducer thermal power stations	100	103	103	104	86	53	47	33	13	14	:
Freight traffic on road	:	:	:	:	:	:	:	:	:	:	:
CO_2 emissions from diesel consumption of freight traffic	100	79	103	121	117	107	115	122	138	147	:
Value added of the services sector	:	:	:	:	:	100	103	112	120	125	:
CO_2 emissions from the services sector	100	94	323	98	137	74	106	91	1.153	1.009	:

Source: Eurostat.

Netherlands

In the Netherlands greenhouse gas emissions declined in 1999 and 2000. Important factors for this decrease were HFC-reduction measures in the manufacturing of HCFC-22, higher electricity imports and warmer weather. The Netherlands did not meet its CO_2 reduction target for 2000.

In base year:	211.5 Tg
In 2000:	216.9 Tg
Change base year–2000:	+ 5.4 Tg
	+ 2.6 %
Share in total EU greenhouse gases:	5.3 %

Distance-to-target indicator (DTI)
Dutch greenhouse gas emissions slightly declined in 2000, compared to 1999, but were still above the base-year level (1995 for fluorinated gases). In 2000, total greenhouse gas emissions were 217 Tg (CO_2 equivalents), which was 2.6 % above the base-year level. In the burden-sharing agreement to the Kyoto Protocol, the Netherlands agreed to reduce its greenhouse gas emissions by 6 % by 2008–12. Assuming a linear target path from 1990 to 2010, Dutch greenhouse gas emissions were 5.6 index points above this target path in 2000 (Figure 72).

CO_2 emissions were 174 Tg in 2000, which was 8.7 % above 1990 levels. For CO_2, the Netherlands set a 3 % reduction target, which has been clearly missed ([2]).

Greenhouse gas emissions by gas
The share of CO_2 emissions in total Dutch greenhouse gas emissions increased between the base year and 2000, whereas the share of CH_4 and fluorinated gas emissions reduced. The importance of N_2O was stable in the past decade (Figure 73).

CO_2 emissions account for 80 % of total Dutch greenhouse gas emissions. In 2000, CO_2 emissions increased slightly, compared to 1999, and were 9 % above the 1990 levels. Between 1990 and 2000, emissions increased from energy industry (+ 15 %), transport (+ 21 %) and energy use in manufacturing industries (+ 3 %), while emissions from small combustion decreased by 5 %. The increase in energy use from manufacturing industries between 1990 and 2000 is dominated by the chemical industry and is mainly due to increases of actual CO_2 emissions from feedstock use of energy carriers. The combustion emissions, also of other industrial sectors, remained fairly constant in this period (Olivier et al., 2002).

CH_4 emissions account for 10 % of total Dutch greenhouse gas emissions and decreased by 24 % between 1990 and 2000. Also, in 2000, emissions dropped by 5 %, compared to 1999. The main reasons for declining CH_4 emissions during the past decade were emission reductions from landfills (– 28 %) and from enteric fermentation (– 21 %). Also, fugitive emissions from oil and gas decreased by 27 %. The decrease of CH_4 from landfills is due to the threefold increase of the amount of CH_4 recovered from about 5 % in 1990 to 18 % in 2000, but also due to the decrease of the amount of methane produced in solid waste disposal sites. Since 1990, the amounts of waste as well as the concentration of C have decreased, and thus the quantity of CH_4 produced has decreased too (Olivier et al., 2002).

N_2O emissions are responsible for 8 % of total greenhouse gas emissions and increased by 3 % between 1990 and 2000. In 2000, emissions decreased by 2 %, compared to 1999. The main reasons for increasing N_2O emissions were transport and emission increases from agricultural soils (+ 11 %) and transport (+ 65 %) were not offset by emission reductions from chemical industries (– 6 %). The increase in emissions from agricultural soils is mainly due to a change in manure management: due to the policy of reducing ammonia emissions, manure is now incorporated into the soil instead of being spread on the surface of the soil. As a negative side effect, this management technique increases N_2O emissions (Olivier et al., 2002).

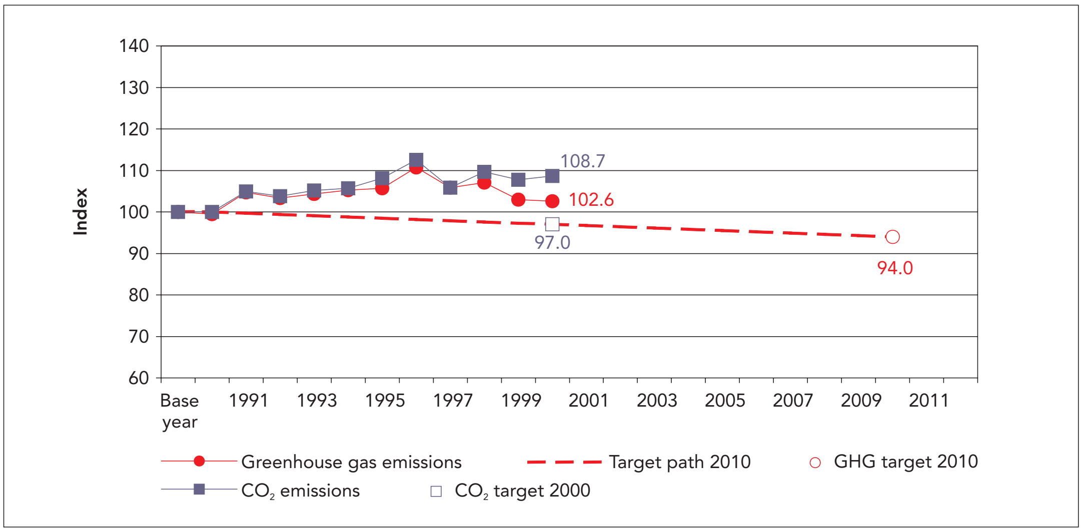
(2) The reduction target is for temperature-adjusted emissions, so temperature adjusted data should be compared with the target. However, due to the large difference between non-adjusted data and the target, it seems to be very unlikely that the Netherlands achieved its target with adjusted data.

Fluorinated gas emissions account for 3 % of total greenhouse gas emissions. The main sources of fluorinated gas emissions in Netherlands is HFCs from the production of halocarbons and SF_6, but emissions from this source dropped considerably between 1998 and 2000: HFC-23 emissions from the manufacture of HCFC-22 decreased by more than 5 Tg because a thermal afterburner was installed (Olivier et al., 2002). HFC emissions from consumption of halocarbons and SF_6 are growing in importance. In 2000, total HFC emissions decreased by 19 %, compared to 1999, and were 12 % below 1990 levels.

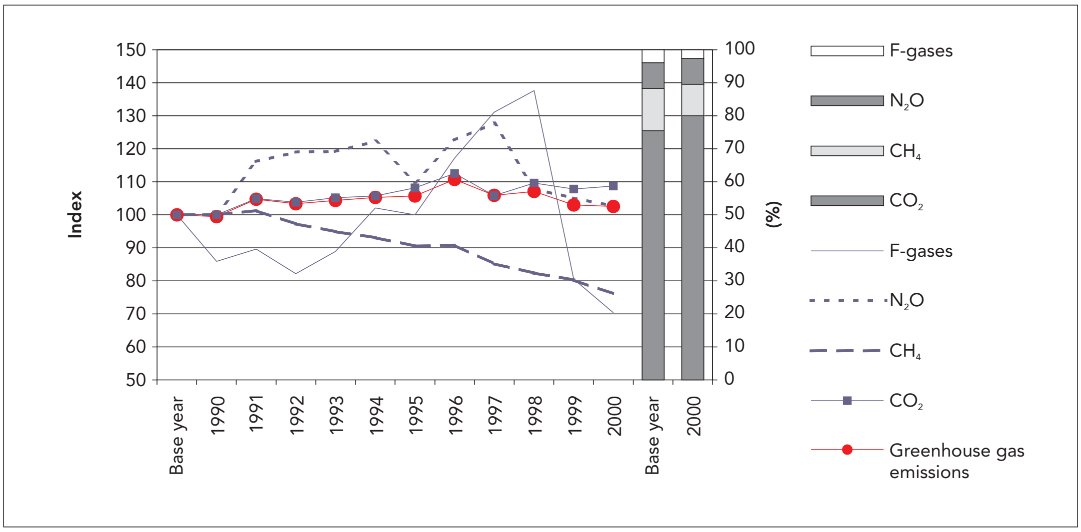
Main driving forces of CO_2 emissions from fossil fuels

CO_2 emissions from fossil-fuel combustion account for 78 % of total Dutch greenhouse gas emissions. They increased by 7 % between 1990 and 1999. Figure 74 shows that the increase in GDP per capita and population growth are main drivers of CO_2 emissions, whereas the decrease in energy intensity of GDP was the main factor to partly offset emission increases. The shift towards non-carbon energies and the shift to lower carbon fuels within fossil fuels played a less significant role in the Netherlands. CO_2 emissions increased in the first half of the 1990s and decreased in the second half, despite of higher economic growth in the second half of the decade. This is mainly due to considerable decreases in the energy intensity of GDP in the second half of the 1990s.

Dutch greenhouse gas emissions compared with targets for 2000 and 2008–12 (excl. LUCF) Figure 72



Dutch greenhouse gas emissions by gas (excluding LUCF) Figure 73



Note: The left side of the figure shows the trend in GHG emissions as an index (base year = 100); the right side of the figure shows the percentage contribution of the main GHG to the total emissions in the base year and 2000.

Figure 74 **Change of Dutch CO_2 emissions from fossil-fuel combustion and the influence of main driving forces (population, GDP per capita, energy intensity of GDP, share of fossil fuels, shift within fossil fuels) in the 1990s**

Source: Eurostat, Member State submission (CRF tables), EEA (2002a).

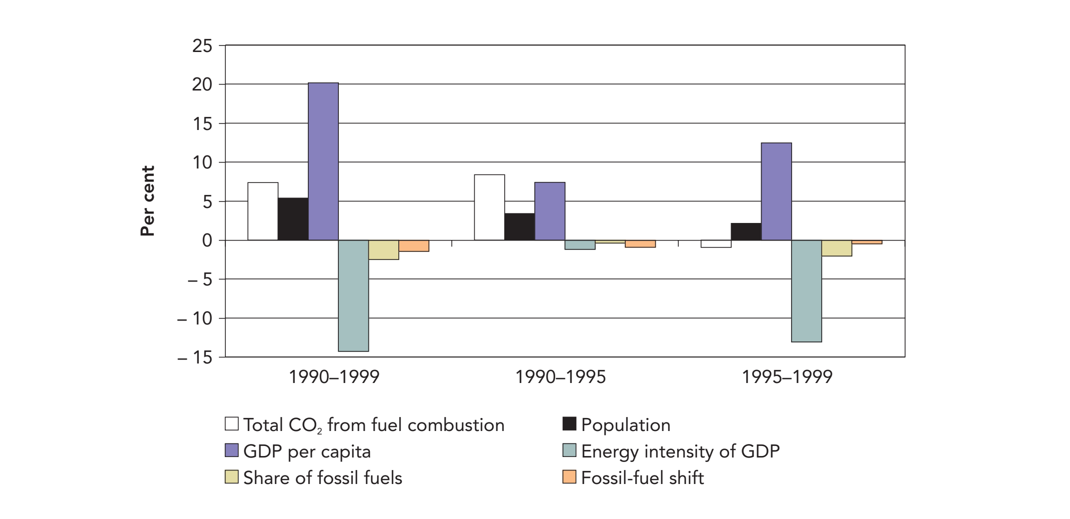


Table A1.61 **Greenhouse gases and distance-to-target indicators for the Netherlands**

Source: Member State submission (CRF tables), EEA (2002a).

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Greenhouse gas emissions (without LUCF)	100,0	99,5	104,7	103,3	104,3	105,3	105,7	110,7	105,9	107,1	103,0	102,6
DTI 2010	0,0	– 0,5	5,0	3,9	5,2	6,5	7,2	12,5	8,0	9,5	5,7	5,6
CO_2 (without LUCF)	100,0	100,0	104,9	103,8	105,2	105,7	108,2	112,6	105,9	109,7	107,8	108,7
CH_4 (without LUCF)	100,0	100,0	101,3	97,3	94,9	93,1	90,5	90,8	85,2	82,4	80,3	76,0
N_2O (without LUCF)	100,0	100,0	116,2	119,0	119,2	122,3	110,0	122,6	127,8	107,9	105,1	102,8
F-gases	100,0	85,9	89,7	82,2	88,9	102,1	100,0	117,2	131,0	137,7	80,6	70,3

Table A1.62 **Sectoral emission indicators (key sources) for the Netherlands**

Source: Member State submission (CRF tables), EEA (2002a).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1.A.1. Energy industries (CO_2)	100	101	105	104	109	110	115	113	117	112	115
1.A.2. Manufacturing industries and construction (CO_2)	100	102	101	95	98	103	101	93	103	103	103
1.A.3. Transport (CO_2)	100	100	104	106	107	110	112	114	117	119	121
1.A.3. Transport (N_2O)	100	112	128	141	149	161	163	165	168	168	165
1.A.4. Other sectors (CO_2)	100	117	108	116	111	111	123	103	98	95	95
1.A.4. Other sectors (CH_4)	100	111	103	107	106	102	119	101	98	95	95
1.A.4. Other sectors (N_2O)	100	112	112	112	112	100	106	91	87	84	83
1.A.5. Other (CO_2)	100	8 589	– 2 970	13 245	4 495	87	1 105	0	88	0	0
1.B.1. Fugitive emissions from solid fuels (CH_4)	0	0	0	0	0	0	0	0	0	0	0
1.B.2. Fugitive emissions from oil and natural gas (CH_4)	100	105	91	88	94	95	105	88	82	81	73
2.A. Mineral products (CO_2)	100	62	67	93	93	99	80	97	91	87	87
2.B. Chemical industry (N_2O)	100	133	125	123	130	99	130	144	101	95	94
2.B. Chemical industry (HFC)	0	0	0	0	0	0	0	0	0	0	0
2.C. Metal production (CO_2)	0	0	0	0	0	100	0	0	0	0	130
2.C. Metal production (PFC)	100	100	86	86	76	75	82	86	68	55	58
2.E. Production of halocarbons and SF_6 (HFC)	100	109	102	114	142	130	151	167	186	86	64
2.F. Consumption of halocarbons and SF_6 (HFC)	0	0	0	0	100	324	773	1 232	1 457	1 557	1 665
4.A. Enteric fermentation (CH_4)	100	102	100	98	95	94	91	88	85	83	79
4.B. Manure management (CH_4)	100	102	101	102	98	97	94	90	90	88	85
4.B. Manure management (N_2O)	100	106	106	121	121	112	110	105	102	99	95
4.D. Agricultural soils (N_2O)	100	102	118	119	118	122	120	118	115	115	111
6.A. Solid waste disposal on land (CH_4)	100	99	96	93	90	85	85	82	79	76	72

Note: The list of key sources in this table is the one identified for the EC and differs from the one defined by the Member States for their UNFCCC reporting.

Main driving-force indicators for the Netherlands — Table A1.63

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Population	100	101	102	102	103	103	104	104	105	106	:
GDP per capita	100	102	103	103	105	107	110	114	118	122	:
Energy intensity of GDP	100	102	100	101	98	99	100	94	91	87	:
Share of fossil fuels	100	100	100	100	100	100	99	99	99	98	:
Shift within fossil fuels (CO_2 intensity of fossil fuels)	100	100	100	100	101	99	99	95	99	99	:
GDP	100	102	104	105	108	111	114	119	124	129	133
Gross inland energy consumption	100	105	104	106	106	110	114	112	112	111	:
Heating degree days	:	:	:	:	:	100	122	102	95	91	88

Source: Eurostat, Member State inventory submission (CRF tables), EEA (2002a).

Sectoral driving-force indicators (Eurostat) — Table A1.64

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Final electricity consumption	100	103	106	107	111	113	117	122	126	129	:
Gross value added in industry	100	102	101	100	104	106	108	109	112	114	:
Volume passenger transport	100	100	102	103	108	108	107	111	111	112	:
Volume freight transport	100	73	125	124	128	133	138	142	146	153	:
Stock of permanently occupied dwellings	100	101	103	104	105	107	108	109	110	111	:

Source: Eurostat.

Sectoral driving-force indicators (CRF) — Table A1.65

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Coal mining and handling	0	0	0	0	0	0	0	0	0	0	0
Cement production	100	95	88	90	91	84	62	74	85	102	93
Use of synthetic fertilisers	100	97	95	95	90	99	94	97	98	93	93
Use of animal manures	100	105	113	114	113	109	106	101	97	102	94
Cattle population	100	103	100	97	96	94	92	90	87	85	83
Waste disposal on land	100	86	82	81	65	61	49	42	38	39	37

Source: Member State inventory submission (CRF tables), EEA (2002a).

Data basis for the CO_2 intensity indicators — Table A1.66

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Value added of iron and steel industry	100	91	87	95	88	94	94	:	:	:	:
Crude steel production	100	96	100	111	114	118	117	123	118	112	:
CO_2 emissions from iron and steel industry	100	92	94	101	84	107	105	111	106	99	:
Value added of glass, pottery & building mat. industry	100	104	107	109	121	124	120	121	123	:	:
CO_2 emissions from glass, pottery & building mat. industry	100	94	94	90	85	78	84	82	76	78	:
Value added of the chemical industry	100	92	93	90	125	140	123	124	115	:	:
CO_2 emissions from the chemical industry	100	86	88	94	86	71	70	68	68	57	:
All output of autoproducer thermal power stations	100	103	111	120	104	98	103	107	112	108	:
CO_2 emissions from autoproducer thermal power stations	100	101	109	117	104	94	94	93	97	92	:
Freight traffic on road	100	104	112	114	116	120	118	122	124	135	:
CO_2 emissions from diesel consumption of freight traffic	100	79	103	121	117	107	115	122	138	147	:
Value added of the services sector	100	103	105	107	108	112	116	122	128	133	:
CO_2 emissions from the services sector	100	121	111	109	106	103	129	104	105	93	:

Source: Eurostat.

Portugal

After three consecutive years of increasing emissions, Portugal managed to reduce emissions in 2000. This was mainly due to a decline in thermal power production and increases of hydropower production and electricity imports.

In base year:	65.1 Tg
In 2000:	84.7 Tg
Change base year–2000:	+ 19.6 Tg + 30.1 %
Share in total EU greenhouse gases:	2.1 %

Distance-to-target indicator (DTI)
Portuguese greenhouse gas emissions decreased by 1.1 % in 2000, compared to 1999, which was the first decline in four years. In 2000, total greenhouse gas emissions were 85 Tg (CO_2 equivalents), which was 30.1 % above the base-year level. In the burden-sharing agreement to the Kyoto Protocol, Portugal agreed to limit its greenhouse gas emission growth to a 27 % increase by 2008–12. Assuming a linear target path from 1990 to 2010, Portuguese greenhouse gas emissions were 16.6 index points above this target path in 2000 (Figure 75).

Greenhouse gas emissions by gas
The share of the CO_2 in total Portuguese greenhouse gas emissions increased in the last decade, whereas the relative importance CH_4 and N_2O declined (Figure 76).

CO_2 emissions account for 75 % of Portugal's total greenhouse gas emissions. In 2000, CO_2 emissions decreased slightly compared to 1999, but were 43 % above the 1990 levels. The decline in 2000 compared to 1999 was mainly due to decreases in power production from conventional thermal power stations and increases of hydropower production and net electricity imports. Between 1990 and 2000, all large fuel-combustion-related sources showed emission increases: transport (+ 75 %), energy industries (+ 41 %), small combustion (+ 39 %), and energy use in manufacturing industries (+ 14 %). Also, process-related CO_2 emissions from mineral products (mainly cement production) increased by 32 %.

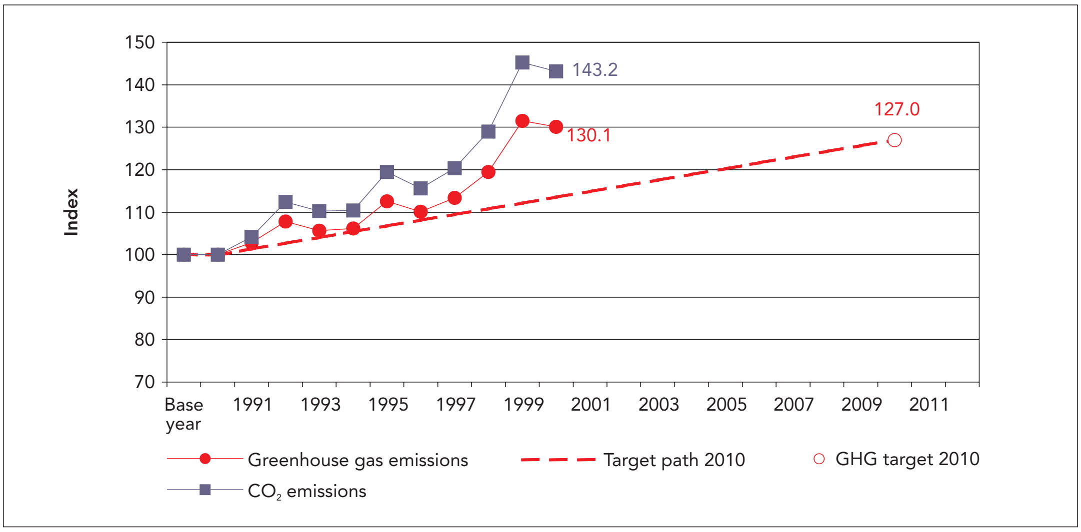
CH_4 emissions account for 16 % of Portugal's total greenhouse gas emissions. This is the second largest share in the EU and reflects high emissions from waste disposal on land. In 2000, CH_4 emissions increased slightly, compared to 1999, and were 2 % above 1990 levels. Between 1990 and 2000, emissions mainly increased from waste disposal on land (+ 12 %), whereas emissions from manure management decreased by 11%.

N_2O emissions are responsible for 10 % of total greenhouse gas emissions. In 2000, N_2O emissions were stable, compared to 1999, but were 4 % above 1990 levels. Emissions increased mainly from transport.

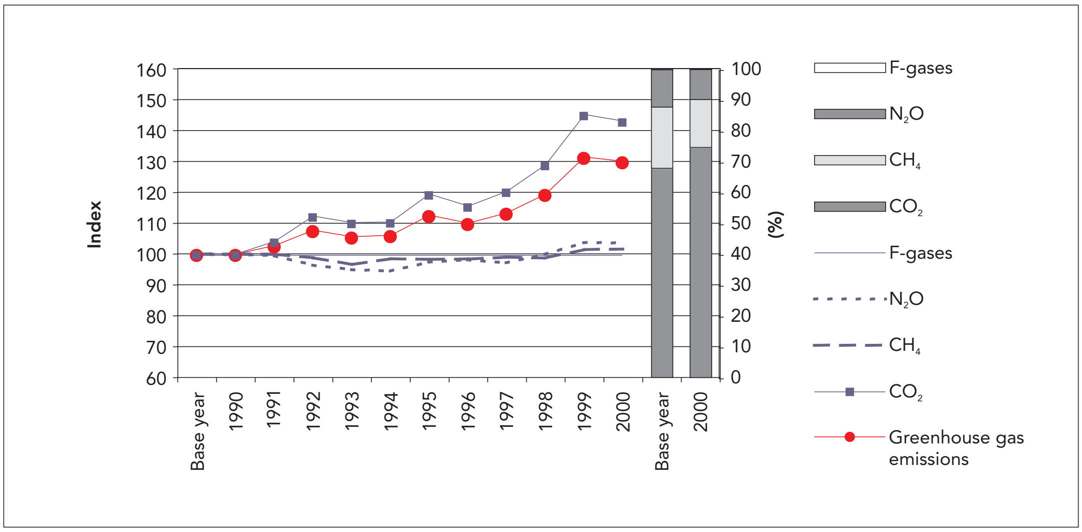
Fluorinated gas emissions account for less than 1 % of total Portuguese greenhouse gas emissions. Fluorinated gas emissions mainly occur in metal production (PFC). HFC emissions were not reported.

Main driving forces of CO_2 emissions from fossil fuel
CO_2 emissions from fossil-fuel combustion account for 67 % of Portugal's total greenhouse gas emissions. They increased by 48 % between 1990 and 1999. Figure 77 shows that the increases in GDP per capita and in energy intensity of GDP are the main drivers of growing CO_2 emissions. A small shift towards the use lower carbon fossil fuels in the second half of the 1990s contributed to limit growth of CO_2 emissions from fossil-fuel combustion. CO_2 emissions increased in both halves of the 1990s by nearly the same percentage rate. GDP growth per capita was a larger driver in the second half of the decade.

Portuguese greenhouse gas emissions compared with targets for 2000 and 2008–12 (excl. LUCF) Figure 75

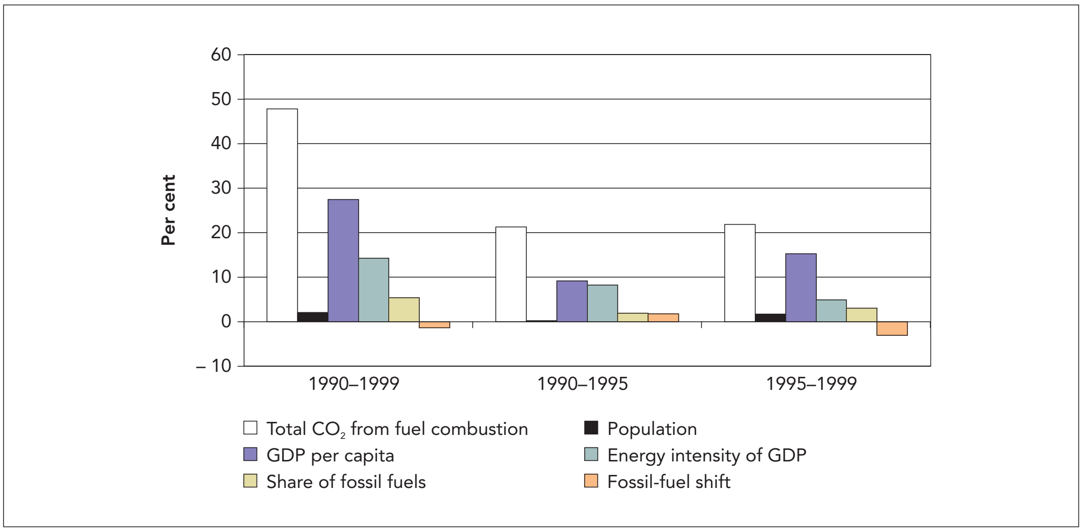


Portuguese greenhouse gas emissions by gas (excluding LUCF) Figure 76



Note: The left side of the figure shows the trend in GHG emissions as an index (base year = 100); the right side of the figure shows the percentage contribution of the main GHG to the total emissions in the base year and 2000.

Change of Portuguese CO_2 emissions from fossil-fuel combustion and the influence of main driving forces (population, GDP per capita, energy intensity of GDP, share of fossil fuels, shift within fossil fuels) in the 1990s Figure 77



Source: Eurostat, Member State submission (CRF tables), EEA (2002a).

Table A1.67 **Greenhouse gases and distance-to-target indicators for Portugal**

Source: Member State submission (CRF tables), EEA (2002a).

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Greenhouse gas emissions (without LUCF)	100,0	100,0	102,8	107,8	105,7	106,2	112,6	110,1	113,4	119,5	131,5	130,1
DTI 2010	0,0	0,0	1,5	5,1	1,6	0,8	5,8	2,0	3,9	8,7	19,3	16,6
CO_2 (without LUCF)	100,0	100,0	104,2	112,4	110,2	110,4	119,5	115,6	120,4	129,0	145,2	143,2
CH4 (without LUCF)	100,0	100,0	100,1	98,9	96,7	98,6	98,4	98,5	99,2	98,9	101,7	101,8
N2O (without LUCF)	100,0	100,0	99,8	96,7	95,2	94,8	97,8	98,5	97,6	100,3	104,1	104,1
F-gases	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,1

Table A1.68 **Sectoral emission indicators (key sources) for Portugal**

Source: Member State submission (CRF tables), EEA (2002a).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1.A.1. Energy industries (CO_2)	100	104	122	112	105	129	104	108	124	156	141
1.A.2. Manufacturing industries and construction (CO_2)	100	103	102	100	106	103	108	107	109	116	114
1.A.3. Transport (CO_2)	100	106	115	120	124	129	136	144	154	165	175
1.A.3. Transport (N_2O)	100	107	115	144	171	196	228	260	296	334	371
1.A.4. Other sectors (CO_2)	100	104	107	108	116	111	127	139	137	135	139
1.A.4. Other sectors (CH_4)	100	98	95	92	90	87	84	81	79	77	75
1.A.4. Other sectors (N_2O)	100	98	96	94	92	89	87	86	84	82	81
1.A.5. Other (CO_2)	100	72	68	37	5	0	0	0	0	0	0
1.B.1. Fugitive emissions from solid fuels (CH_4)	100	97	90	84	63	0	0	0	0	0	0
1.B.2. Fugitive emissions from oil and natural gas (CH_4)	100	91	108	103	129	123	112	135	280	578	401
2.A. Mineral products (CO_2)	100	103	101	106	108	114	113	129	125	128	132
2.B. Chemical industry (N_2O)	100	100	101	84	63	101	101	101	101	101	101
2.B. Chemical industry (HFC)	0	0	0	0	0	0	0	0	0	0	0
2.C. Metal production (CO_2)	100	95	128	132	129	130	127	149	151	163	173
2.C. Metal production (PFC)	100	100	100	100	100	100	100	100	100	100	100
2.E. Production of halocarbons and SF_6 (HFC)	0	0	0	0	0	0	0	0	0	0	0
2.F. Consumption of halocarbons and SF_6 (HFC)	0	0	0	0	0	0	0	0	0	0	0
4.A. Enteric fermentation (CH_4)	100	102	98	96	95	96	95	94	94	100	99
4.B. Manure management (CH_4)	100	97	96	88	92	91	89	90	89	90	89
4.B. Manure management (N_2O)	100	101	99	97	98	98	97	98	99	110	108
4.D. Agricultural soils (N_2O)	100	99	94	93	94	94	95	92	95	98	97
6.A. Solid waste disposal on land (CH_4)	100	101	103	104	105	106	107	109	108	110	112

Note: The list of key sources in this table is the one identified for the EC and differs from the one defined by the Member States for their UNFCCC reporting.

Table A1.69 **Main driving-force indicators for Portugal**

Source: Eurostat, Member State inventory submission (CRF tables), EEA (2002a).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Population	100	100	100	100	100	100	100	100	101	102	:
GDP per capita	100	105	106	104	104	109	113	117	122	125	:
Energy intensity of GDP	100	98	104	105	107	108	104	106	108	113	:
Share of fossil fuels	100	100	102	100	99	102	98	98	102	105	:
Shift within fossil fuels (CO_2 intensity of fossil fuels)	100	102	101	103	101	102	101	98	96	98	:
GDP	100	104	106	103	104	109	113	117	123	127	131
Gross inland energy consumption	100	102	110	109	112	117	117	125	133	143	:
Heating degree days	:	:	:	:	:	100	136	95	127	143	139

Sectoral driving-force indicators (Eurostat) Table A1.70

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Final electricity consumption	100	106	109	110	114	122	128	136	144	153	:
Gross value added in industry	100	98	96	93	97	102	108	115	120	123	:
Volume passenger transport	100	107	120	131	142	152	163	175	187	201	:
Volume freight transport	100	89	100	94	107	107	109	111	117	116	:
Stock of permanently occupied dwellings	100	101	102	103	104	105	108	110	111	113	:

Source: Eurostat.

Sectoral driving-force indicators (CRF) Table A1.71

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Coal mining and handling	100	96	79	70	52	0	0	0	0	0	0
Cement production	100	104	101	107	108	112	117	130	127	130	133
Use of synthetic fertilisers	100	94	85	86	85	83	88	81	87	87	87
Use of animal manures	100	101	99	98	98	99	98	98	100	111	109
Cattle population	100	103	98	96	96	96	95	93	92	103	103
Waste disposal on land	100	103	106	108	108	110	113	115	116	113	106

Source: Member State inventory submission (CRF tables), EEA (2002a).

Data basis for the CO_2 intensity indicators Table A1.72

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Value added of iron and steel industry	:	:	:	:	:	:	100	125	109	143	:
Crude steel production	100	76	109	110	106	117	123	128	128	147	:
CO_2 emissions from iron and steel industry	100	93	95	97	98	100	102	99	101	100	:
Value added of glass, pottery & building mat. industry	:	:	:	:	:	:	100	114	121	131	:
CO_2 emissions from glass, pottery & building mat. industry	100	107	103	102	108	108	122	125	146	165	:
Value added of the chemical industry	:	:	:	:	:	:	100	109	100	99	:
CO_2 emissions from the chemical industry	100	101	99	73	123	122	65	180	174	58	:
All output of autoproducer thermal power stations	100	114	127	151	187	221	236	285	305	363	:
CO_2 emissions from autoproducer thermal power stations	100	111	123	181	211	302	301	366	374	362	:
Freight traffic on road	100	:	97	91	102	101	212	227	233	246	:
CO_2 emissions from diesel consumption of freight traffic	100	79	103	121	117	107	115	122	138	147	:
Value added of the services sector	100	108	111	111	108	111	114	119	126	133	:
CO_2 emissions from the services sector	100	108	132	127	125	153	330	255	193	195	:

Source: Eurostat.

Spain

Spain increased greenhouse gas emissions for the fourth consecutive year. Spain has the largest increase of all MS in absolute and relative terms between 1990 and 2000. Emissions increased in almost all EC key sources with the largest increases in absolute terms in transport and energy industries. However, per capita emissions are still relatively low. The CO_2 limitation target was clearly missed.

In base year:	288.7 Tg
In 2000:	386.0 Tg
Change base year–2000:	+ 97.3 Tg + 33.7 %
Share in total EU greenhouse gases:	9.5 %

Distance-to-target indicator (DTI)
Spanish greenhouse gas emissions increased by 4.1 % in 2000, compared to 1999. The year 2000 was the fourth consecutive year with increasing greenhouse gas emissions. In 2000, total greenhouse gas emissions were 386 Tg (CO_2 equivalents), which was 33.7 % above the base-year level. In the 1990s, Spain had the highest absolute and percentage change in greenhouse gas emissions amongst all EC MS. In the burden-sharing agreement to the Kyoto Protocol, Spain agreed to limit its greenhouse gas emission growth to a 15 % increase by 2008–12. Assuming a linear target path from 1990 to 2010, Spanish greenhouse gas emissions were 26.2 index points above this target path in 2000 (Figure 78).

CO_2 emissions were 307 Tg in 2000, which was 34.9 % above 1990 levels. For CO_2, Spain aimed at limiting the emission increase to 11 to 13 % between 1990 and 2000. This target was clearly missed.

Greenhouse gas emissions by gas
The share of the CO_2 and CH_4 in total Spanish greenhouse gas emissions remained stable in the last decade. N_2O decreased in relative importance, whereas the share of fluorinated gases increased (Figure 79).

CO_2 emissions account for 79 % of total Spanish greenhouse gas emissions. In 2000, CO_2 emissions increased by 4 %, compared to 1999, and were 35 % above 1990 levels. Between 1990 and 2000, all large fuel-combustion-related sources showed emission increases: transport (+ 48 %), energy industries (+ 35 %), small combustion (+ 33 %), and energy use in manufacturing industries (+ 31 %). Also, process-related CO_2 emissions from mineral products (mainly cement production) increased by 22 %.The same pattern was reported for the change in 1999–2000. One reason for the decline in CO_2 emissions in 1993 and 1996 was increased production of hydropower.

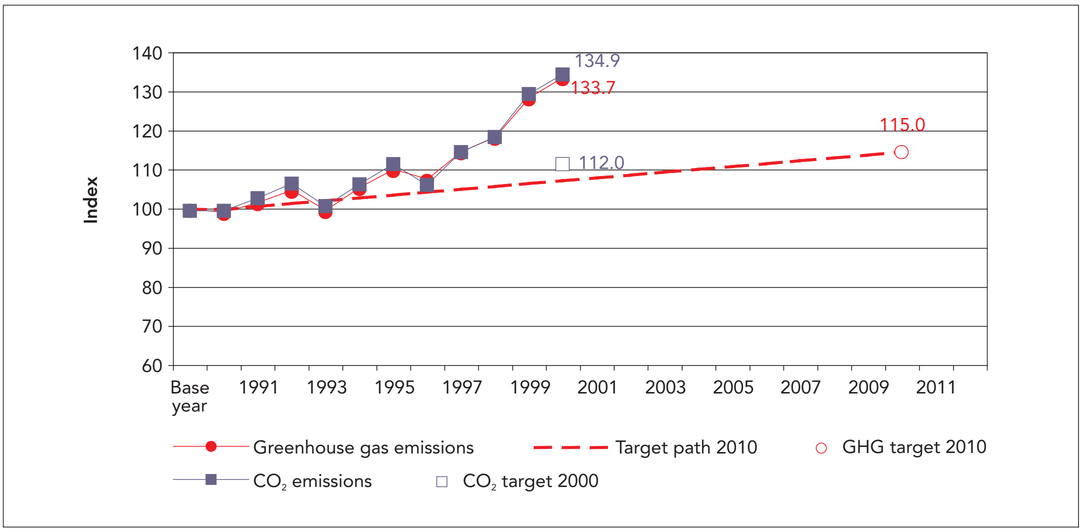
CH_4 emissions account for 10 % of total Spanish greenhouse gas emissions and increased by 29 % between 1990 and 2000. Also, in 2000, emissions increased, compared to 1999. Between 1990 and 2000, emissions mainly increased from landfills (+ 87 %) and agriculture (manure management: + 35 %; enteric fermentation: + 13 %).

N_2O emissions are responsible for 8 % of total greenhouse gas emissions. In 2000, emissions increased by 5 %, compared to 1999, and were 16 % above 1990 levels. Large emission increases were reported from agricultural soils (+ 16 %) and transport (+ 144 %), whereas emissions from chemical industry decreased.

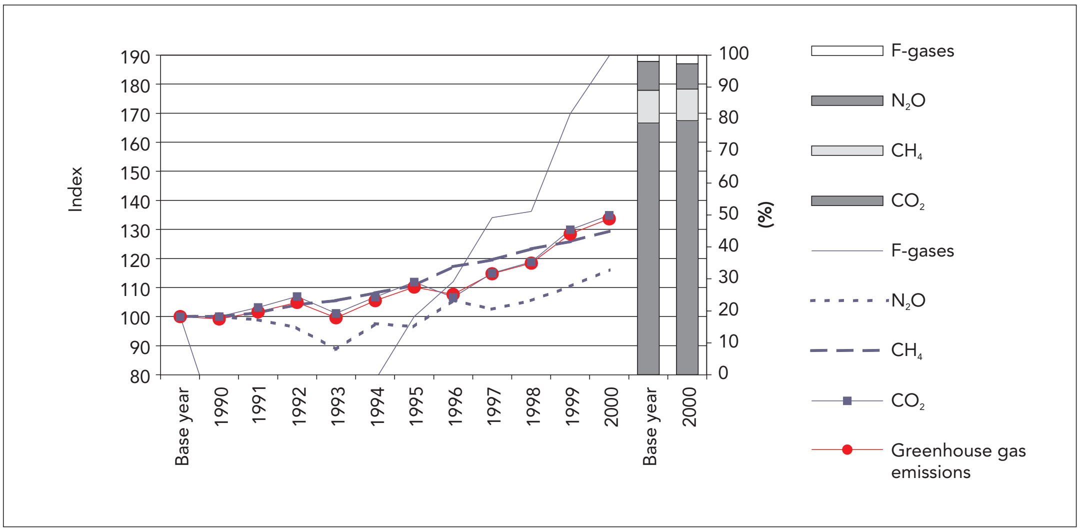
Fluorinated gas emissions account for 3 % of total greenhouse gas emissions. The main source of fluorinated gas emissions in Spain is HFCs from the production of halocarbons and SF_6. These emissions increased by 166 % between 1990 and 2000 and still show a rising trend. In recent years, HFC emissions from consumption of halocarbons and SF_6 show high growth rates.

Main driving forces of CO_2 emissions from fossil fuels
CO_2 emissions from fossil-fuel combustion account for 73 % of total Spanish greenhouse gas emissions. They increased by 32 % between 1990 and 1999. Figure 80 shows that the increase in GDP per capita is the main drivers of CO_2 emissions. Also, increases in energy intensity of GDP and in the share of fossil fuels contributed considerably to the growth of fossil-fuel-related CO_2 emissions. Emissions grew slightly more in the second half of the decade; also, economic growth was higher in the late 1990s. Energy intensity of GDP increased in the early 1990s, but decreased slightly in the second half of the decade. Shifts towards lower carbon fossil fuels took place in both halves of the 1990s (but they were stronger in the early 1990s), whereas the share of fossil fuels increased in both halves of the decade.

Spanish greenhouse gas emissions compared with targets for 2000 and 2008–12 (excl. LUCF) Figure 78

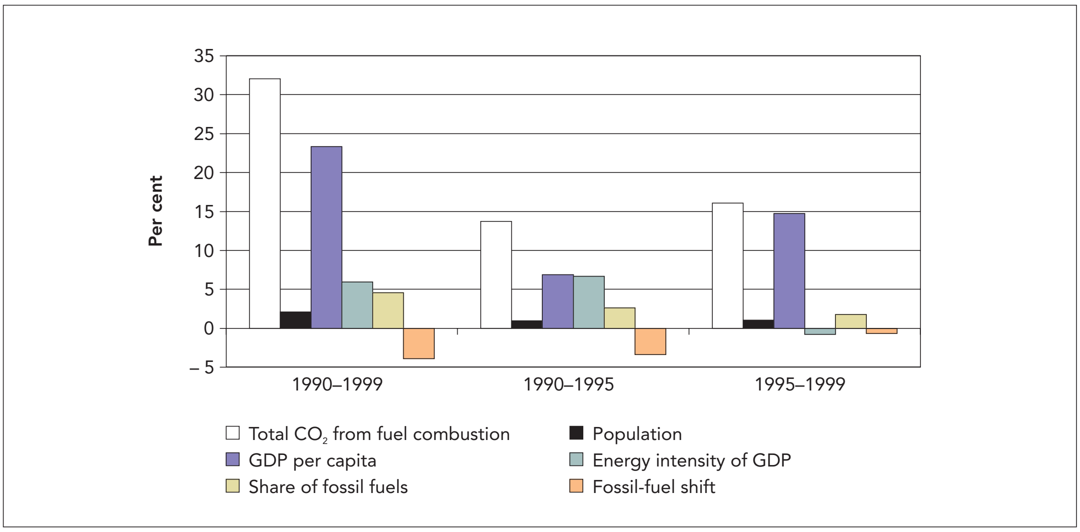


Spanish greenhouse gas emissions by gas (excluding LUCF) Figure 79



Note: The left side of the figure shows the trend in GHG emissions as an index (base year = 100); the right side of the figure shows the percentage contribution of the main GHG to the total emissions in the base year and 2000.

Change of Spanish CO_2 emissions from fossil-fuel combustion and the influence of main driving forces (population, GDP per capita, energy intensity of GDP, share of fossil fuels, shift within fossil fuels) in the 1990s Figure 80



Source: Eurostat, Member State submission (CRF tables), EEA (2002a).

Table A1.73 **Greenhouse gases and distance-to-target indicators for Spain**

Source: Member State submission (CRF tables), EEA (2002a).

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Greenhouse gas emissions (without LUCF)	100,0	99,2	101,7	104,9	99,6	105,5	110,2	107,7	114,7	118,5	128,5	133,7
DTI 2010	0,0	– 0,8	0,9	3,4	– 2,6	2,5	6,5	3,2	9,5	12,5	21,7	26,2
CO_2 (without LUCF)	100,0	100,0	103,2	106,9	101,2	106,8	112,0	106,6	115,0	118,9	129,9	134,9
CH_4 (without LUCF)	100,0	100,0	101,3	104,1	105,5	108,2	110,7	117,2	119,5	123,3	125,8	129,4
N_2O (without LUCF)	100,0	100,0	99,0	96,3	88,7	97,5	96,6	105,6	102,6	105,5	110,4	116,1
F-gases	100,0	59,5	54,8	65,3	56,4	78,1	100,0	112,0	134,1	136,2	169,9	189,8

Table A1.74 **Sectoral emission indicators (key sources) for Spain**

Source: Member State submission (CRF tables), EEA (2002a).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1.A.1. Energy industries (CO_2)	100	101	111	102	103	111	94	110	108	129	135
1.A.2. Manufacturing Industries and Construction (CO_2)	100	103	101	98	108	120	108	119	121	127	131
1.A.3. Transport (CO_2)	100	104	110	104	112	113	122	123	135	143	148
1.A.3. Transport (N_2O)	100	105	113	117	135	148	164	181	211	234	244
1.A.4. Other sectors (CO_2)	100	114	112	109	114	112	117	117	120	126	133
1.A.4. Other sectors (CH_4)	100	105	107	100	96	90	89	89	88	84	83
1.A.4. Other sectors (N_2O)	100	111	113	108	113	114	117	118	117	122	131
1.A.5. Other (CO_2)	0	0	0	0	0	0	0	0	0	0	0
1.B.1. Fugitive emissions from solid fuels (CH_4)	100	88	89	86	80	80	81	80	72	67	68
1.B.2. Fugitive emissions from oil and natural gas (CH_4)	100	83	81	76	73	82	105	101	98	105	112
2.A. Mineral products (CO_2)	100	96	88	83	97	104	101	107	116	120	122
2.B. Chemical industry (N_2O)	100	90	76	63	75	83	85	80	75	81	80
2.B. Chemical industry (HFC)	0	0	0	0	0	0	0	0	0	0	0
2.C. Metal production (CO_2)	100	96	86	94	99	102	100	107	111	111	115
2.C. Metal production (PFC)	100	95	94	96	95	95	91	93	88	80	44
2.E. Production of halocarbons and SF_6 (HFC)	100	91	115	94	144	193	211	242	213	247	266
2.F. Consumption of halocarbons and SF_6 (HFC)	0	0	0	100	295	2 605	88 158	235 402	523 865	887 641	1 201 100
4.A. Enteric fermentation (CH_4)	100	102	100	100	100	101	109	107	110	113	113
4.B. Manure management (CH_4)	100	100	105	108	111	112	113	119	126	127	135
4.B. Manure management (N_2O)	100	100	99	96	98	98	100	98	102	102	100
4.D. Agricultural soils (N_2O)	100	99	95	87	96	91	106	100	103	107	116
6.A. Solid waste disposal on land (CH_4)	100	107	118	126	135	145	154	165	172	179	187

Note: The list of key sources in this table is the one identified for the EC and differs from the one defined by the Member States for their UNFCCC reporting.

Table A1.75 **Main driving-force indicators for Spain**

Source: Eurostat, Member State inventory submission (CRF tables), EEA (2002a).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Population	100	100	100	101	101	101	101	101	102	102	:
GDP per capita	100	102	103	102	104	107	109	113	118	122	:
Energy intensity of GDP	100	103	104	100	104	107	103	104	104	106	:
Share of fossil fuels	100	101	103	100	101	103	101	104	103	104	:
Shift within fossil fuels (CO_2 intensity of fossil fuels)	100	97	99	100	98	97	94	94	93	96	:
GDP	100	103	103	102	105	108	110	115	120	125	130
Gross inland energy consumption	100	106	107	103	109	115	113	119	125	132	:
Heating degree days	:	:	:	:	:	100	120	99	118	124	122

Sectoral driving-force indicators (Eurostat) — Table A1.76

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Final electricity consumption	100	102	104	104	109	112	117	126	132	141	:
Gross value added in industry	100	102	100	96	97	101	102	107	113	118	:
Volume passenger transport	100	103	110	113	117	101	105	109	114	125	:
Volume freight transport	100	199	109	111	117	120	117	122	131	141	:
Stock of permanently occupied dwellings	100	101	103	104	105	107	108	110	111	112	:

Source: Eurostat.

Sectoral driving-force indicators (CRF) — Table A1.77

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Coal mining and handling	100	92	93	88	83	82	80	77	74	67	65
Cement production	100	95	85	81	94	101	99	104	112	118	120
Use of synthetic fertilisers	100	98	90	75	92	84	106	96	100	107	117
Use of animal manures	100	100	103	102	104	104	106	107	113	113	117
Cattle population	100	102	99	99	103	111	117	115	120	124	120
Waste disposal on land	100	110	125	129	127	135	125	134	134	140	135

Source: Member State inventory submission (CRF tables), EEA (2002a).

Data basis for the CO_2 intensity indicators — Table A1.78

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Value added of iron and steel industry	100	87	76	64	69	88	70	79	78	86	:
Crude steel production	100	103	101	103	107	110	97	109	118	118	:
CO_2 emissions from iron and steel industry	100	99	90	90	93	90	78	90	86	80	:
Value added of glass, pottery & building mat. industry	100	102	100	81	86	88	85	92	102	115	:
CO_2 emissions from glass, pottery & building mat. industry	100	113	111	91	95	94	98	115	116	111	:
Value added of the chemical industry	100	102	100	91	95	92	93	97	104	112	:
CO_2 emissions from the chemical industry	100	104	110	101	120	134	111	119	114	105	:
All output of autoproducer thermal power stations	100	93	116	136	252	321	445	660	766	974	:
CO_2 emissions from autoproducer thermal power stations	100	110	123	135	231	419	308	409	436	683	:
Freight traffic on road	100	104	106	109	114	121	126	130	151	158	:
CO_2 emissions from diesel consumption of freight traffic	100	79	103	121	117	107	115	122	138	147	:
Value added of the services sector	100	102	103	103	105	107	109	112	116	121	:
CO_2 emissions from the services sector	100	117	128	107	116	135	129	115	136	144	:

Source: Eurostat.

Sweden

Sweden decreased greenhouse gas emissions between 1990 and 2000 mainly due to substantial cuts in CO_2 emissions from small combustion. Also, the limited growth of CO_2 from transport contributed Sweden reached its CO_2 stabilisation target.

In base year:	70.7 Tg
In 2000:	69.4 Tg
Change base year–2000:	– 1.3 Tg – 1.9 %
Share in total EU greenhouse gases:	1.7 %

Distance-to-target indicator (DTI)
Swedish greenhouse gas emissions reduced by 1.6 % in 2000, compared to 1999, and were also below the base-year level (1995 for fluorinated gases). In 2000, total greenhouse gas emissions were 69 Tg (CO_2 equivalents), which was 1.9 % below base-year levels. In the burden-sharing agreement to the Kyoto Protocol, Sweden agreed to limit its greenhouse gas emission growth to a 4 % increase by 2008–12. Assuming a linear target path from 1990 to 2010, Swedish greenhouse gas emissions were 3.9 index points below this target path in 2000 (Figure 81).

CO_2 emissions were 56 Tg in 2000, which was 0.4 % below 1990 levels. Therefore, Sweden met its target to stabilise CO_2 emissions at 1990 levels by 2000.

Greenhouse gas emissions by gas
The share of CO_2 in total Swedish greenhouse gas emissions increased in the last decade, whereas the share of the CH_4 decreased. The relative importance of N_2O and fluorinated gas emissions were stable between the base year and 2000 (Figure 82).

CO_2 emissions account for 81 % of total Swedish greenhouse gas emissions. In 2000, CO_2 emissions decreased by 1 %, compared to 1999, and were at 1990 levels. Between 1990 and 2000, large reductions were achieved in small combustion (– 29 %), which were offset by emission increases from transport (+ 4 %), energy use in manufacturing industries (+ 7 %), and energy industries (+ 5 %).

A main reason for emission reductions from small combustion was increased use of district heating. District heating rose by almost 20 % between 1990 and 1999; the use of biomass fuels for district heating production almost trebled during the same period. Main reasons for this increase was the carbon dioxide tax on heat production using fossil fuels and the subsidy for development of biomass-fuel-based combined power and heating plants (MES, 2001; see also Box 4). Natural variations in temperature and precipitation also affect GHG emissions in Sweden. 2000 was a warm and wet year with low demand for heating energy and large supply of hydropower resulting in low emissions of greenhouse gases.

The growth in CO_2 emissions from transport was relatively small, compared to other EC MS. Sweden was the only EC MS to reduce passenger transport in cars between 1990 and 1999. Important reasons for the low emission increase might have been relatively high per capita emissions in 1990 and high road-fuel prices, compared to other MS.

CH_4 emissions account for 8 % of total Swedish greenhouse gas emissions and decreased by 14 % between 1990 and 2000. In 2000, emissions dropped by 5 %, compared to 1999. The main reasons for declining CH_4 emissions between 1990 and 2000 were emission reductions from landfills (– 20 %), from transport (– 50 %) and enteric fermentation (– 7 %).

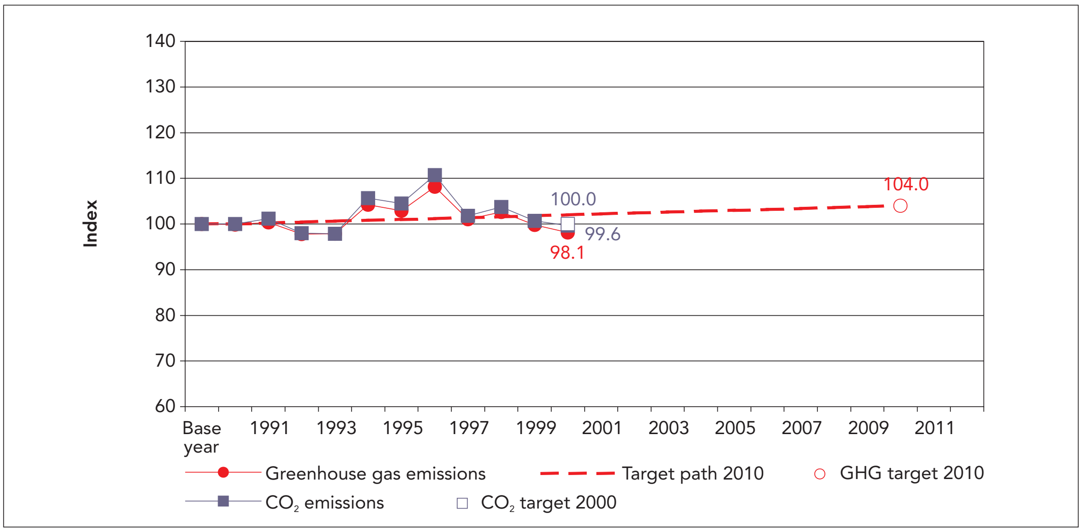
N_2O emissions are responsible for 10 % of total greenhouse gas emissions. In 2000, emissions declined by 3 %, compared to 1999, and were 4 % below 1990 levels. Between 1990 and 2000, N_2O emissions mainly decreased from agriculture (agricultural soils: – 5 %; manure management: – 19 %) and from chemical industry (– 21 %).

Fluorinated gas emissions account for 1 % of total greenhouse gas emissions. The main sources of fluorinated gas emissions in Sweden is HFC emissions from consumption of halocarbons and SF_6 and PFC emissions from metal production. HFC emissions show increasing trends, whereas PFC emissions decreased in recent years.

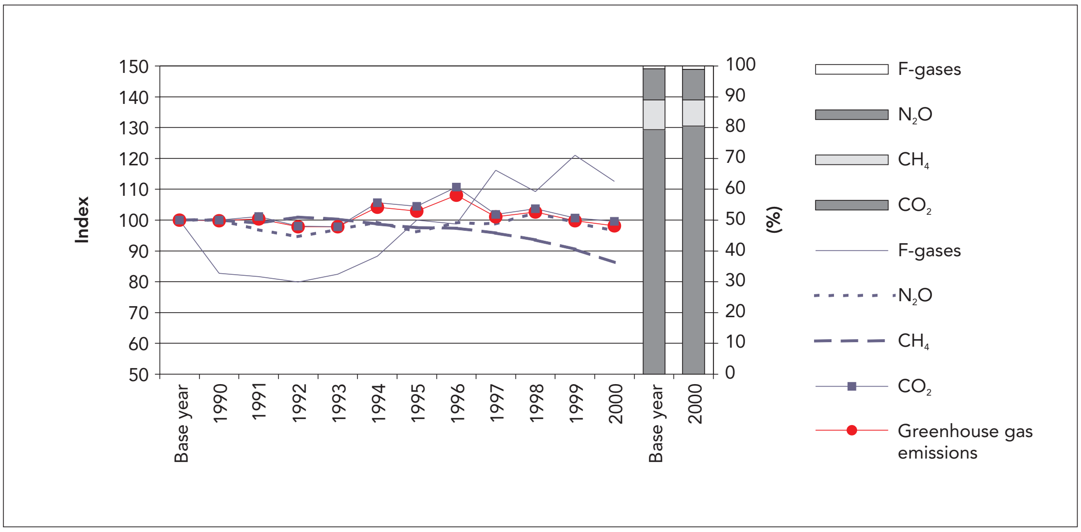
Main driving forces of CO_2 emissions from fossil fuels

CO_2 emissions from fossil-fuel combustion account for 73 % of total Swedish greenhouse gas emissions. They increased by 1 % between 1990 and 1999. Figure 83 shows that decreases in energy intensity of GDP and shifts towards lower carbon fossil fuels and non-carbon energies almost offset CO_2 emission increases driven by growth in population and GDP per capita. CO_2 emissions increased in the first half of the 1990s but decreased in the second half. In the first half of the 1990s, population growth and increases in energy intensity of GDP were large drivers of emission growth. In the second half of the 1990s, CO_2 emission increases due to growth in GDP per capita were offset by improvements in energy intensity and increasing share of non-carbon energies.

Swedish greenhouse gas emissions compared with targets for 2000 and 2008–12 (excl. LUCF) Figure 81



Swedish greenhouse gas emissions by gas (excluding LUCF) Figure 82



Note: The left side of the figure shows the trend in GHG emissions as an index (base year = 100); the right side of the figure shows the percentage contribution of the main GHG to the total emissions in the base year and 2000.

Figure 83

Change of Swedish CO_2 emissions from fossil-fuel combustion and the influence of main driving forces (population, GDP per capita, energy intensity of GDP, share of fossil fuels, shift within fossil fuels) in the 1990s

Source: Eurostat, Member State submission (CRF tables), EEA (2002a).

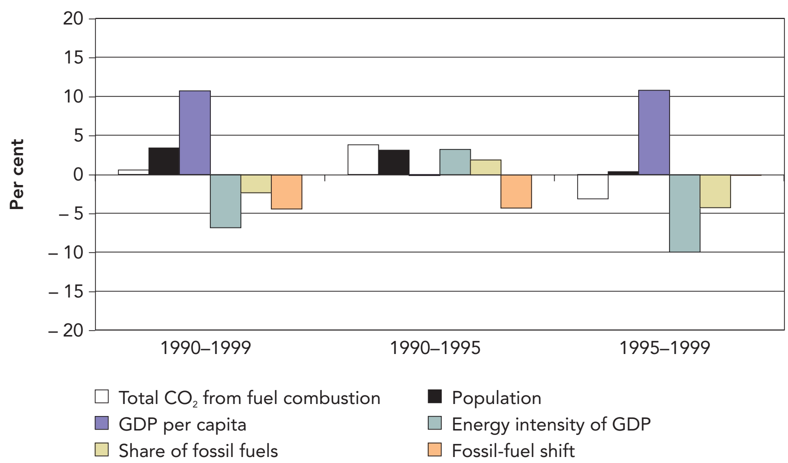


Table A1.79

Greenhouse gases and distance-to-target indicators for Sweden

Source: Member State submission (CRF tables), EEA (2002a).

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Greenhouse gas emissions (without LUCF)	100,0	99,8	100,4	97,8	97,9	104,2	102,9	108,1	101,1	102,6	99,8	98,1
DTI 2010	0,0	– 0,2	0,2	– 2,6	– 2,7	3,4	1,9	6,9	– 0,3	1,0	– 2,0	– 3,9
CO_2 (without LUCF)	100,0	100,0	101,2	98,0	97,9	105,6	104,5	110,7	101,8	103,7	100,7	99,6
CH4 (without LUCF)	100,0	100,0	99,0	101,0	100,3	98,7	97,6	97,4	95,8	93,6	90,6	86,2
N2O (without LUCF)	100,0	100,0	96,9	94,7	97,0	99,3	96,2	99,1	98,7	102,3	99,2	96,5
F-gases	100,0	82,7	81,7	79,9	82,5	88,3	100,0	98,8	116,1	109,3	121,0	112,6

Table A1.80

Sectoral emission indicators (key sources) for Sweden

Source: Member State submission (CRF tables), EEA (2002a).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1.A.1. Energy industries (CO_2)	100	111	111	106	129	114	155	113	125	109	105
1.A.2. Manufacturing industries and construction (CO_2)	100	98	87	97	109	114	109	110	108	102	107
1.A.3. Transport (CO_2)	100	100	102	97	99	101	101	101	104	106	104
1.A.3. Transport (N_2O)	100	93	95	100	105	107	114	122	118	126	139
1.A.4. Other sectors (CO_2)	100	98	91	91	91	88	88	81	79	81	71
1.A.4. Other sectors (CH_4)	100	100	100	101	95	101	104	98	96	102	97
1.A.4. Other sectors (N_2O)	100	99	95	95	99	87	89	86	109	109	98
1.A.5. Other (CO_2)	100	100	100	100	98	110	98	51	35	29	471
1.B.1. Fugitive emissions from solid fuels (CH_4)	100	99	79	92	144	131	116	94	109	118	114
1.B.2. Fugitive emissions from oil and natural gas (CH_4)	100	83	95	84	53	53	146	159	0	0	12
2.A. Mineral products (CO_2)	100	92	86	87	92	102	97	93	93	90	90
2.B. Chemical industry (N_2O)	100	95	95	95	87	87	84	83	93	93	79
2.B. Chemical industry (HFC)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.C. Metal production (CO_2)	100	102	108	109	111	119	125	119	112	111	122
2.C. Metal production (PFC)	100	97	94	91	88	86	75	69	66	73	60
2.E. Production of halocarbons and SF_6 (HFC)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.F. Consumption of halocarbons and SF_6 (HFC)	100	220	332	1 172	2 712	4 849	6 808	10 441	11 637	13 587	14 484
4.A. Enteric fermentation (CH_4)	100	97	101	101	101	99	99	99	97	96	93
4.B. Manure management (CH_4)	100	97	108	116	126	124	124	121	120	118	112
4.B. Manure management (N_2O)	100	98	95	91	92	82	84	88	86	83	81
4.D. Agricultural soils (N_2O)	100	96	93	97	99	97	98	100	100	95	95
6.A. Solid waste disposal on land (CH_4)	100	102	102	98	94	94	93	91	89	84	80

Note: The list of key sources in this table is the one identified for the EC and differs from the one defined by the Member States for their UNFCCC reporting.

Main driving-force indicators for Sweden Table A1.81

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Population	100	101	101	102	103	103	103	103	103	103	:
GDP per capita	100	98	96	94	97	100	101	103	106	111	:
Energy intensity of GDP	100	105	101	104	105	103	106	101	93	93	:
Share of fossil fuels	100	96	101	101	99	102	104	100	105	98	:
Shift within fossil fuels (CO_2 intensity of fossil fuels)	100	102	99	97	102	96	97	94	96	96	:
GDP	100	99	97	95	99	103	104	106	110	115	119
Gross inland energy consumption	100	103	98	99	104	106	110	107	103	107	:
Heating degree days	:	:	:	:	:	100	107	96	101	95	89

Source: Eurostat, Member State inventory submission (CRF tables), EEA (2002a).

Sectoral driving-force indicators (Eurostat) Table A1.82

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Final electricity consumption	100	101	100	101	102	104	105	102	103	104	:
Gross value added in industry	100	96	92	91	100	108	109	113	120	127	:
Volume passenger transport	100	102	102	101	93	94	92	92	93	94	:
Volume freight transport	100	96	92	98	102	111	118	125	123	124	:
Stock of permanently occupied dwellings	100	104	105	105	105	106	105	105	104	105	:

Source: Eurostat.

Sectoral driving-force indicators (CRF) Table A1.83

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Coal mining and handling	0	0	0	0	0	0	0	0	0	0	0
Cement production	100	89	86	86	87	102	96	87	90	90	89
Use of synthetic fertilisers	100	93	79	92	96	88	86	91	92	80	84
Use of animal manures	100	98	100	102	105	96	94	94	93	90	87
Cattle population	100	99	103	105	106	103	104	104	101	100	98
Waste disposal on land	100	95	92	89	81	74	72	76	62	55	46

Source: Member State inventory submission (CRF tables), EEA (2002a).

Data basis for the CO_2 intensity indicators Table A1.84

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Value added of iron and steel industry	100	63	62	61	71	62	65	71	66	:	:
Crude steel production	100	95	98	103	112	111	110	116	116	114	:
CO_2 emissions from iron and steel industry	100	93	99	102	127	130	116	113	110	107	:
Value added of glass, pottery & building mat. industry	100	88	74	59	55	57	57	58	56	:	:
CO_2 emissions from glass, pottery & building mat. industry	100	88	70	78	73	74	73	70	70	66	:
Value added of the chemical industry	100	110	119	115	125	108	95	121	126	:	:
CO_2 emissions from the chemical industry	100	119	90	111	106	81	93	65	107	89	:
All output of autoproducer thermal power stations	100	109	114	136	148	148	283	287	284	358	:
CO_2 emissions from autoproducer thermal power stations	100	156	157	260	319	269	316	286	261	199	:
Freight traffic on road	100	*98*	*98*	98	*102*	111	118	125	124	124	:
CO_2 emissions from diesel consumption of freight traffic	100	79	103	121	117	107	115	122	138	147	:
Value added of the services sector	100	101	99	99	100	103	105	108	111	115	:
CO_2 emissions from the services sector	100	79	74	72	78	116	108	95	90	93	:

Eurostat estimated data in italics.

Source: Eurostat.

United Kingdom

The UK decreased greenhouse gas emissions between 1990 and 2000 mainly due to fuel shifts from coal to gas and efficiency improvements in power production. Other important factors were emission-reduction measures in the adipic acid production and the decline in coal mining. The UK reached its CO_2 emission target for 2000.

In base year:	745.5 Tg
In 2000:	649.1 Tg
Change base year–2000:	– 96.4 Tg – 12.9 %
Share in total EU greenhouse gases:	16.0 %

Distance-to-target indicator (DTI)
UK greenhouse gas emissions increased slightly in 2000, compared to 1999, but were well below base-year levels (1995 for fluorinated gases). In 2000, total greenhouse gas emissions were 649 Tg (CO_2 equivalents), which was 12.9 % below base-year levels. In the burden-sharing agreement to the Kyoto Protocol, the UK agreed to reduce its greenhouse gas emissions by 12.5 % by 2008–12. Assuming a linear target path from 1990 to 2010, UK greenhouse gas emissions were 6.7 index points below this target path in 2000 (Figure 84).

CO_2 emissions were 543 Tg in 2000, which was 7 % below 1990 levels. Therefore, the UK met its target to stabilise CO_2 emissions at 1990 level by 2000.

Greenhouse gas emissions by gas
The share of the CO_2 in total UK greenhouse gas emissions increased in the last decade, whereas the relative importance of CH_4, N_2O and fluorinated gases decreased (Figure 85).

CO_2 emissions account for 84 % of total UK greenhouse gas emissions. In 2000, CO_2 emissions grew by 1 %, compared to 1999, but were 7 % below 1990 levels. The main reason for emission increases in 2000, compared to 1999, was an increase in thermal power production and a shift towards carbon-intensive fuels. Between 1990 and 2000, large emission cuts were achieved from energy industries (– 16 %), mainly due to a shift from coal to gas and efficiency improvements in power production after the UK electricity market liberalisation. Eichhammer et al. (2001) conclude that the liberalisation of the electricity market accounts for about 50 % of the reduction of all six greenhouse gas emissions in the UK. Apart from energy industries, emissions decreased from energy use in manufacturing industries (– 8 %), fugitive emissions from oil and gas
(– 40 %) and process-related emissions from mineral products (– 11 %). Emissions increased from transport (+ 6 %) and from small combustion (+ 5 %).

The UK was one of the few MS to limit its growth rate of CO_2 from transport to less than 10 % between 1990 and 2000. One of the most important reason for this was the road duty escalator, i.e. annual fuel duty increases. The escalator was introduced in 1993, first at an annual rate of 3 % above inflation and then at 5 %. It was increased to 6 % in July 1997, but terminated in 1999. Taken in isolation, increases in duties between 1996 and 1999 are estimated to have produced annual carbon savings of between 3.6 and 9.2 Tg of CO_2 by 2010 (DEFRA, 2001).

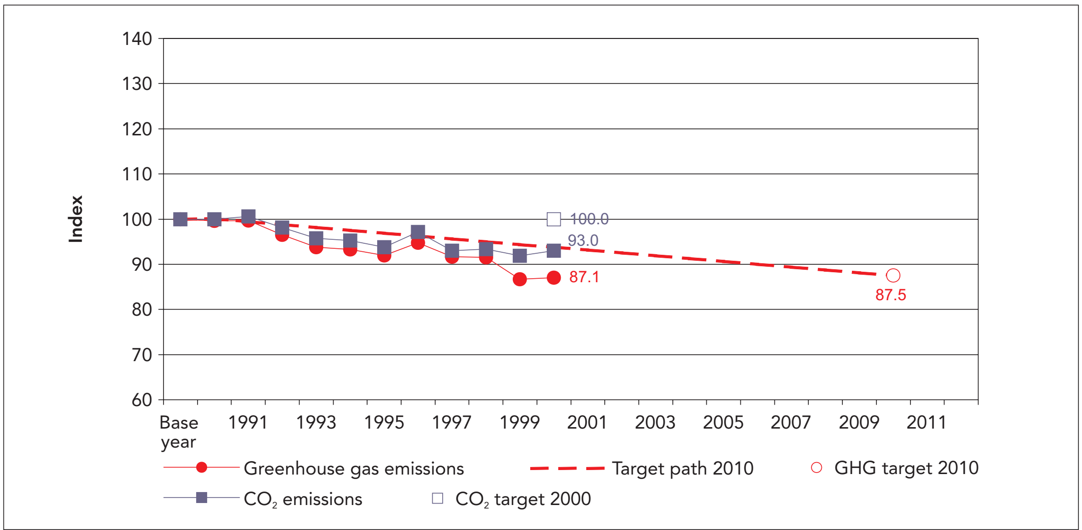
CH_4 emissions account for 8 % of total UK greenhouse gas emissions and decreased by 33 % between 1990 and 2000. Also, in 2000, emissions dropped, compared to 1999. The most important factor for the cuts in CH_4 emissions during the past decade was the decline in coal mining. Fugitive CH_4 emissions from solid fuels decreased by 68 % mainly due to lower levels of coal production and the collection of methane for use as energy. In addition, large emission cuts were achieved from landfills (– 41 %), mainly because of increased collection of landfill gas for use as energy and environmental control (DEFRA, 2001).

N_2O emissions are responsible for 7 % of total greenhouse gas emissions and decreased by 35 % between 1990 and 2000. Also, in 2000, emissions decreased, compared to 1999. The main reason for decreasing N_2O emissions were considerable emission cuts in the adipic acid production (– 79 %). Also, emissions from agricultural soils were reduced by 12 %.

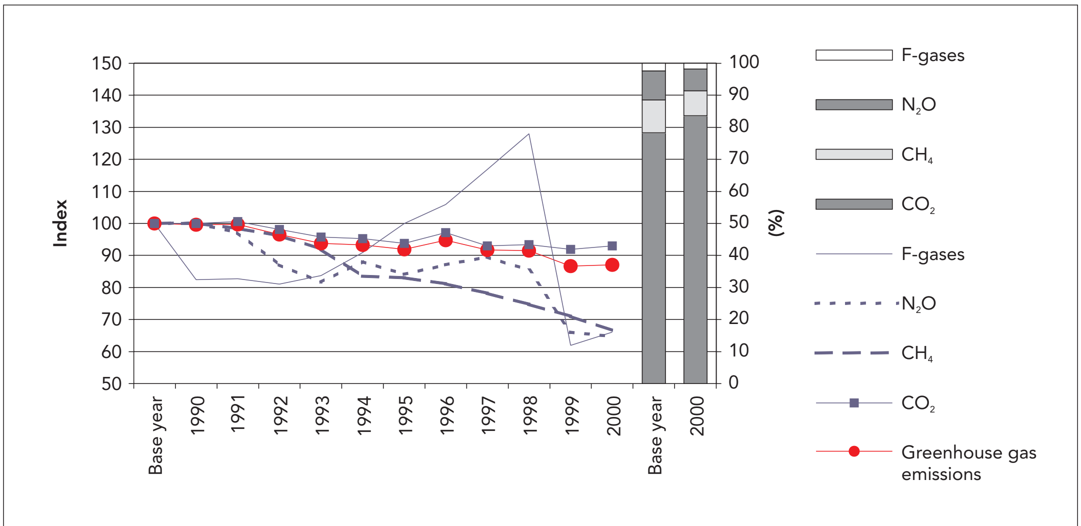
Fluorinated gas emissions account for 1 % of total UK greenhouse gas emissions. After large cuts of HFC emissions from the HCFC production in 1999, HFC emissions from consumption of halocarbons and SF_6 are becoming the most important source of fluorinated gas emissions in the UK. The latter increased by 17 % from 1999 to 2000.

Main driving forces of CO_2 emissions from fossil fuels: CO_2 emissions from fossil-fuel combustion account for 80 % of UK's total greenhouse gas emissions. They decreased by 8 % between 1990 and 1999. Figure 86 shows that the increase in GDP per capita and population growth are main drivers of CO_2 emissions, but decreases in other components overcompensated the emission increases (in particular the shift towards lower-carbon fossil fuels and the decrease in energy intensity of GDP). CO_2 emissions decreased in both halves of the 1990s, but the decrease was stronger in the first half of the decade. Economic growth was a larger driver in the second half of the 1990s. The move towards non-carbon energies was stronger in the early 1990s.

UK greenhouse gas emissions compared with targets for 2000 and 2008–12 (excl. LUCF) Figure 84



UK greenhouse gas emissions by gas (excluding LUCF) Figure 85



Note: The left side of the figure shows the trend in GHG emissions as an index (base year = 100); the right side of the figure shows the percentage contribution of the main GHG to the total emissions in the base year and 2000.

Figure 86

Change of UK CO_2 emissions from fossil-fuel combustion and the influence of main driving forces (population, GDP per capita, energy intensity of GDP, share of fossil fuels, shift within fossil fuels) in the 1990s

Source: Eurostat, Member State submission (CRF tables), EEA (2002a).

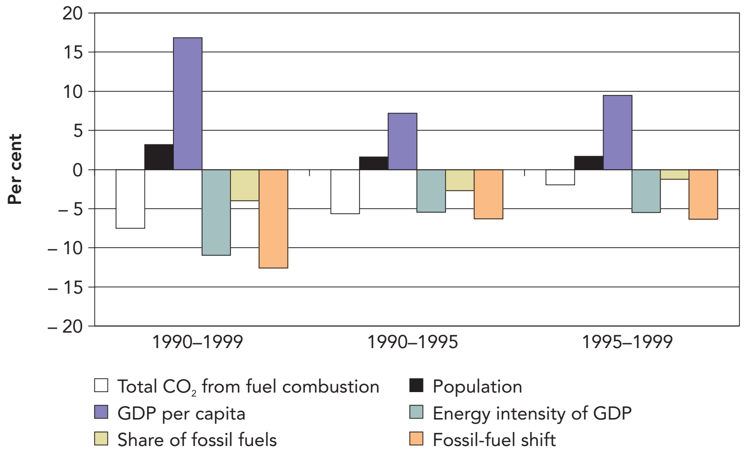


Table A1.85

Greenhouse gases and distance-to-target indicators for the United Kingdom

Source: Member State submission (CRF tables), EEA (2002a).

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Greenhouse gas emissions (without LUCF)	100,0	99,6	99,7	96,5	93,8	93,3	91,9	94,8	91,7	91,6	86,7	87,1
DTI 2010	0,0	– 0,4	0,3	– 2,2	– 4,3	– 4,2	– 4,9	– 1,5	– 3,9	– 3,4	– 7,7	– 6,7
CO_2 (without LUCF)	100,0	100,0	100,6	98,2	95,8	95,2	93,8	97,1	93,0	93,4	91,9	93,0
CH_4 (without LUCF)	100,0	100,0	98,5	96,1	92,0	83,5	83,1	81,2	78,3	74,7	71,0	66,6
N_2O (without LUCF)	100,0	100,0	97,2	87,1	81,6	88,1	84,1	87,1	89,5	85,4	66,1	64,6
F-gases	100,0	82,5	82,7	81,1	83,8	90,9	100,0	105,9	116,9	128,0	61,9	66,1

Table A1.86

Sectoral emission indicators (key sources) for the United Kingdom

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1.A.1. Energy industries (CO_2)	100	99	95	87	86	87	87	80	83	79	84
1.A.2. Manufacturing industries and construction (CO_2)	100	101	100	98	100	97	98	99	96	95	92
1.A.3. Transport (CO_2)	100	100	101	102	102	101	105	106	105	106	106
1.A.3. Transport (N_2O)	100	104	112	132	160	186	217	243	269	293	312
1.A.4. Other sectors (CO_2)	100	110	107	110	105	101	113	104	106	105	105
1.A.4. Other sectors (CH_4)	100	105	96	94	75	57	61	56	58	62	48
1.A.4. Other sectors (N_2O)	100	104	95	98	90	78	85	80	79	73	67
1.A.5. Other (CO_2)	100	81	77	78	75	74	72	69	60	60	55
1.B.1. Fugitive emissions from solid fuels (CH_4)	100	102	98	88	56	62	58	54	46	38	32
1.B.2. Fugitive emissions from oil and natural gas (CH_4)	100	96	95	93	93	92	89	85	84	80	77
2.A. Mineral products (CO_2)	100	85	80	80	88	89	91	100	100	94	89
2.B. Chemical industry (N_2O)	100	94	76	65	76	65	69	71	63	19	21
2.B. Chemical industry (HFC)	0	0	0	0	0	0	0	0	0	0	0
2.C. Metal production (CO_2)	100	69	66	70	82	80	99	66	51	93	101
2.C. Metal production (PFC)	100	77	37	23	20	18	15	12	11	10	10
2.E. Production of halocarbons and SF_6 (HFC)	100	104	108	112	117	123	126	138	145	38	38
2.F. Consumption of halocarbons and SF_6 (HFC)	100	2 637	5 520	18 899	84 006	186 352	299 043	419 686	546 198	640 344	748 164
4.A. Enteric fermentation (CH_4)	100	99	99	99	100	99	100	98	98	98	95
4.B. Manure management (CH_4)	100	99	99	100	101	99	100	100	101	99	95
4.B. Manure management (N_2O)	100	100	98	99	100	99	100	100	100	101	95
4.D. Agricultural soils (N_2O)	100	100	94	93	95	96	96	99	96	94	88
6.A. Solid waste disposal on land (CH_4)	100	97	92	88	85	82	78	74	69	64	59

Note: The list of key sources in this table is the one identified for the EC and differs from the one defined by the Member States for their UNFCCC reporting.

Source: Member State submission (CRF tables), EEA (2002a).

Main driving-force indicators for the United Kingdom

Table A1.87

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Population	100	100	101	101	101	102	102	103	103	103	:
GDP per capita	100	98	98	100	105	107	110	113	116	118	:
Energy intensity of GDP	100	103	102	102	98	95	96	91	91	90	:
Share of fossil fuels	100	100	99	97	97	97	97	97	96	96	:
Shift within fossil fuels (CO_2 intensity of fossil fuels)	100	100	99	97	95	94	93	92	90	88	:
GDP	100	99	99	101	106	109	112	116	119	122	126
Gross inland energy consumption	100	102	101	103	104	103	108	105	109	109	:
Heating degree days	:	:	:	:	:	100	114	98	97	96	100

Source: Eurostat, Member State inventory submission (CRF tables), EEA (2002a).

Sectoral driving-force indicators (Eurostat)

Table A1.88

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Final electricity consumption	100	102	103	104	104	107	111	113	115	118	:
Gross value added in industry	100	96	95	97	102	103	105	106	107	108	:
Volume passenger transport	100	99	99	99	101	101	103	105	105	105	:
Volume freight transport	100	96	93	99	106	110	113	115	120	115	:
Stock of permanently occupied dwellings	100	101	102	103	104	105	106	107	108	109	:

Source: Eurostat.

Sectoral driving-force indicators (CRF)

Table A1.89

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Coal mining and handling	100	101	92	74	53	57	53	52	44	40	34
Cement production	100	82	75	76	87	86	88	92	94	90	87
Use of synthetic fertilisers	100	100	90	85	89	91	89	96	90	86	76
Use of animal manures	100	100	96	97	99	97	99	98	97	101	97
Cattle population	100	98	99	98	99	98	100	96	95	95	92
Waste disposal on land	100	101	102	104	105	111	109	108	106	105	103

Source: Member State inventory submission (CRF tables), EEA (2002a).

Data basis for the CO_2 intensity indicators

Table A1.90

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Value added of iron and steel industry	100	89	77	73	81	82	68	84	:	:	:
Crude steel production	100	92	91	93	97	99	101	104	97	91	:
CO_2 emissions from iron and steel industry	100	96	90	88	106	110	108	110	92	84	:
Value added of glass, pottery & building mat. industry	100	82	72	:	81	77	76	88	:	:	:
CO_2 emissions from glass, pottery & building mat. industry	100	88	76	71	80	73	72	66	62	58	:
Value added of the chemical industry	100	110	110	108	114	114	115	134	:	:	:
CO_2 emissions from the chemical industry	100	99	166	110	153	115	151	139	138	160	:
All output of autoproducer thermal power stations	100	108	107	109	112	123	131	129	164	196	:
CO_2 emissions from autoproducer thermal power stations	100	122	101	126	69	79	78	93	133	121	:
Freight traffic on road	100	96	93	99	106	110	113	116	117	115	:
CO_2 emissions from diesel consumption of freight traffic	100	79	103	121	117	107	115	122	138	147	:
Value added of the services sector	100	100	100	103	108	111	116	121	126	130	:
CO_2 emissions from the services sector	100	150	152	153	147	162	154	146	140	139	:

Source: Eurostat.

European Union

This section presents indicators for the EU referred to in Chapters 2 and 3 including distance-to-target indicators, main driving-force indicators, sectoral greenhouse gas indicators, and sectoral driving-force indicators.

Table A1.91 **Distance-to-target indicators for the EU**

Source: EEA (2002a) based on inventory submissions by the Member States (CRF tables), EEA (2002a).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Greenhouse gas emissions (without LUCF)	100,0	100,2	97,9	95,8	96,0	97,0	98,8	97,3	97,7	96,2	96,5
DTI 2010	0,0	0,6	– 1,3	– 3,0	– 2,4	– 1,0	1,2	0,1	0,9	– 0,2	0,5
CO_2 (without LUCF)	100,0	100,8	98,5	96,5	96,7	97,9	100,0	98,2	99,7	99,0	99,5
CH_4 (without LUCF)	100,0	97,5	94,9	92,2	89,8	89,3	87,6	85,2	83,7	82,1	80,0
N_2O (without LUCF)	100,0	99,0	96,4	93,6	94,9	94,9	97,3	97,1	89,9	84,6	84,1
F-gases	100,0	98,1	95,5	99,5	109,7	120,4	128,9	143,6	152,4	122,9	135,9

Table A1.92 **Sectoral emission indicators (key sources) for the EU**

Source: EEA (2002a) based on inventory submissions by the Member States (CRF tables), EEA (2002a).

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1.A.1. Energy industries (CO_2)	100	100	97	92	93	94	94	91	95	93	95
1.A.2. Manufacturing industries and construction (CO_2)	100	96	93	89	92	95	93	94	92	91	92
1.A.3. Transport (CO_2)	100	102	106	106	107	108	110	112	116	118	118
1.A.3. Transport (N_2O)	100	108	119	131	142	154	165	176	188	198	203
1.A.4. Other sectors (CO_2)	100	107	102	104	99	100	110	102	102	100	97
1.A.4. Other sectors (CH_4)	100	102	93	91	82	74	78	74	73	73	69
1.A.4. Other sectors (N_2O)	100	103	98	97	92	86	87	85	77	78	71
1.A.5. Other (CO_2)	100	86	67	72	65	55	55	48	45	38	36
1.B.1. Fugitive emissions from solid fuels (CH_4)	100	95	92	83	67	70	63	59	53	48	41
1.B.2. Fugitive emissions from oil and natural gas (CH_4)	100	99	99	100	99	94	95	91	90	89	86
2.A. Mineral products (CO_2)	100	95	94	90	93	94	92	95	97	98	99
2.B. Chemical industry (N_2O)	100	100	95	89	92	90	95	93	67	45	44
2.B. Chemical industry (HFC)	100	100	100	100	100	50	0	0	0	0	0
2.C. Metal production (CO_2)	100	90	83	84	88	96	92	94	88	92	94
2.C. Metal production (PFC)	100	87	70	57	50	49	48	46	45	44	39
2.E. Production of halocarbons and SF_6 (HFC)	100	100	101	105	120	132	142	156	160	86	82
2.F. Consumption of halocarbons and SF_6 (HFC)	100	107	151	573	859	1 541	2 465	3 510	4 535	5 706	8 212
4.A. Enteric fermentation (CH_4)	100	97	95	95	95	95	95	94	93	93	91
4.B. Manure management (CH_4)	100	97	97	97	98	98	98	100	101	100	100
4.B. Manure management (N_2O)	100	93	93	90	90	89	90	89	89	89	87
4.D. Agricultural soils (N_2O)	100	98	95	94	94	94	96	96	96	96	96
6.A. Solid waste disposal on land (CH_4)	100	98	94	90	89	88	84	80	78	76	74

Table A1.93 **Main driving-force indicators for the EU**

Source: Eurostat, inventory submissions by the Member States (CRF tables), EEA (2002a), EC (2000b) for heating degree days.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Population	100	100	101	101	102	102	102	103	103	103	:
GDP per capita	100	101	102	101	103	105	107	109	112	115	:
Energy intensity of GDP	100	101	99	99	97	96	98	96	95	93	:
Share of fossil fuels	100	100	99	98	98	98	98	97	98	97	:
Shift within fossil fuels (CO_2 intensity of fossil fuels)	100	99	98	97	97	97	95	94	94	93	:
GDP	100	101	103	102	105	107	109	112	115	118	122
Gross inland energy consumption	100	102	101	101	101	103	107	107	109	109	:
Heating degree days	100	119	110	110	99	103	116	102	101	:	:

Note: Eurostat estimated data in italics.

Sectoral driving-force indicators Table A1.94

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Final electricity consumption	100	102	103	103	105	109	111	114	116	119	:
Gross value added in industry	*100*	*100*	*100*	*96*	*100*	*102*	*102*	*104*	*107*	*108*	:
Volume passenger transport	100	102	106	107	109	109	111	113	115	117	:
Volume freight transport	100	109	110	110	118	123	124	129	135	142	:
Stock of permanently occupied dwellings [1)]	100	101	102	103	104	106	107	108	109	111	:
Coal mining and handling	100	90	84	74	66	66	63	60	55	52	:
Cement production	100	98	94	88	93	93	91	93	98	102	:
Use of nitrogenous fertiliser	100	97	89	90	94	93	98	95	97	98	:
Use of animal manures	:	:	:	:	:	:	:	:	:	:	:
Cattle population	100	99	95	93	92	92	93	92	91	91	90
Waste disposal on land	:	:	:	:	:	:	:	:	:	:	:

Source: Eurostat, FAO for use of nitrogenous fertiliser and cattle population.

[1)] Includes estimates for Belgium and Luxembourg.

Eurostat estimated data in italics.

Data basis for the CO_2 intensity indicators Table A1.95

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Value added of iron and steel industry	*100*	*94*	*88*	*78*	*88*	*86*	*84*	*88*	*90*	*89*	:
Crude steel production	100	101	97	97	102	105	99	108	108	105	:
CO_2 emissions from iron and steel industry	100	95	89	85	92	94	89	95	90	85	:
Value added of glass, pottery & building mat. industry	*100*	*98*	*97*	*90*	*96*	*96*	*96*	*97*	*100*	*105*	:
CO_2 emissions from glass, pottery & building mat. industry	100	97	94	87	86	85	85	84	82	88	:
Value added of the chemical industry	*100*	*100*	*104*	*104*	*110*	*112*	*114*	*119*	*122*	*130*	:
CO_2 emissions from the chemical industry	100	87	91	85	86	83	79	76	68	70	:
All output of autoproducer thermal power stations	100	100	99	103	104	112	117	127	137	147	:
CO_2 emissions from autoproducer thermal power stations	100	104	95	100	93	87	82	85	91	91	:
Freight traffic on road [1)]	100	101	103	103	109	111	113	117	125	131	:
CO_2 emissions from diesel consumption of freight traffic [1)]	100	79	103	121	117	107	115	122	138	147	:
Value added of the services sector	*100*	*102*	*104*	*105*	*107*	*109*	*112*	*115*	*119*	*123*	:
CO_2 emissions from the services sector	100	105	108	106	101	102	110	104	99	98	:

Source: Eurostat.

[1)] Does not include data for Belgium, Ireland, Luxembourg, Portugal.

Eurostat estimated data in italics.

Annex 2: Summary of EC and Member States greenhouse gas emissions data

This annex gives a short summary of the inventory data used in this report which are taken from the EEA technical report *Annual European Community greenhouse gas inventory 1990–2000 and inventory report 2002* (EEA, 2002a). This report includes all detailed emission tables and is available on the EEA web site (http://www.eea.eu.int/).

Greenhouse gas emission data, as referred to in this report, do not include emissions and removals from LUCF.

Table A2.1 **Austria**

	Base Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	CO_2 equivalent (Tg = million tons)											
CO_2 (without LUCF)	62,3	62,3	66,2	60,3	60,7	62,0	64,0	65,4	67,0	65,5	66,0	66,1
CH_4 (without LUCF)	11,3	11,3	11,1	10,8	10,7	10,5	10,3	10,1	9,9	9,6	9,5	9,4
N_2O (without LUCF)	2,3	2,3	2,4	2,4	2,5	2,6	2,6	2,6	2,6	2,6	2,5	2,5
HFCs	0,5	0,0	0,0	0,0	0,0	0,0	0,5	0,6	0,7	0,8	0,9	1,0
PFCs	0,0	1,0	1,0	0,6	0,0	0,1	0,0	0,0	0,0	0,0	0,0	0,0
SF_6	1,2	0,5	0,7	0,7	0,8	1,0	1,2	1,2	1,1	1,0	0,7	0,7
Total (without LUCF)	**77,6**	**77,4**	**81,3**	**74,9**	**74,8**	**76,2**	**78,6**	**80,0**	**81,3**	**79,5**	**79,7**	**79,8**

Table A2.2 **Belgium**

	Base Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	CO_2 equivalent (Tg = million tons)											
CO_2 (without LUCF)	118,0	118,0	123,6	122,7	120,9	124,1	127,6	130,4	125,6	128,6	125,6	127,0
CH_4 (without LUCF)	11,5	11,5	11,5	11,6	11,5	11,6	11,5	11,4	11,3	11,3	11,2	10,9
N_2O (without LUCF)	13,0	13,0	12,7	12,4	12,6	13,2	13,8	13,4	13,3	13,7	13,6	13,2
HFCs	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,4	0,5	0,6	0,8	0,8
PFCs	0,0	0,1	0,1	0,1	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0
SF_6	0,2	0,3	0,3	0,3	0,3	0,3	0,2	0,2	0,2	0,0	0,0	0,0
Total (without LUCF)	**143,0**	**143,1**	**148,4**	**147,4**	**145,7**	**149,7**	**153,5**	**155,8**	**150,9**	**154,2**	**151,2**	**151,9**

Table A2.3 **Denmark**

	Base Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	CO_2 equivalent (Tg = million tons)											
CO_2 (without LUCF)	58,9	52,6	63,5	57,5	59,9	63,9	61,0	74,5	65,2	60,0	57,2	52,9
CH_4 (without LUCF)	5,8	5,8	5,9	5,9	6,0	6,1	6,1	6,2	6,1	6,0	5,7	5,8
N_2O (without LUCF)	10,8	10,8	10,7	10,1	10,2	10,0	9,9	9,7	9,3	9,4	9,3	9,1
HFCs	0,2	0,0	0,0	0,0	0,1	0,1	0,2	0,4	0,4	0,5	0,6	0,7
PFCs	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
SF_6	0,1	0,0	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
Total (without LUCF)	**76,0**	**69,4**	**80,2**	**73,6**	**76,3**	**80,2**	**77,4**	**90,9**	**81,1**	**76,0**	**72,9**	**68,5**

Note: Base-year emissions are adjusted for electricity trade.

Finland

Table A2.4

	Base Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	CO_2 equivalent (Tg = million tons)											
CO_2 (without LUCF)	62,5	62,5	61,1	58,7	59,2	65,5	62,7	68,1	66,8	64,6	64,1	62,3
CH_4 (without LUCF)	6,1	6,1	5,8	5,4	5,0	4,7	4,6	4,5	4,3	4,1	3,9	3,9
N_2O (without LUCF)	8,4	8,4	7,9	7,3	7,5	7,6	7,8	7,8	8,1	7,9	7,7	7,2
HFCs	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,2	0,2	0,3	0,5
PFCs	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
SF_6	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total (without LUCF)	**77,1**	**77,1**	**74,8**	**71,4**	**71,7**	**77,8**	**75,2**	**80,5**	**79,4**	**76,8**	**76,1**	**74,0**

France

Table A2.5

	Base Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	CO_2 equivalent (Tg = million tons)											
CO_2 (without LUCF)	394,1	394,1	417,4	408,2	388,5	384,0	390,5	404,2	398,3	419,5	407,0	401,9
CH_4 (without LUCF)	64,5	64,5	65,5	66,0	66,7	67,1	68,1	67,4	62,2	61,5	59,8	58,2
N_2O (without LUCF)	85,6	85,6	85,1	83,6	81,0	81,5	83,6	85,1	86,2	78,3	72,8	71,2
HFCs	2,3	2,3	1,5	1,1	0,8	0,8	1,3	2,2	3,1	3,8	4,8	7,0
PFCs	3,2	3,2	2,5	2,1	1,6	1,4	1,3	1,5	1,5	1,7	1,9	1,7
SF_6	2,2	2,2	2,2	2,2	2,3	2,3	2,3	2,4	2,4	2,3	2,3	2,3
Total (without LUCF)	**551,8**	**551,8**	**574,3**	**563,2**	**541,0**	**537,3**	**547,1**	**562,7**	**553,7**	**567,0**	**548,6**	**542,3**

Germany

Table A2.6

	Base Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	CO_2 equivalent (Tg = million tons)											
CO_2 (without LUCF)	1 014,5	1 014,5	976,0	928,3	918,3	904,1	903,7	923,1	892,6	886,0	859,2	857,9
CH_4 (without LUCF)	110,7	110,7	99,6	92,4	84,4	79,2	75,9	69,0	67,4	65,2	63,9	60,6
N_2O (without LUCF)	88,6	88,6	84,4	85,8	82,0	79,4	80,4	82,0	77,5	63,8	60,2	60,1
HFCs	3,1	2,3	2,3	2,5	3,8	4,0	3,1	2,6	3,5	4,3	5,3	7,7
PFCs	1,8	2,7	2,4	2,1	2,0	1,7	1,8	1,8	1,6	1,7	1,7	1,7
SF_6	6,2	3,9	4,3	4,9	5,4	5,8	6,2	5,8	5,7	5,5	3,5	3,4
Total (without LUCF)	**1 225,0**	**1 222,8**	**1 169,0**	**1 116,0**	**1 095,8**	**1 074,1**	**1 071,2**	**1 084,4**	**1 048,2**	**1 026,5**	**993,8**	**991,4**

Greece

Table A2.7

	BaseYear	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	CO_2 equivalent (Tg = million tons)											
CO_2 (without LUCF)	84,3	84,3	84,2	85,8	85,8	87,5	87,6	90,2	94,7	99,4	98,6	103,7
CH_4 (without LUCF)	8,6	8,6	8,7	8,8	9,0	9,2	9,4	9,8	9,9	10,1	10,4	10,5
N_2O (without LUCF)	10,6	10,6	10,5	10,4	10,1	10,2	9,9	10,3	10,6	10,6	10,4	11,0
HFCs	3,4	0,9	1,1	0,9	1,6	2,2	3,4	3,9	4,2	4,1	4,2	4,3
PFCs	0,1	0,3	0,3	0,3	0,2	0,1	0,1	0,1	0,2	0,2	0,1	0,1
SF_6	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total (without LUCF)	**107,0**	**104,8**	**104,8**	**106,2**	**106,7**	**109,2**	**110,4**	**114,2**	**119,5**	**124,3**	**123,7**	**129,7**

Table A2.8 **Ireland**

	Base Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	CO_2 equivalent (Tg = million tons)											
CO_2 (without LUCF)	31,5	31,5	32,2	32,8	32,3	33,9	34,4	35,6	38,0	40,0	41,8	43,8
CH_4 (without LUCF)	12,8	12,8	13,0	13,0	13,1	13,2	13,3	13,6	13,7	13,6	13,3	12,8
N_2O (without LUCF)	9,1	9,1	8,9	8,9	9,0	9,3	9,5	9,7	9,5	10,1	10,1	9,7
HFCs	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
PFCs	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
SF_6	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Total (without LUCF)	**53,4**	**53,4**	**54,1**	**54,7**	**54,5**	**56,4**	**57,2**	**58,8**	**61,3**	**63,7**	**65,3**	**66,3**

Table A2.9 **Italy**

	Base Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	CO_2 equivalent (Tg = million tons)											
CO_2 (without LUCF)	441,1	441,1	440,2	439,2	426,8	420,6	445,9	440,3	442,7	456,5	459,1	461,8
CH_4 (without LUCF)	39,3	39,3	39,7	37,9	37,5	38,0	38,6	38,4	38,5	38,1	37,7	37,7
N_2O (without LUCF)	40,8	40,8	42,3	41,5	41,7	40,7	41,9	41,6	42,8	39,8	40,8	41,6
HFCs	0,9	0,4	0,4	0,4	0,4	0,6	0,9	0,8	1,2	1,4	1,6	1,8
PFCs	0,3	0,2	0,2	0,2	0,2	0,2	0,3	0,2	0,2	0,2	0,2	0,2
SF_6	0,5	0,3	0,4	0,4	0,4	0,4	0,5	0,5	0,6	0,5	0,3	0,3
Total (without LUCF)	**522,9**	**522,1**	**523,1**	**519,5**	**507,0**	**500,5**	**528,1**	**521,8**	**525,9**	**536,4**	**539,5**	**543,5**

Table A2.10 **Luxembourg**

	Base Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	CO_2 equivalent (Tg = million tons)											
CO_2 (without LUCF)	10,2	10,2	10,7	10,5	10,7	12,0	7,1	7,1	6,1	5,2	5,4	5,4
CH_4 (without LUCF)	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
N_2O (without LUCF)	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,1	0,1
HFCs	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
PFCs	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
SF_6	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Total (without LUCF)	**10,8**	**10,8**	**11,4**	**11,2**	**11,4**	**12,7**	**7,7**	**7,8**	**6,8**	**5,9**	**6,0**	**5,9**

Table A2.11 **Netherlands**

	Base Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	CO_2 equivalent (Tg = million tons)											
CO_2 (without LUCF)	159,6	159,6	167,5	165,7	167,9	168,8	172,7	179,7	169,0	175,1	172,1	173,5
CH_4 (without LUCF)	27,1	27,1	27,5	26,4	25,7	25,3	24,6	24,6	23,1	22,4	21,8	20,6
N_2O (without LUCF)	16,5	16,5	19,2	19,7	19,7	20,2	18,2	20,3	21,1	17,8	17,4	17,0
HFCs	6,0	4,4	4,8	4,5	5,1	6,3	6,0	7,2	8,2	9,2	4,8	3,9
PFCs	1,9	2,4	2,4	2,1	2,1	1,9	1,9	2,0	2,2	1,7	1,4	1,5
SF_6	0,4	0,2	0,1	0,1	0,1	0,1	0,4	0,4	0,4	0,4	0,3	0,3
Total (without LUCF)	**211,5**	**210,3**	**221,5**	**218,5**	**220,7**	**222,6**	**223,6**	**234,2**	**224,0**	**226,5**	**217,8**	**216,9**

Portugal Table A2.12

	Base Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	CO_2 equivalent (Tg = million tons)											
CO_2 (without LUCF)	44,1	44,1	46,0	49,6	48,6	48,7	52,7	51,0	53,1	56,9	64,1	63,2
CH_4 (without LUCF)	12,9	12,9	12,9	12,8	12,5	12,7	12,7	12,7	12,8	12,8	13,1	13,1
N_2O (without LUCF)	7,9	7,9	7,9	7,7	7,6	7,5	7,8	7,8	7,7	8,0	8,3	8,3
HFCs	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
PFCs	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2
SF_6	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total (without LUCF)	**65,1**	**65,1**	**66,9**	**70,2**	**68,8**	**69,1**	**73,3**	**71,7**	**73,8**	**77,8**	**85,6**	**84,7**

Spain Table A2.13

	Base Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	CO_2 equivalent (Tg = million tons)											
CO_2 (without LUCF)	227,2	227,2	234,5	243,0	229,9	242,7	254,4	242,2	261,4	270,1	295,2	306,6
CH_4 (without LUCF)	29,6	29,6	30,0	30,9	31,3	32,1	32,8	34,8	35,4	36,6	37,3	38,4
N_2O (without LUCF)	26,3	26,3	26,0	25,3	23,3	25,6	25,4	27,7	26,9	27,7	29,0	30,5
HFCs	4,6	2,4	2,2	2,8	2,3	3,5	4,6	5,3	6,5	6,6	8,5	9,9
PFCs	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,8	0,7	0,7	0,4
SF_6	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,2
Total (without LUCF)	**288,7**	**286,4**	**293,6**	**302,8**	**287,6**	**304,7**	**318,1**	**310,9**	**331,2**	**341,9**	**370,9**	**386,0**

Sweden Table A2.14

	Base Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	CO_2 equivalent (Tg = million tons)											
CO_2 (without LUCF)	56,1	56,1	56,7	55,0	54,9	59,2	58,6	62,1	57,1	58,1	56,5	55,9
CH_4 (without LUCF)	6,8	6,8	6,7	6,9	6,8	6,7	6,6	6,6	6,5	6,4	6,2	5,9
N_2O (without LUCF)	7,2	7,2	6,9	6,8	7,0	7,1	6,9	7,1	7,1	7,3	7,1	6,9
HFCs	0,1	0,0	0,0	0,0	0,0	0,1	0,1	0,2	0,3	0,3	0,3	0,4
PFCs	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,3	0,3	0,3	0,3	0,3
SF_6	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,1	0,1	0,1
Total (without LUCF)	**70,7**	**70,6**	**70,9**	**69,1**	**69,2**	**73,6**	**72,7**	**76,4**	**71,4**	**72,5**	**70,5**	**69,4**

United Kingdom Table A2.15

	Base Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	CO_2 equivalent (Tg = million tons)											
CO_2 (without LUCF)	583,7	583,7	587,3	573,0	558,9	555,9	547,4	567,0	542,7	545,1	536,5	542,7
CH_4 (without LUCF)	76,5	76,5	75,4	73,6	70,4	63,9	63,6	62,2	59,9	57,2	54,4	51,0
N_2O (without LUCF)	67,9	67,9	66,0	59,1	55,4	59,8	57,1	59,1	60,8	58,0	44,9	43,9
HFCs	15,2	11,4	11,9	12,3	12,9	13,8	15,2	16,3	18,4	20,2	8,6	9,3
PFCs	1,1	2,3	1,8	1,0	0,8	1,0	1,1	0,9	0,7	0,7	0,7	0,7
SF_6	1,1	0,7	0,8	0,8	0,9	1,1	1,1	1,3	1,3	1,5	1,5	1,5
Total (without LUCF)	**745,5**	**742,5**	**743,0**	**719,8**	**699,4**	**695,5**	**685,5**	**706,7**	**683,8**	**682,6**	**646,5**	**649,1**

Table A2.16 **European Union**

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	CO_2 equivalent (Tg = million tons)										
CO_2 (without LUCF)	3 341,8	3 366,9	3 290,3	3 223,4	3 232,8	3 270,3	3 340,8	3 280,3	3 330,5	3 308,5	3 324,8
CH_4 (without LUCF)	424,3	413,7	402,7	391,2	380,8	378,7	371,8	361,5	355,3	348,5	339,2
N_2O (without LUCF)	395,2	391,1	381,1	369,7	374,8	374,9	384,5	383,7	355,1	334,1	332,2
HFCs	24,4	24,5	24,8	27,2	31,8	35,8	40,0	47,1	52,0	40,7	47,3
PFCs	13,5	11,9	9,8	8,4	7,7	7,8	7,8	7,5	7,4	7,3	6,8
SF_6	8,4	9,1	9,7	10,5	11,4	12,3	12,1	12,0	11,3	9,0	9,0
Total (without LUCF)	4 207,6	4 217,3	4 118,4	4 030,5	4 039,4	4 079,8	4 156,9	4 092,1	4 111,6	4 048,2	4 059,3

Note: For fluorinated gases, most Member States have selected a base year other than 1990 (namely 1995), as allowed for under the Kyoto Protocol. The European Union as a whole has not yet selected a base year for the fluorinated gases. For the analysis of emission trends in this report, for the EU as a whole, 1990 emission data have been used as the base year for all gases.

Annex 3: Greenhouse gas emission trends in the candidate countries, 1990–1999 (2000)

Introduction

This annex provides a trend assessment of greenhouse gas emissions in the following 10 candidate countries: Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia. It is the first step towards regular assessment of greenhouse gas emission trends in these candidate countries. The annex is based on the data and information (CRF tables) provided by six candidate countries (Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Slovakia) under Council Decision 1999/296/EC. The information is completed with the data from UNFCCC and EMEP databases.

The purpose of this annex is:

- to show data availability in the candidate countries to fulfil the voluntary requirements of reporting under Council Decision 1999/296/EC and under the UNFCCC;
- to illustrate greenhouse gas emission trends of the candidate countries and to identify progress towards fulfilling their commitments under the UNFCCC and the Kyoto Protocol;
- to identify gaps in emission reporting to assist parties in completing the required information;
- (to identify indicators for main driving forces of greenhouse gas emissions in these countries).

The outline of this annex
The annex starts with a section, providing summary information on status of reporting and data availability in the candidate countries. The next section shows trends and distance-to-target indicators for the region as a whole and summary information for each candidate country. The last section presents a short analysis for each of the 10 candidate countries including the sectoral emission trends. The emissions presented in key sector tables in the last section are limited to the data reported by countries.

Reporting
The reporting under Council Decision 1993/389/EEC as amended by Decision 1999/296/EC for a monitoring mechanism of Community CO_2 and other greenhouse gas emissions (3) is not obligatory for candidate countries yet, but should be implemented when joining the EU. Candidate countries are required to report greenhouse gas emissions under the UNFCCC and CLRTAP. Candidate countries are Annex I parties to the UN Framework Convention on Climate Change and some of the candidate countries already ratified the Kyoto Protocol (Table 17).

Under the UNFCCC 10 candidate countries (Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia) belong to the group of countries undergoing the process of transition to a market economy. They can apply a certain degree of flexibility in the implementation of their commitments under Article 4.6 of the UNFCCC. The practical implication of this flexibility led to the declaration of base years other than 1990 in Bulgaria (1988), Hungary (average 1985–87), Poland (1988), Romania (1989), and Slovenia (1986).

(3) OJ L 117, 5.5.1999, p. 35. For a brief description of this Council Decision see Section 1.1 in this report.

Table A3.1 **Kyoto Protocol status of ratification in non-EU parties**

Source: UNFCCC.

Country	Signature	Ratification	% of emissions 1)	Reduction commitment 1)
Bulgaria	18.9.1998		0.6	92 %
Czech Republic	23.11.1998	15.11.2001 (Ap)	1.2	92 %
Cyprus 2)	—	16.7.1999 (Ac)	—	Not included in Annex B
Estonia	3.12.1998		0.3	92 %
Hungary			0.5	94 %
Latvia	14.12.1998		0.2	92 %
Lithuania	21.9.1998		—	92 %
Malta 2)	17.4.1998	11.11.2001 (R)	—	Not included in Annex B
Poland	15.7.1998		3.0	94 %
Romania	5.1.1999	19.3.2001 (R)	1.2	92 %
Slovakia	26.2.1999	31.5.2002 (R)	0.4	92 %
Slovenia	21.10.1998		—	92 %
Turkey 2)			—	Not included in Annex B

Status on 17 June 2002.
1) Percentage and reduction commitment (percentage of base year) as listed in Kyoto Protocol.
2) Cyprus and Malta are not Annex I parties, Turkey is also Annex II party to the UNFCCC.

Primary data used for this annex
The main data source of this report are data supplied by the candidate countries under the UNFCCC (submission 2001 or 2002), data reported to UNECE/EMEP, and data submitted under Council Decision 1999/296/EC by May 2002. Background data were obtained from the IEA and Eurostat.

The completeness of the data sets reported under the UNFCCC, UNECE/EMEP and Council Decision 296/1999/EC differs among the parties (Table 18). Some parties reported emissions for the whole period 1990–2000 in consistent time series. Several countries still need to remove gaps and inconsistencies in order to fulfil the requirements of the UNFCCC and the Kyoto Protocol ([4]). No emission data are available for Cyprus, Malta and Turkey. The following problems were identified for some countries:

- new gases are not reported at all, or only incomplete time series are reported, the base year for fluorinated gases is not reported;
- estimation methods are not consistently applied for the whole period;
- emissions are not reported for all gases and years from 1990 to 2000;
- sector emissions are not reported consistently;
- 2000 year emissions are not reported in the last submission (2002).

For the preparation of this summary section of the annex and for the calculation of the indicators, a data gap-filling procedure (interpolation, extrapolation) was applied in accordance with standard rules developed under the EEA/ETC-ACC: national totals were interpolated for Lithuania (CO_2 and CH_4, 1991–94; N_2O, 1991–97), the Czech Republic (N_2O, 1991–95). The last reported value for Lithuania (1998 values for all gases in 1999), Romania (1994 values for all gases 1995–99) and Slovenia (1996 values for all gases 1997–99). Gaps in sectoral data were not filled.

The data availability of fluorinated gas emissions is very limited; therefore, these emissions were not included in total greenhouse gas emissions in this annex.

Note: For the sectoral analysis in this annex, the same key source categories are used as identified for the EU, in order to facilitate the comparison between EC Member States and candidate countries ([1]). IPCC key source categories for national reporting under UNFCCC have to be identified by the candidate countries themselves and can differ from those of the EU.

(4) Some details see in country-related tables in the next section.
(5) A description of the selection of the EC key sources is provided in Section 3.1.

Data and base year of the candidate countries Table A3.2

Country	Base year	Emissions CO_2, CH_4, N_2O	Emissions of fluorinated gases
Bulgaria	1988	1988, 1990–99	1998–99
Czech Republic	1990	1990–2000	1995–2000
Estonia	1990	1990–2000	NA
Hungary	Average 1985–87	Average 1985–87, 1990–2000	1998–2000
Latvia	1990	1990–2000	1999–2000
Lithuania	1990	1990, 1995–98	NA
Poland	1988	1988, 1990–99	1995–2000
Romania	1989	1989,1990–94	NA
Slovakia	1990	1990–2000	1990–2000
Slovenia	1986	1986, 1990–96	1990–96
Cyprus	NA	NA	NA
Malta	NA	NA	NA
Turkey	NA	NA	NA

Source: Submissions by candidate countries (CRF tables, IPCC tables), UNFCCC database, EMEP database.

Note: NA –data are not available from any of these sources.

Distance-to-target assessment of 10 candidate countries

This section provides an overview of the progress of the candidate countries towards fulfilling their greenhouse gas emission targets. According to Article 4.2 of the UNFCCC, parties shall aim at returning individually or jointly to their 1990 levels of anthropogenic emissions of carbon dioxide and other greenhouse gases not controlled by the Montreal Protocol. In the Kyoto Protocol, eight candidate countries agreed to reduce their greenhouse gas emissions by 8 % by 2008–12, from base-year levels. Hungary and Poland agreed to reduce their emissions by 6 % from base-year levels (Table 17).

The candidate countries do not have a common target for emission reductions. All countries have to reach their targets individually as defined in the Kyoto Protocol, and all candidate countries aimed to stabilise emissions in line with Article 4.2 of the UNFCCC. Nevertheless, an aggregate analysis is performed in this section for information purposes and in order to compare the overall trends in the candidate countries with the trends in the EU.

Distance-to-target indicator (DTI)
In the whole region of the 10 candidate countries, total greenhouse gas emissions declined by 33.7 % between the base year and 1999 (Figure 87). The aggregated base-year emission for the 10 candidate countries is assumed to be the sum of the base-year emissions of the individual candidate countries (Table 19). In 1999, the distance-to-target indicator for the whole region was – 30.2 index points ([6]). This means that the whole region was far below its hypothetical Kyoto target path in this year.

The performance of the candidate countries, however, varies considerably (Figure 88). Nine countries were below their Kyoto target path, with distance-to target indicators ranging from – 13 index points in Hungary to – 60 index points in Latvia. Only Slovenia was above its target path, with + 2.9 index points.

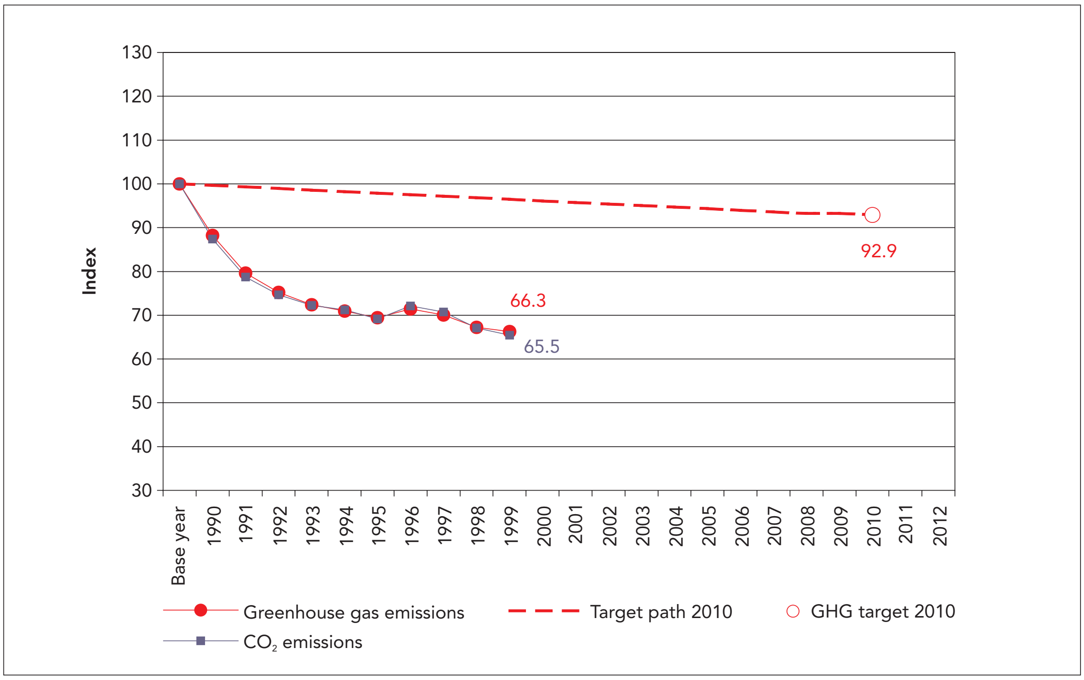
The calculated distance-to-target indicators for the whole region as well as for Romania, Slovenia and Lithuania are indicative, as the three countries did not provide the complete emission time series. In order to enable a preliminary assessment of the trends in all candidate countries as a whole, a standardised EEA/ETC-ACC gap-filling procedure was applied.

(6) For a description of the distance-to-target indicator see Section 1.2.

Figure 87

Greenhouse gas emissions of 10 candidate countries compared with their Kyoto targets for 2008–12 (excl. fluorinated gases and LUCF)

Source: Submissions by candidate countries (CRF tables, IPCC tables), UNFCCC database, EMEP database.



Note: Lithuania 1998, Romania 1994, Slovenia 1996 did not report the complete time series, for missing years the values were interpolated (in the middle of series) or data from the last submitted year were used.

Table A3.3

Greenhouse gas emissions in CO_2 equivalents (excl. fluorinated gases and LUCF) and Kyoto Protocol targets for 2008–12

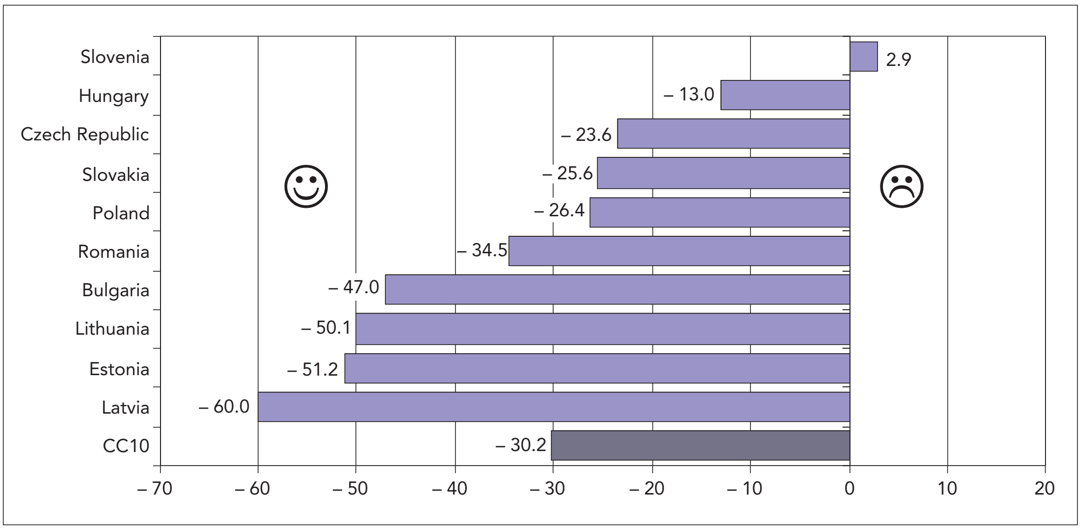
Source: Submissions by candidate countries (CRF tables, IPCC tables), UNFCCC database, EMEP database.

Country	Base year (million tonnes)	1990 (million tonnes)	1999 (million tonnes)	Change 1998–99 (%)	Change base year–1999 (%)	Targets 2008–12 under Kyoto Protocol (%)	Distance-to-target indicator (DTI) (index points)	Evaluation of progress in 1999
Bulgaria	157,1	137,7	77,6	– 3,9	– 50,6	– 8,0	– 47,0	☺
Czech Republic	192,0	192,0	139,8	– 5,5	– 27,2	– 8,0	– 23,6	☺
Estonia	43,5	43,5	19,7	– 8,6	– 54,8	– 8,0	– 51,2	☺
Hungary	101,6	86,6	85,7	3,6	– 15,7	– 6,0	– 13,0	☺
Latvia	31,0	31,0	11,3	– 6,6	– 63,6	– 8,0	– 60,0	☺
Lithuania	51,5	51,5	23,9	–	– 53,7	– 8,0	– 50,1	☺
Poland	564,3	459,0	400,2	– 0,6	– 29,1	– 6,0	– 26,4	☺
Romania	264,9	229,1	164,0	–	– 38,1	– 8,0	– 34,5	☺
Slovakia	72,6	72,6	51,4	– 2,6	– 29,2	– 8,0	– 25,6	☺
Slovenia	19,9	18,3	19,8	–	– 0,7	– 8,0	2,9	☹
CC10	**1 498,4**	**1 321,4**	**993,3**	**– 1,5**	**– 33,7**	**– 7,1**	**– 30,2**	**☺**

Note: Lithuania 1998, Romania 1994, Slovenia 1996 did not report the complete time series; for missing years, the values from the last submitted year were used. The percentage change of 1998–99 does not include the data for these countries.

Note: The common target under Kyoto Protocol for all candidate countries was calculated for the presentation of the development in the 10 candidate countries as a region for this report only, and does not have any legally binding implication.

Distance-to-target indicators (in index points) for the Kyoto Protocol of candidate countries Figure 88



Source: Submissions by candidate countries (CRF tables, IPCC tables), UNFCCC database, EMEP database.

Note: The distance-to-target indicator is related to the year 1999 for all candidate countries, except for Lithuania 1998, Romania 1994, Slovenia 1996. The year 1999 was used for comparison, as for this year data for seven countries were available. For 2000, data for only five countries were available.

Emission trends

Bulgaria, the Czech Republic, Estonia, Latvia, Poland, and Slovakia partly achieved substantial greenhouse emission cuts in 1999 compared to 1998. All these countries have already achieved or will achieve the aim of the UNFCCC to keep greenhouse gas emissions below 1990 levels by the year 2000 (not all of these countries provided data for 2000). The emissions in Hungary were 13 % below the base-year level in 1999, but from 1998 to 1999 emissions already increased by 3.6 %. For Lithuania, Romania, and Slovenia, data for the year 1999 are not available. By simple extrapolation of emission trends from previous years Romania and Lithuania achieve their targets, but Slovenia will need emission cuts to fulfil the commitments.

In the region, CO_2 is by far the most important greenhouse gas (about 80 %), second is methane and third is N_2O (Figure 89). Fluorinated gas emissions are not yet reported consistently in most of the candidate countries, but in general they do not contribute more than 1 % to national totals. Compared to the base year, the share of CO_2 and CH_4 emissions slightly decreased, and the share of N_2O in total greenhouse gas emissions in the region increased from 6.6 % to 8.0 %. These changes are partly influenced by inconsistent N_2O calculation methodologies in some countries and might change after revisions of national totals during the commitment period.

In 1999, total greenhouse gas emissions were 33.7 % below base-year levels in the whole region, and 1.5 % below 1998 emissions (7). In most candidate countries, the CO_2 emissions decreased more than total greenhouse gas emissions.

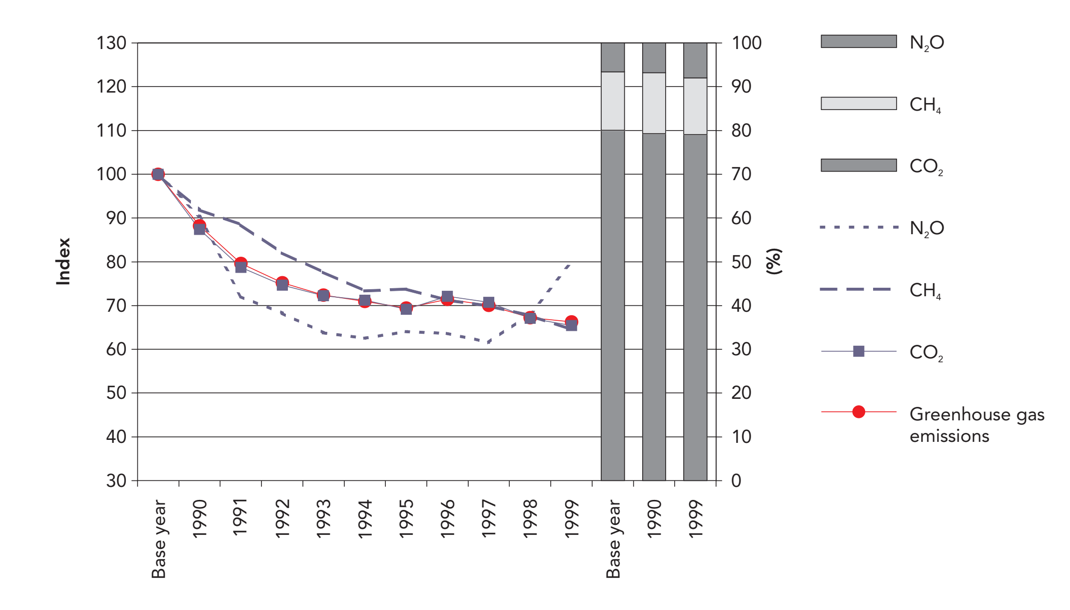
All countries reduced significantly emissions of greenhouse gases in the first half of the 1990s. The further development of greenhouse gas emissions is more individual and depends on country-specific economic developments. The emissions in Slovenia, the Czech Republic, Poland and Hungary show increases, the other countries show stabilisations or continued decreases. The development in methane emissions follows the same trend as CO_2. The nitrous oxide emissions trend is only partly caused by increasing transport emissions, a main reason seems to be inconsistent reporting of agricultural emissions.

GDP is growing faster than greenhouse gas emissions in all countries (Figure 90). GDP data are not available for all countries for the whole period. The increasing gap between emissions and GDP shows that the energy use must have decoupled considerably from the economic activity in the region.

(7) Note that the percentage change 1998–99 does not include data from Lithuania, Romania and Slovenia.

Figure 89 **Candidate countries' greenhouse gas emissions by gas (excl. fluorinated gases and LUCF)**

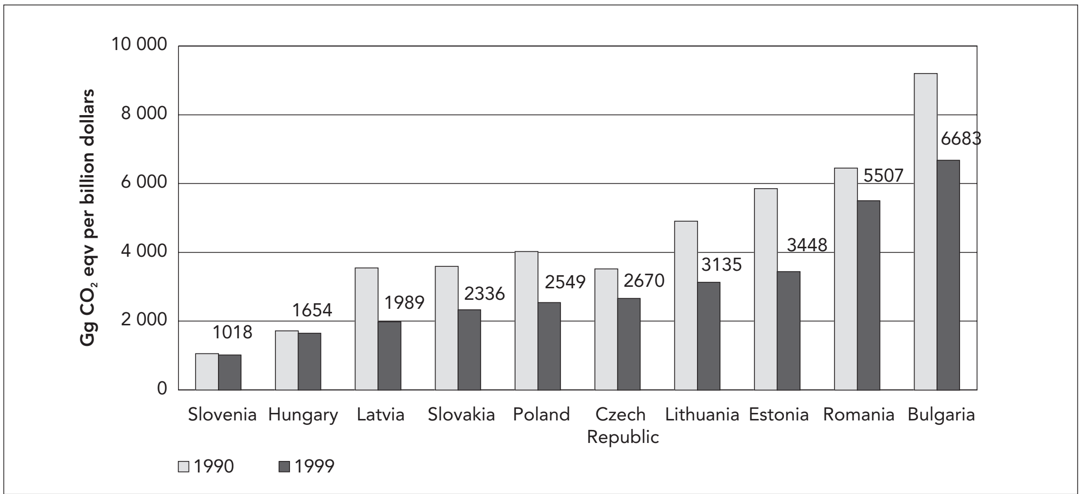
Source: Submissions by the candidate countries (CRF tables), UNFCCC database, EMEP database.



Note: It is very difficult to calculate consistent GDP values for economies in transition for the whole period from 1990 to 2000. In most countries, the calculation methods of GDP changed in the years 1992/1993/1994. The GDP for earlier years are not available (Baltic countries, Slovenia) or were estimated retrospectively.

Figure 90 **Greenhouse gas emissions per GDP by country for the candidate countries 1990 and 1999**

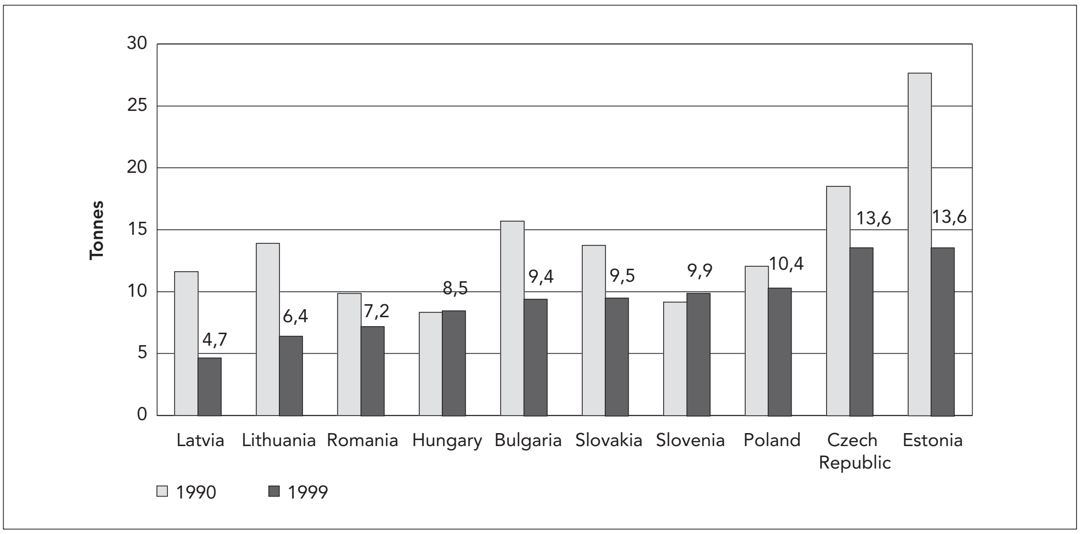
Source: Eurostat, GDP (billion USD, 1995 prices and exchange rates).



Note: For lack of data for several Candidate Countries the comparison refers to other years than 1990/1999: Estonia (1992/1999), Latvia (1992/1999), Lithuania (1992/1998), Romania (1990/1994) and Slovenia (1992/1996)

In 1999, emissions per capita vary between 4 and 14 tonnes in the candidate countries (Figure 91). They are below 1990 levels in most candidate countries (except Slovenia and Hungary). The Baltic countries and Bulgaria had large per capita emission decreases from 1990 to 1999. In the Czech Republic, Poland and Slovakia the reduction was smaller.

Greenhouse gas emissions per capita by country for the candidate countries in years 1990 and 1999 Figure 91



Source: Submissions by candidate countries (CRF tables), UNFCCC database, EMEP database.

Note: For lack of data for some Candidate Countries the comparison refers to other years than 1990/1999: Lithuania (1990/1998), Romania (1990/1994) and Slovenia (1990/1996)

Bulgaria

After a sharp decline between 1990 and 1994, Bulgarian greenhouse gas emissions have increased until 1996 and since then decreased again.

In base year (1988):	157.1 Tg
In 1999:	77.6 Tg
Change base year–1999:	– 79.5 Tg
	– 50.6 %

Distance-to-target indicator (DTI)
In 1999, Bulgarian greenhouse gas emissions were 50.6 % below base-year levels. After declining sharply from 1990 to 1994, Bulgarian greenhouse gas emissions have increased until 1996 and decreased since then. In 1999, total greenhouse gas emissions decreased by 3.9%, compared to 1998, and were 47.0 index points below the Kyoto target path Bulgaria has chosen 1988 as the base year.

Greenhouse gas emissions by gas
The share of CO_2 in total greenhouse gas emissions is about 65 %. N_2O accounts for a relatively high share of greenhouse gas emissions.

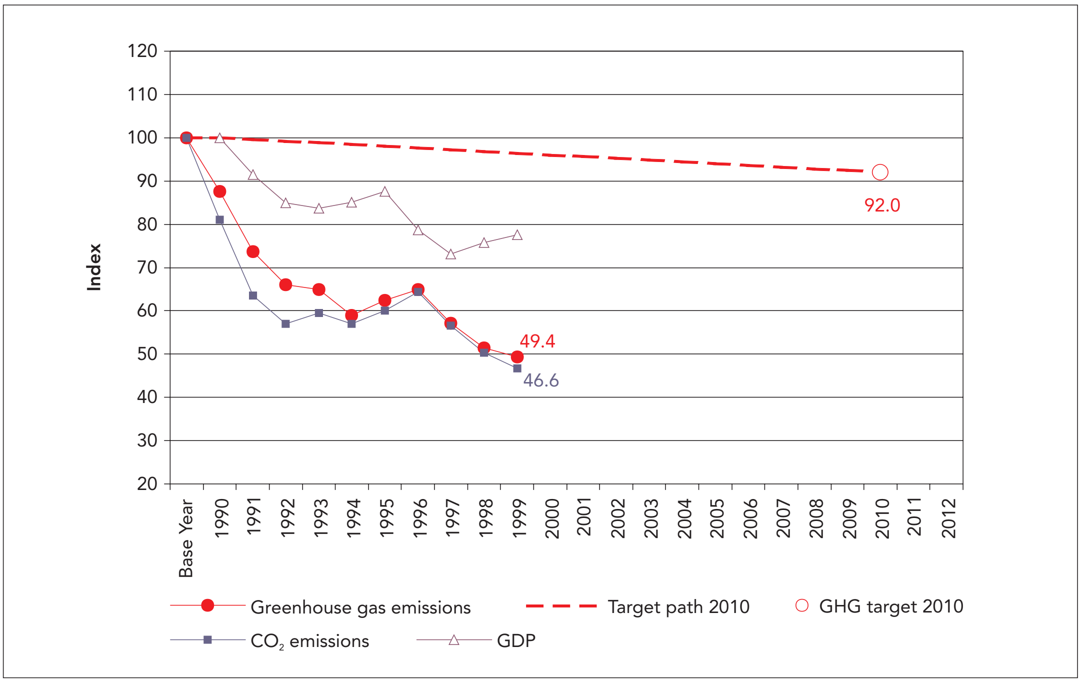
CO_2 emissions decreased by 53 % between the base year and 1999. Emissions from energy industries decreased more or less steadily and were 30 % below the base-year level in 1999. Emissions from energy use in manufacturing industries and from transport decreased rapidly between 1990 and 1991 and were 73 % and 51 % respectively below the base year in 1999. CO_2 emissions from metal production show large variations. The emissions from mineral products decreased by more than 50 % by 1992, but did not change significantly since then.

Methane emissions decreased by 64 % between the base year and 1999. Agricultural emissions and fugitive emissions from oil and natural gas dropped by more than 50 %, emissions from solid waste disposal on land even by 70 %. One reason for such a sharp emission decrease could be significant changes in waste-management practices (e.g. the utilisation of methane or an increased proportion of waste incineration).

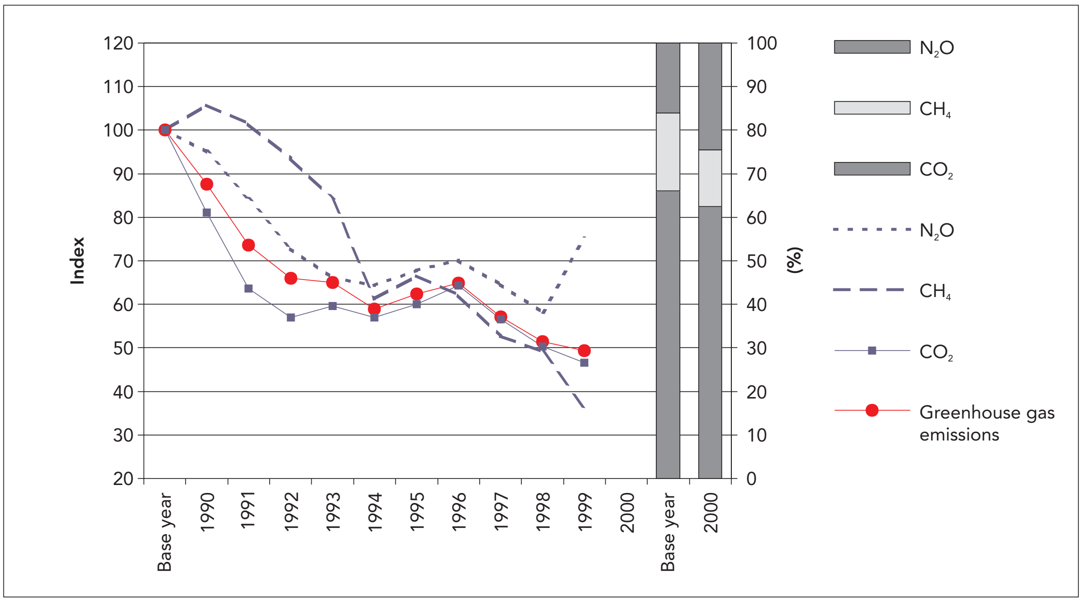
N_2O emissions show slightly different trends than the other two gases: after a decline in 1991 and 1992, the trend stabilised, and in 1999 emissions were higher than in 1991. Emissions from transport decreased by 46 % and from chemical industry by 70 % between the base year and 1999. The N_2O emission trend seems to be influenced significantly by emissions from other fuel combustion. In 1996, there seems to have been a change in allocation of emission to the sectors.

Figure 92 **Bulgarian greenhouse gas emissions compared with targets for 2000, 2008–12 (excl. fluorinated gases and LUCF) and GDP**

Source: Submissions by country (CRF tables), Eurostat.



Bulgarian greenhouse gas emissions by gas (excluding fluorinated gases and LUCF) Figure 93



Source: Submissions by country (CRF tables).

Greenhouse gases and distance-to-target indicators for Bulgaria Table A3.4

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Greenhouse gas emissions (without LUCF)	100,0	87,7	73,6	66,0	65,0	58,9	62,4	64,9	57,2	51,4	49,4	NA
DTI 2010	0,0	– 12,3	– 26,0	– 33,2	– 33,8	– 39,5	– 35,6	– 32,7	– 40,0	– 45,4	– 47,0	NA
CO_2 (without LUCF)	100,0	81,0	63,6	57,0	59,6	57,0	60,0	64,3	56,6	50,3	46,6	NA
CH_4 (without LUCF)	100,0	105,7	101,5	93,5	84,1	61,3	66,6	62,1	52,7	49,1	36,2	NA
N_2O (without LUCF)	100,0	95,0	84,1	72,7	66,1	64,3	67,8	70,1	64,6	58,3	75,2	NA
F-gases	NA	NA	NA	NA	NA	NA	NA	NA	NA	100	22,6	NA

Source: Submissions by country (CRF tables).

Note: Total greenhouse gas emissions do not contain fluorinated gases.

Sectoral emission indicators (key sources) for Bulgaria Table A3.5

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1.A.1. Energy industries (CO_2)	100,0	104,9	99,5	90,2	91,6	83,5	85,3	82,7	83,2	73,0	69,6	NA
1.A.2. Manufac. industries and constr.(CO_2)	100,0	55,6	33,7	27,1	30,1	33,5	40,8	39,2	39,1	31,9	26,5	NA
1.A.3. Transport (CO_2)	100,0	86,0	51,6	50,9	58,9	51,8	54,2	49,9	42,1	51,2	49,1	NA
1.A.3. Transport (N_2O)	100,0	111,1	66,4	63,2	72,1	60,2	62,3	57,5	50,7	55,5	54,0	NA
1.A.4. Other sectors (fuel combustion) (CO_2)	100,0	70,7	53,7	60,6	54,1	43,7	34,4	122,9	35,2	39,3	32,7	NA
1.A.4. Other sectors (fuel combustion) (CH_4)	100,0	82,5	45,1	45,0	27,8	36,3	40,7	288,1	47,5	100,0	117,4	NA
1.A.4. Other sectors (fuel combustion) (N_2O)	100,0	38,0	30,6	18,1	15,8	31,6	16,0	588,6	7,0	29,1	42,0	NA
1.A.5. Other (fuel combustion) (CO_2)	100,0	60,4	53,0	11,8	44,0	48,6	18,9	15,7	6,7	2,9	0,0	NA
1.B.1. Solid fuels (CH_4)	100,0	82,5	70,9	77,9	77,7	72,7	75,3	73,3	66,1	69,4	61,0	NA
1.B.2. Oil and natural gas (CH_4)	100,0	106,0	90,6	79,9	75,0	75,3	90,2	91,9	72,8	64,6	43,7	NA
2.A. Mineral products (CO_2)	100,0	92,1	53,4	42,7	37,7	41,4	50,3	52,8	44,2	30,5	40,6	NA
2.B. Chemical industry (N_2O)	100,0	93,1	67,1	54,7	46,8	55,2	79,3	81,0	66,7	40,0	30,2	NA
2.B. Chemical industry (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.C. Metal production (CO_2)	100,0	74,2	56,2	53,0	66,1	85,9	93,5	84,6	90,9	75,5	68,8	NA
2.C. Metal production (PFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.E. Production of halocarbons & SF_6 (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.F. Consumption of halocarbons & SF_6 (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4.A. Enteric fermentation (CH_4)	100,0	93,2	85,4	70,1	54,0	45,2	42,7	41,1	39,4	42,4	43,0	NA
4.B. Manure management (CH_4)	100,0	98,5	86,6	70,4	56,4	47,8	47,6	43,5	38,5	40,8	41,8	NA
4.B. Manure management (N_2O)	100,0	97,6	87,2	71,9	57,4	48,2	46,9	43,7	40,0	42,8	44,2	NA
4.D. Agricultural soils (N_2O)	100,0	100,1	91,3	77,7	70,1	67,4	68,6	66,1	66,1	62,5	90,6	NA
6.A. Solid waste disposal on land (CH_4)	100,0	112,1	118,8	112,7	102,5	63,1	62,2	55,4	50,0	44,2	30,4	NA

Source: Submissions by country (CRF tables).

Czech Republic

The decline of the Czech greenhouse gas emissions in the first half of the 1990s has come to an end. Emissions did not decrease significantly after 1994. In 2000, total emissions increased by 3.5 %, compared to 1999. CO_2 emissions from Transport increased by 53 % between 1990 and 2000.

Base year (1990):	192.0 Tg
In 2000:	146.7 Tg
Change base year–2000:	– 45.2 Tg
	– 23.6 %

Distance-to-target indicator (DTI)
The Czech greenhouse gas emissions have decreased from 1990 to 2000 by 23.6 %. Greenhouse gas emissions dropped significantly in the period 1990–94, but since 1994 they do not show a significant decline. Between 1999 and 2000, total greenhouse gas emissions increased by 3.5 % and were 19.6 index points below the Kyoto target path.

The emission trend follows the GDP development. However, between 1992 and 1995, the GDP was growing significantly faster than emissions.

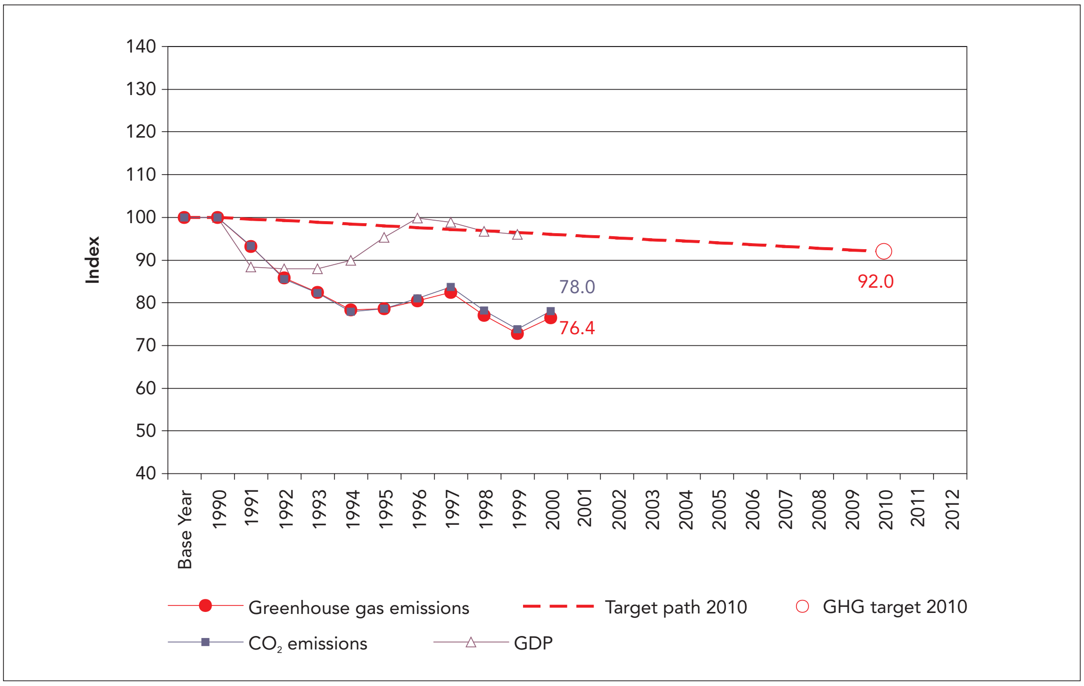
Greenhouse gas emissions by gas
CO_2 is the most important greenhouse gas with a share of more than 85 % in total greenhouse gas. Methane and N_2O emissions are less important. The emissions of fluorinated gases are reported since 1995. During this period, fluorinated gas emissions increased more than five times, but their share in national totals is still below 1 %.

CO_2 emissions decreased by 22 % between 1990 and 2000; the large combustion-related sources show different trends. CO_2 emissions from small combustion and from energy use in manufacturing industries decreased by 54 % and 39 % respectively, whereas CO_2 emissions from transport increased by 53 %. Emissions from energy industries increased by 1.7%. Process-related CO_2 emissions from mineral products decreased by more than 33 % between 1990–2000 due to the decrease of cement and lime production.

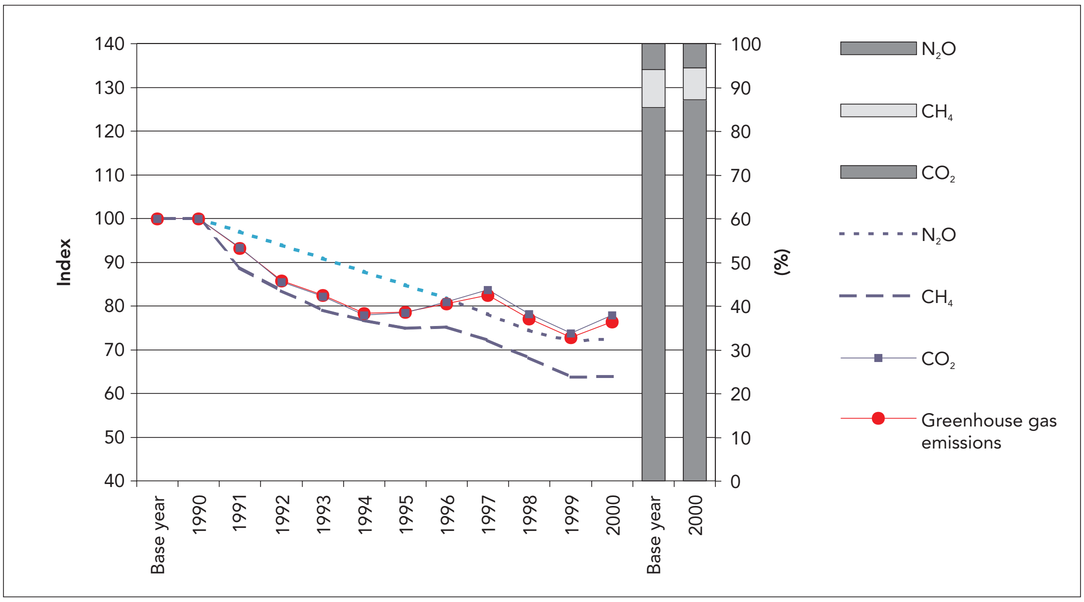
Methane emissions declined by 36 % between 1990 and 2000. Emissions from manure management decreased by 33 %, emissions from enteric fermentation by 48 %. The main reason for this decline are decreasing animal numbers in particular cattle and pigs.

N_2O emissions declined by 27 % between 1990 and 2000. This was mainly due to a decline of emissions from agricultural soils (– 37.5 %). N_2O emissions from chemical industry did not change significantly during the period, whereas emissions from transport increased by 540 %.

Figure 94 **Czech greenhouse gas emissions compared with targets for 2000 and 2008–12 (excl. fluorinated gases and LUCF)**



Czech greenhouse gas emissions by gas (excluding fluorinated gases and LUCF) Figure 95



Source: Submissions by country (CRF tables), UNFCCC database.

Note: N_2O emissions from 1991 to 1995 are interpolated.

Greenhouse gases and distance-to-target indicators for) for Czech Republic Table A3.6

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Greenhouse gas emissions (without LUCF)	100,0	100,0	93,8	86,5	83,2	78,4	78,6	80,5	82,4	77,1	72,8	76,4
DTI 2010	0,0	0,0	– 5,8	– 12,7	– 15,6	– 20,0	– 19,4	– 17,1	– 14,8	– 19,7	– 23,6	– 19,6
CO_2 (without LUCF)	100,0	100,0	94,1	86,2	83,0	77,9	78,6	81,0	83,8	78,2	73,8	78,0
CH_4 (without LUCF)	100,0	100,0	89,1	83,8	79,3	76,9	75,1	75,1	72,0	68,1	63,7	63,8
N_2O (without LUCF)	100,0	100,0	97,0	93,9	90,9	87,8	84,8	81,8	78,2	74,5	72,0	72,6
F-gases	NA	NA	NA	NA	NA	NA	100,0	190,0	369,4	308,5	310,2	525,2

Note: Total greenhouse gas emissions do not contain fluorinated gases.

Sectoral emission indicators (key sources) for Czech Republic Table A3.7

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1.A.1. Energy industries (CO_2)	100,0	100,0	NA	NA	NA	NA	NA	97,7	100,0	99,2	91,0	101,7
1.A.2. Manufac. industries and constr.(CO_2)	100,0	100,0	NA	NA	NA	NA	NA	73,8	72,9	59,5	57,4	60,8
1.A.3. Transport (CO_2)	100,0	100,0	NA	NA	NA	NA	NA	136,0	156,6	148,2	165,2	152,7
1.A.3. Transport (N_2O)	100,0	100,0	NA	NA	NA	NA	NA	683,2	748,2	541,6	608,6	639,6
1.A.4. Other sectors (fuel combustion) (CO_2)	100,0	100,0	NA	NA	NA	NA	NA	52,5	58,6	57,4	51,1	46,4
1.A.4. Other sectors (fuel combustion) (CH_4)	100,0	100,0	NA	NA	NA	NA	NA	56,0	48,5	35,9	33,6	30,9
1.A.4. Other sectors (fuel combustion) (N_2O)	100,0	100,0	NA	NA	NA	NA	NA	63,9	68,1	39,6	35,0	27,5
1.A.5. Other (fuel combustion) (CO_2)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1.B.1. Solid fuels (CH_4)	100,0	100,0	NA	NA	NA	NA	NA	74,2	72,8	69,9	63,3	66,0
1.B.2. Oil and natural gas (CH_4)	100,0	100,0	NA	NA	NA	NA	NA	100,3	108,7	87,6	89,4	89,4
2.A. Mineral products (CO_2)	100,0	100,0	NA	NA	NA	NA	NA	73,3	73,9	78,7	69,9	66,6
2.B. Chemical industry (N_2O)	100,0	100,0	NA	NA	NA	NA	NA	85,3	92,3	98,8	82,5	92,9
2.B. Chemical industry (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.C. Metal production (CO_2)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.C. Metal production (PFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.E. Production of halocarbons & SF_6 (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.F. Consumption of halocarbons & SF_6 (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4.A. Enteric fermentation (CH_4)	100,0	100,0	NA	NA	NA	NA	NA	62,8	59,6	55,1	54,7	52,0
4.B. Manure management (CH_4)	100,0	100,0	NA	NA	NA	NA	NA	74,3	74,9	72,9	73,0	67,6
4.B. Manure management (N_2O)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4.D. Agricultural soils (N_2O)	100,0	100,0	NA	NA	NA	NA	NA	77,9	72,6	65,3	64,3	62,5
6.A. Solid waste disposal on land (CH_4)	100,0	100,0	NA	NA	NA	NA	NA	102,0	86,8	87,9	81,5	81,5

Source: Submissions by country (CRF tables), UNFCCC database.

Estonia

Estonian greenhouse gas dropped sharply in the early 1990s; after 1993 the decline is slowing down. In 2000 emissions increased by 0.2 %, compared to 1999.

Base year (1990):	43.5 Tg
In 2000:	19.7 Tg
Change base year–2000:	– 23.8 Tg
	– 54.6 %

Distance-to-target indicator (DTI)
Estonian greenhouse gas emissions decreased from 1990 to 2000 by 54.6 %. Emissions dropped significantly in the period 1990–93 (– 46 %) and declined by a further 10 % between 1994 and 2000. In 2000, Estonian greenhouse gas emissions increased by 0.2 %, compared to 1999, but were 50.6 index points below the Kyoto target path.

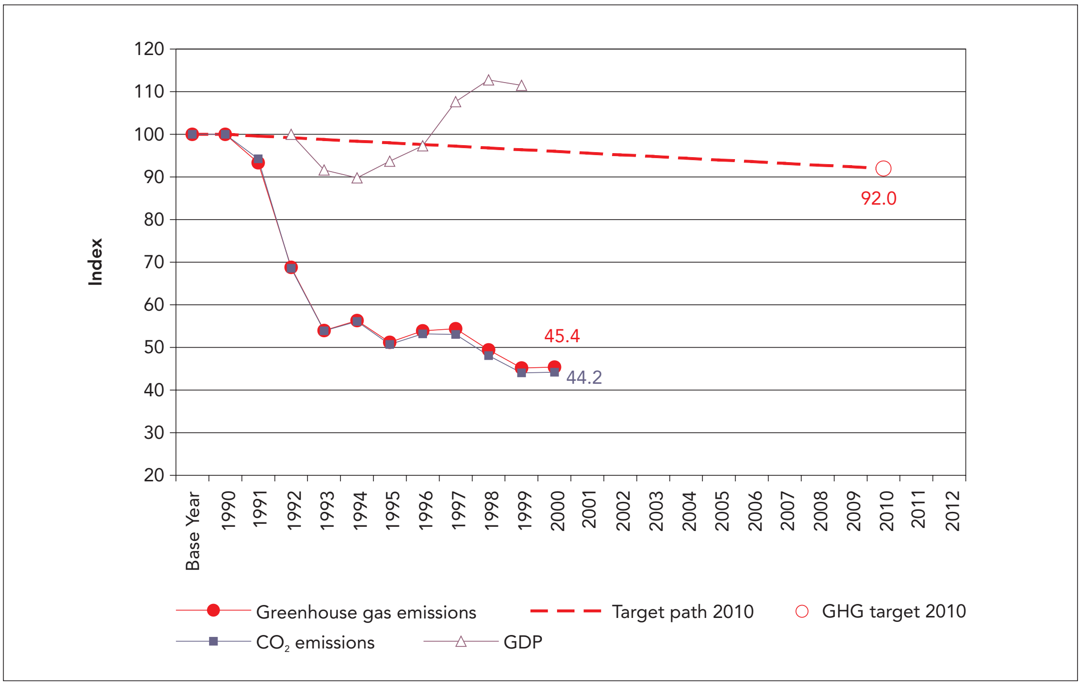
GDP decreased from 1990 to 1994 as well, but since 1995 the trends in emissions and GDP are opposite.

Greenhouse gas emissions by gas
The most important greenhouse gas in Estonia is CO_2 with a share of 85 % in total greenhouse gas emissions. Emissions of fluorinated gases are not reported. CO_2 emissions declined by 56 % between 1990 and 2000. Emissions from energy industries decreased by 53 %. CO_2 from energy use in manufacturing industries and from transport decreased even more rapidly, by 82 % and 62 % respectively.

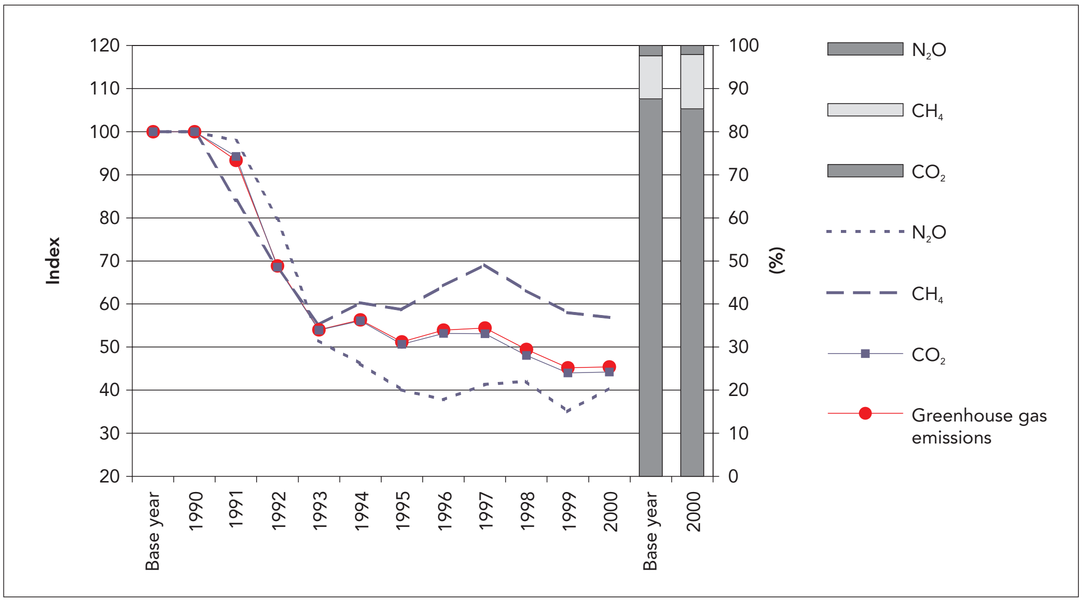
CH_4 emissions declined by 43 % between 1990 and 2000. Emissions from enteric fermentation and from waste disposal on land declined by 65 % and 31 % respectively.

N_2O emissions decreased by 59.5 % between 1990 and 2000.

Figure 96 **Estonian greenhouse gas emissions compared with targets for 2000 and 2008–12 (excl. fluorinated gases and LUCF)**



Estonian greenhouse gas emissions by gas (excluding fluorinated gases and LUCF) Figure 97



Source: Submissions by candidate countries (CRF tables).

Greenhouse gases and distance-to-target indicators for Estonia Table A3.8

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Greenhouse gas emissions (without LUCF)	100,0	100,0	93,3	68,8	54,0	56,3	51,2	53,9	54,4	49,4	45,2	45,4
DTI 2010	0,0	0,0	– 6,3	– 30,4	– 44,8	– 42,1	– 46,8	– 43,7	– 42,8	– 47,4	– 51,2	– 50,6
CO_2 (without LUCF)	100,0	100,0	94,2	68,6	53,9	56,1	50,7	53,2	53,1	48,1	44,0	44,2
CH_4 (without LUCF)	100,0	100,0	84,1	68,2	55,2	60,3	58,7	64,3	69,2	63,2	58,0	57,0
N_2O (without LUCF)	100,0	100,0	97,9	79,8	51,5	46,2	40,1	37,8	41,3	42,0	35,1	40,5
F-gases	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Note: Total greenhouse gas emissions do not contain fluorinated gases.

Sectoral emission indicators (key sources) for Estonia Table A3.9

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1.A.1. Energy industries (CO_2)	100,0	100,0	96,3	74,2	57,2	59,7	55,0	57,6	56,6	49,7	45,3	46,9
1.A.2. Manufac. industries and constr.(CO_2)	100,0	100,0	71,7	46,4	24,6	34,2	23,9	27,5	24,7	25,1	24,9	18,2
1.A.3. Transport (CO_2)	100,0	100,0	114,3	55,6	63,6	56,5	41,0	38,9	45,0	50,2	44,7	38,3
1.A.3. Transport (N_2O)	100,0	100,0	104,1	55,3	62,8	57,5	42,1	40,2	47,1	50,2	46,7	40,2
1.A.4. Other sectors (fuel combustion) (CO_2)	100,0	100,0	69,6	43,2	41,3	40,5	41,5	48,2	53,5	47,7	45,3	43,3
1.A.4. Other sectors (fuel combustion) (CH_4)	100,0	100,0	118,2	85,6	73,2	88,6	161,6	188,9	189,7	145,7	142,7	141,1
1.A.4. Other sectors (fuel combustion) (N_2O)	100,0	100,0	88,5	70,4	64,2	80,3	137,2	159,2	162,2	126,6	122,6	122,2
1.A.5. Other (fuel combustion) (CO_2)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1.B.1. Solid fuels (CH_4)	100,0	100,0	90,4	83,7	69,0	67,8	62,5	69,4	NA	NA	NA	NA
1.B.2. Oil and natural gas (CH_4)	100,0	100,0	99,7	58,1	28,5	41,2	47,4	52,5	NA	NA	NA	NA
2.A. Mineral products (CO_2)	100,0	100,0	100,2	51,1	31,5	35,0	36,1	33,7	36,8	59,9	56,5	57,7
2.B. Chemical industry (N_2O)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.B. Chemical industry (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.C. Metal production (CO_2)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.C. Metal production (PFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.E. Production of halocarbons & SF_6 (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.F. Consumption of halocarbons & SF_6 (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4.A. Enteric fermentation (CH_4)	100,0	100,0	93,7	90,2	69,9	64,9	51,0	46,8	49,5	42,3	36,9	35,0
4.B. Manure management (CH_4)	100,0	100,0	93,3	75,6	58,9	56,6	51,6	45,2	NA	NA	NA	NA
4.B. Manure management (N_2O)	100,0	100,0	93,3	79,7	62,0	57,2	50,9	45,7	NA	NA	NA	NA
4.D. Agricultural soils (N_2O)	100,0	100,0	98,1	80,3	50,7	44,6	37,3	34,4	NA	NA	NA	NA
6.A. Solid waste disposal on land (CH_4)	100,0	100,0	40,8	40,8	42,2	58,5	65,5	71,7	75,4	70,6	72,3	69,0

Source: Submissions by candidate countries (CRF tables).

Hungary

Hungarian greenhouse gas emissions declined until 1992 and were almost stable up to 1997. In 2000, emissions were above 1997 levels.

Base year (av. 1985–87):	101.6 Tg
In 2000:	83.8 Tg
Change base year–2000:	– 17.8 Tg
	– 17.6 %

Distance-to-target indicator (DTI)
Hungarian greenhouse gas emissions decreased from the base year to 2000 by 17.6 %. Emissions decreased by 22 % between the base year and 1992, and were almost stable between 1992 and 1997, before increasing again in 1998 and 1999. In 2000, Hungarian greenhouse gas emissions dropped slightly and were 14.6 index points below the Kyoto target path. Hungary has chosen to use the 1985–87 average as base-year emissions.

Greenhouse gas emissions and GDP show the same trend, but GDP is growing faster than the greenhouse gas emissions.

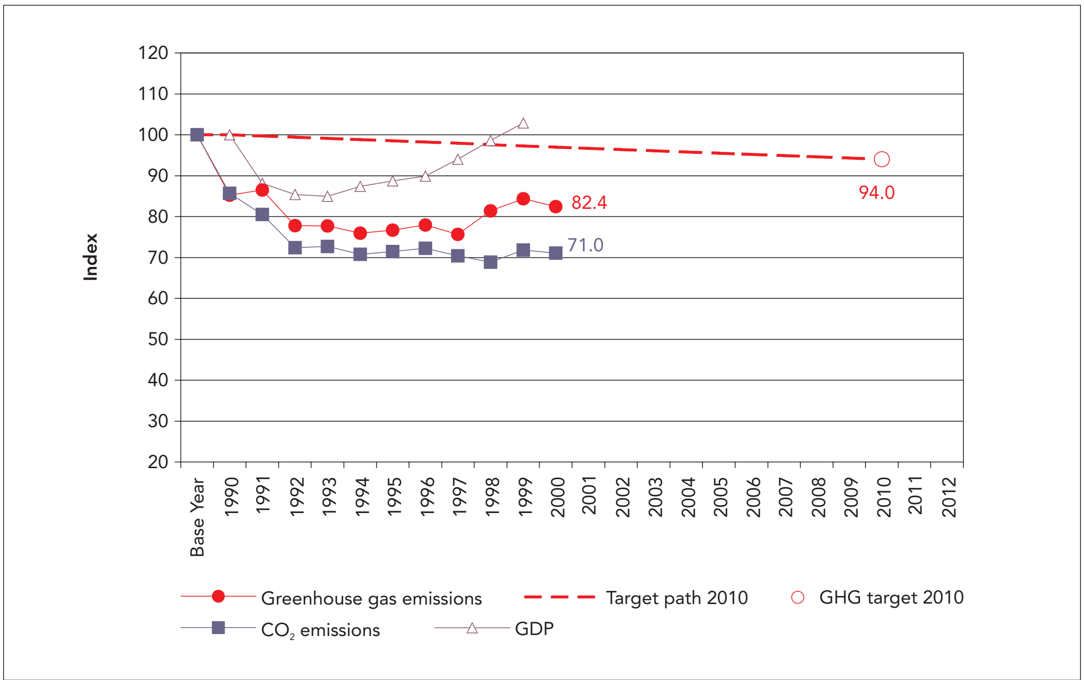
Greenhouse gas emissions by gas
CO_2 is the most important greenhouse gas with a share of 70 % in total greenhouse gas emissions. Fluorinated gas emissions are reported for 1998 and 1999 only.

CO_2 emissions declined by 29 % between the base year and 2000. Emissions from energy industries and small combustion were 39 % and 43 % respectively below base-year levels in 2000. CO_2 emissions from energy use in manufacturing industries were again at base-year level in 2000. Emissions from transport increased by 21 % between the base year and 2000.

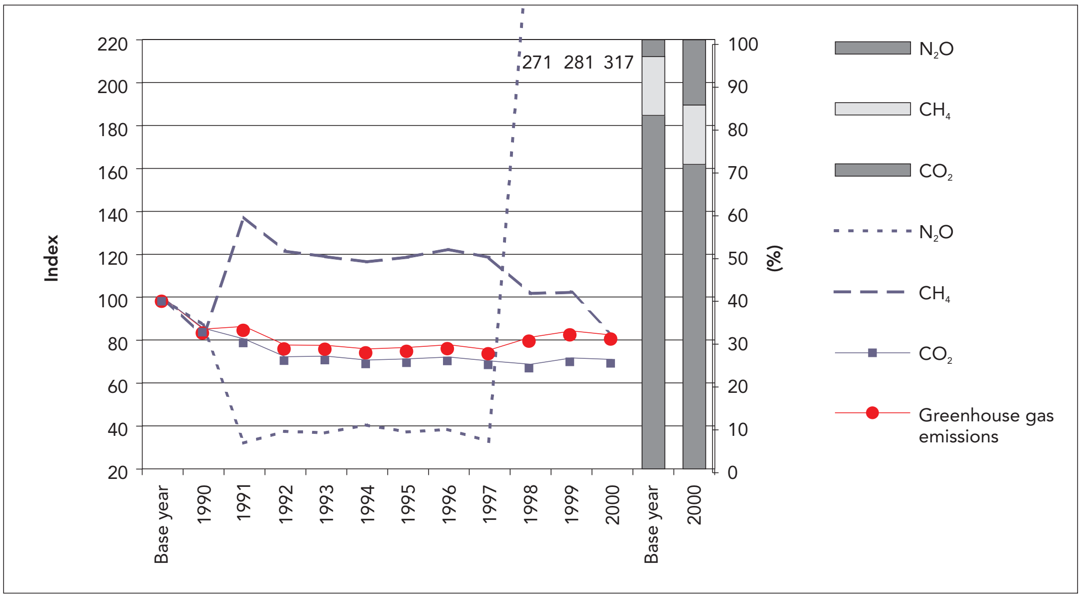
Methane emissions increased from the base year to 1991 by 38 %; since then emissions are decreasing. In 2000, emissions were 17 % below the base-year level. CH_4 emission from solid waste disposal on land are reported since 1991 only and increased by 35 % since then.

For the dramatic change of N_2O emission trend in 1998, the application of different estimation methods for emissions from agricultural soils might be responsible.

Figure 98 **Hungarian greenhouse gas emissions compared with targets for 2000 and 2008–12 (excl. fluorinated gases and LUCF)**



Hungarian greenhouse gas emissions by gas (excluding fluorinated gases and LUCF) Figure 99



Source: Submissions by candidate countries (CRF tables).

Greenhouse gases and distance-to-target indicators for Hungary Table A3.10

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Greenhouse gas emissions (without LUCF)	100,0	85,2	86,5	77,8	77,7	75,9	76,7	77,9	75,6	81,4	84,3	82,4
DTI 2010	0,0	– 14,8	– 13,2	– 21,6	– 21,4	– 22,9	– 21,8	– 20,3	– 22,3	– 16,2	– 13,0	– 14,6
CO_2 (without LUCF)	100,0	85,7	80,5	72,4	72,7	70,7	71,4	72,3	70,4	68,8	71,8	71,0
CH_4 (without LUCF)	100,0	82,0	137,6	121,7	119,2	116,8	119,1	122,7	118,9	102,3	102,8	83,2
N_2O (without LUCF)	100,0	87,8	32,9	38,5	37,8	41,6	38,3	39,5	34,0	271,2	281,1	317,0
F-gases	NA	NA	NA	NA	NA	NA	NA	NA	NA	100,0	87,0	61,1

Note: Total greenhouse gas emissions do not contain fluorinated gases.

Sectoral emission indicators (key sources) for Hungary Table A3.11

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1.A.1. Energy industries (CO_2)	100,0	80,6	77,2	74,4	74,7	71,2	71,6	72,1	71,9	65,4	63,9	60,7
1.A.2. Manufac. industries and constr.(CO_2)	100,0	72,5	58,6	47,1	50,9	57,9	58,3	56,9	45,0	79,2	91,1	99,4
1.A.3. Transport (CO_2)	100,0	106,0	95,4	92,9	92,2	93,2	90,4	85,4	100,0	108,3	123,6	120,5
1.A.3. Transport (N_2O)	NA	NA	NA	NA	NA	NA	NA	NA	NA	100,0	109,3	105,9
1.A.4. Other sectors (fuel combustion) (CO_2)	100,0	90,1	93,8	74,7	75,9	73,2	72,3	78,1	70,0	58,0	57,8	56,9
1.A.4. Other sectors (fuel combustion) (CH_4)	NA	NA	NA	NA	NA	NA	NA	NA	NA	100,0	102,3	95,4
1.A.4. Other sectors (fuel combustion) (N_2O)	NA	NA	NA	NA	NA	NA	NA	NA	NA	100,0	92,4	86,5
1.A.5. Other (fuel combustion) (CO_2)	100,0	102,1	90,5	113,4	66,5	20,5	75,5	49,0	84,9	NA	NA	NA
1.B.1. Solid fuels (CH_4)	100,0	74,9	72,1	55,8	49,1	47,0	47,5	48,4	48,3	42,3	40,1	34,6
1.B.2. Oil and natural gas (CH_4)	100,0	88,3	129,6	114,9	122,3	121,7	129,7	140,8	133,0	135,4	128,3	83,3
2.A. Mineral products (CO_2)	100,0	99,5	35,3	31,2	35,3	38,9	40,1	38,3	39,2	55,0	57,2	58,5
2.B. Chemical industry (N_2O)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.B. Chemical industry (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.C. Metal production (CO_2)	NA	NA	100,0	42,4	44,0	NA	NA	148,5	155,1	145,6	136,1	52,0
2.C. Metal production (PFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.E. Production of halocarbons & SF_6 (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.F. Consumption of halocarbons & SF_6 (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4.A. Enteric fermentation (CH_4)	100,0	80,2	78,1	67,1	57,8	54,4	53,3	52,3	50,4	51,8	51,1	48,5
4.B. Manure management (CH_4)	100,0	92,1	86,7	77,2	70,7	69,7	66,8	68,0	64,2	71,8	71,4	67,5
4.B. Manure management (N_2O)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4.D. Agricultural soils (N_2O)	100,0	89,9	36,8	35,7	32,0	39,5	35,3	36,8	36,7	721,7	727,1	802,2
6.A. Solid waste disposal on land (CH_4)	NA	NA	100,0	100,0	100,0	100,0	100,0	100,0	100,0	106,3	149,8	135,4

Source: Submissions by candidate countries (CRF tables), UNFCCC database, EMEP database.

Latvia

Latvian greenhouse gas emissions decreased in almost every year since 1990, but the reduction rates are declining. Methane emissions from solid waste disposal on land increased significantly from 1990 to 2000.

Base year (1990):	31.0 Tg
In 2000:	10.6 Tg
Change base year–2000:	–20.4 Tg
	– 65.8 %

Distance-to-target indicator (DTI)
Latvian greenhouse gas emissions decreased from 1990 to 2000 by 65.8 %; most of this reduction occurred until 1994. Also, in 2000, greenhouse gas emissions decreased and were 61.9 index points below the Kyoto target path in 2000. This was the largest deviation from the Kyoto target path of all AC. GDP is increasing in Latvia since 1995.

Greenhouse gas emissions by gas
The most important greenhouse gas in Latvia is CO_2, with a share of 65 % in total greenhouse gas emissions in 2000 (76 % in 1990).

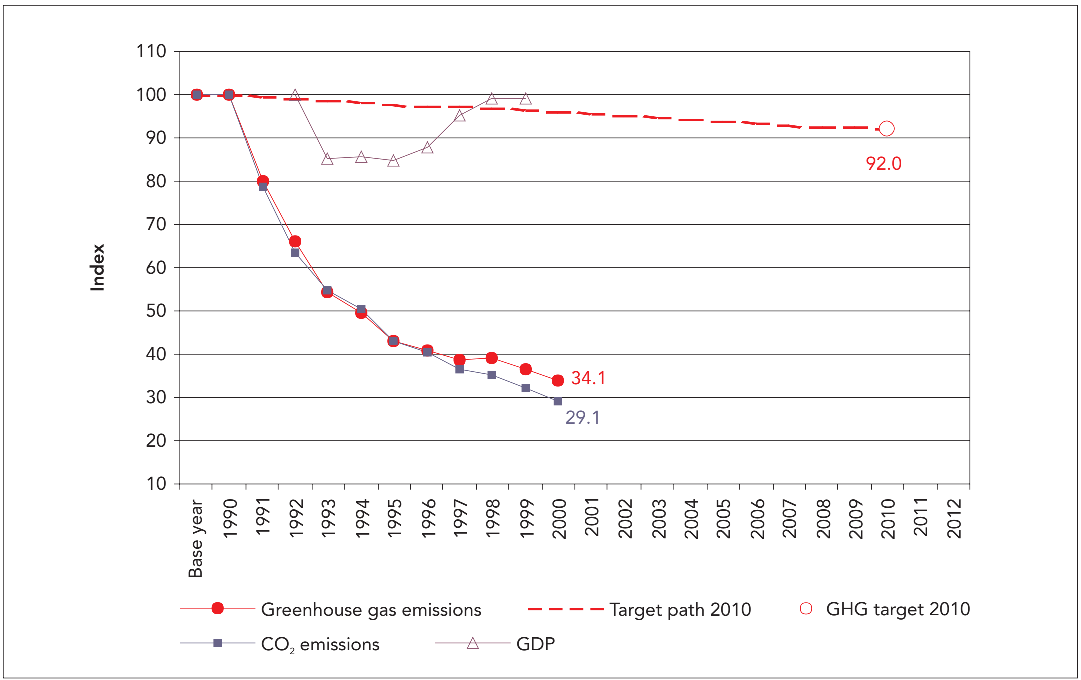
CO_2 emissions decreased by 71 % between 1990 and 2000. CO_2 emissions from fuel-combustion activities decreased by more than 60 % in all presented key source categories.

CH_4 emissions declined by 38 % between 1990 and 2000. CH_4 emissions from enteric fermentation and from manure management decreased by more than 70 %, but emissions from solid waste disposal on land increased by 202 %, with a leap between 1997 and 1998.

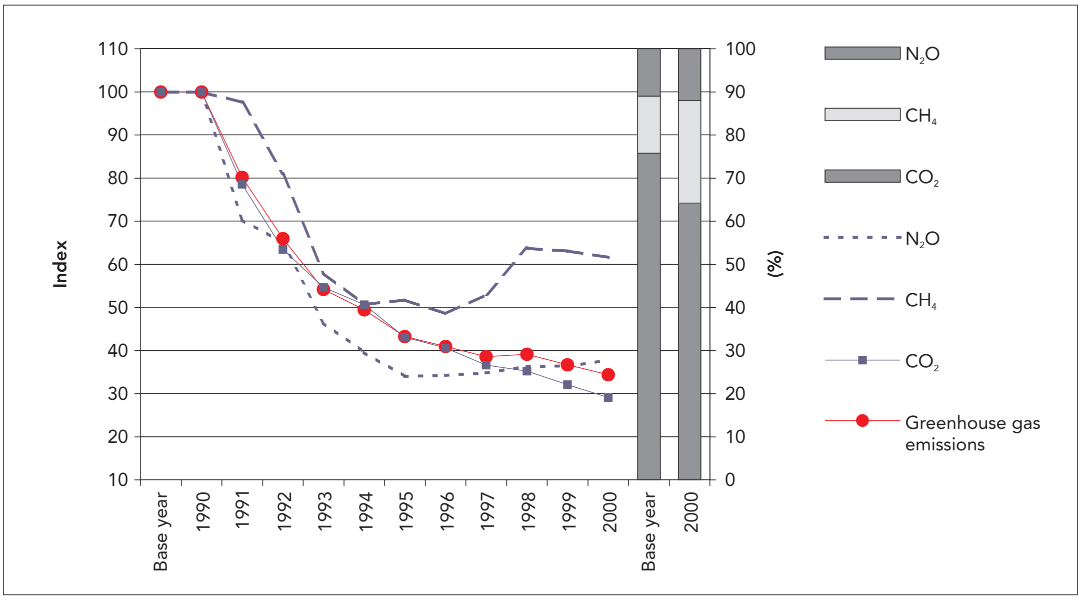
N_2O emissions declined by 62 % between 1990 and 2000. N_2O from agricultural soils decreased by 68 %. N_2O emissions from manure management have been reported since 1998 only.

Emissions of fluorinated gases are reported only for the years 1999 and 2000.

Figure 100 **Latvian greenhouse gas emissions compared with targets for 2000 and 2008–12 (excl. fluorinated gases and LUCF)**



Latvian greenhouse gas emissions by gas (excluding fluorinated gases and LUCF) Figure 101



Source: Submissions by country (CRF tables), UNFCCC database.

Greenhouse gases and distance-to-target indicators for Latvia Table A3.12

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Greenhouse gas emissions (without LUCF)	100,0	100,0	80,2	65,9	54,1	49,4	43,2	40,8	38,5	39,0	36,4	34,1
DTI 2010	0,0	0,0	– 19,4	– 33,3	– 44,7	– 49,0	– 54,8	– 56,8	– 58,7	– 57,8	– 60,0	– 61,9
CO_2 (without LUCF)	100,0	100,0	78,6	63,4	54,7	50,6	43,1	40,6	36,6	35,2	32,1	29,1
CH_4 (without LUCF)	100,0	100,0	97,6	80,8	57,6	50,3	51,1	47,9	52,4	63,2	61,7	60,2
N_2O (without LUCF)	100,0	100,0	70,3	65,0	46,4	39,6	33,9	34,2	34,7	36,2	36,2	37,5
F-gases	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	100,0	22,1

Note: Total greenhouse gas emissions do not contain fluorinated gases.

Sectoral emission indicators (key sources) for Latvia Table A3.13

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1.A.1. Energy industries (CO_2)	100,0	100,0	104,5	84,8	66,1	57,0	54,8	47,1	46,1	42,7	37,6	32,6
1.A.2. Manufac. industries and constr.(CO_2)	100,0	100,0	62,7	49,9	41,2	66,0	38,7	27,6	46,3	47,5	42,7	37,4
1.A.3. Transport (CO_2)	100,0	100,0	54,3	48,8	44,4	37,1	29,1	26,8	36,2	35,4	34,7	35,3
1.A.3. Transport (N_2O)	100,0	100,0	34,9	29,0	23,0	13,7	12,4	28,8	20,2	18,6	17,9	17,4
1.A.4. Other sectors (fuel combustion) (CO_2)	100,0	100,0	71,9	55,8	58,8	50,9	42,9	51,3	19,5	17,6	16,4	14,5
1.A.4. Other sectors (fuel combustion) (CH_4)	100,0	100,0	92,7	92,8	95,5	93,7	81,0	67,6	133,4	123,8	104,7	78,9
1.A.4. Other sectors (fuel combustion) (N_2O)	100,0	100,0	120,8	128,6	128,6	120,8	109,1	90,9	177,9	168,8	135,3	107,0
1.A.5. Other (fuel combustion) (CO_2)	100,0	100,0	67,4	79,1	55,6	NA	513,6	221,3	241,9	232,0	226,8	222,4
1.B.1. Solid fuels (CH_4)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1.B.2. Oil and natural gas (CH_4)	100,0	100,0	96,0	68,3	46,1	34,3	40,6	35,3	43,3	42,4	28,0	30,0
2.A. Mineral products (CO_2)	100,0	100,0	103,7	50,9	15,9	27,4	22,6	32,9	27,3	41,9	28,5	17,9
2.B. Chemical industry (N_2O)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.B. Chemical industry (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.C. Metal production (CO_2)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.C. Metal production (PFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.E. Production of halocarbons & SF_6 (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.F. Consumption of halocarbons & SF_6 (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4.A. Enteric fermentation (CH_4)	100,0	100,0	96,6	80,9	49,9	41,4	40,1	37,9	35,4	32,3	28,1	27,4
4.B. Manure management (CH_4)	100,0	100,0	93,7	71,4	43,0	38,8	40,0	35,9	33,6	31,5	28,7	28,0
4.B. Manure management (N_2O)	NA	NA	NA	NA	NA	NA	NA	NA	NA	100,0	85,4	85,1
4.D. Agricultural soils (N_2O)	100,0	100,0	72,4	66,9	46,3	39,3	33,2	32,3	32,7	28,8	29,9	31,8
6.A. Solid waste disposal on land (CH_4)	100,0	100,0	116,5	120,1	123,9	128,5	132,0	135,0	141,8	274,3	299,6	302,1

Source: Submissions by country (CRF tables), UNFCCC database.

Lithuania

Lithuanian greenhouse gas emissions dropped sharply between 1990 and 1995, but were almost stable between 1995 and 1998.

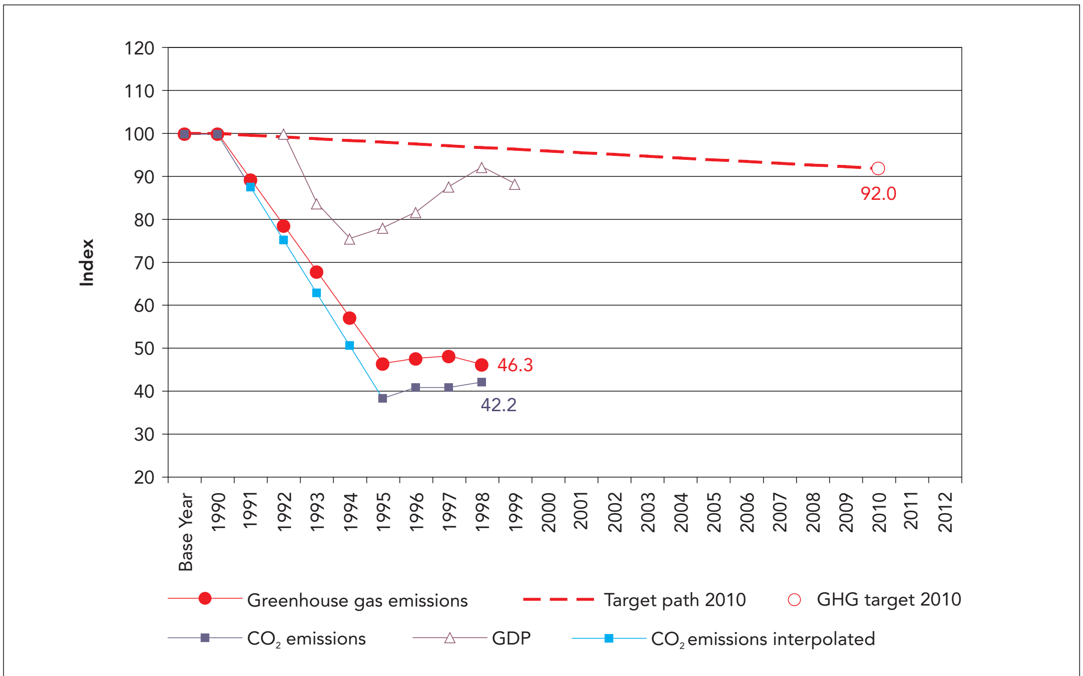
Base year (1990):	51.5 Tg
In 1998:	23.9 Tg
Change base year–1998:	– 27.6 Tg
	– 53.7 %

Distance-to-target indicator (DTI)
Latvian greenhouse gas emissions decreased from 1990 to 1998 by 53.7 %. National totals were available for the years 1990 and 1995–98 only. The missing values for 1991–94 were interpolated. In 1998, Lithuania was 50.5 index points below its Kyoto target path.

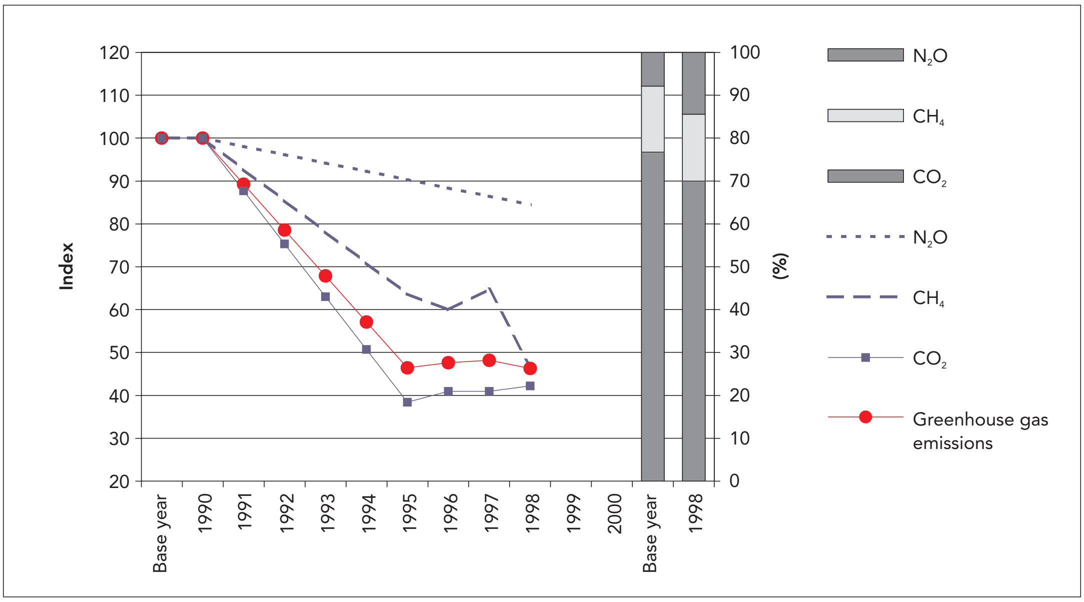
Also, GDP decreased from 1990 to 1994, but since 1995 the trends in emissions and GDP have been opposite.

Greenhouse gas emissions by gas
The most important greenhouse gas is CO_2 with a share of 70 % in total greenhouse gases. CO_2 emissions decreased faster than the other gases. Emissions of fluorinated gases are not reported. The sectoral data availability is very limited, so no more details can be given.

Figure 102 **Lithuanian greenhouse gas emissions compared with targets for 2000 and 2008–12 (excl. fluorinated gases and LUCF)**



Lithuanian greenhouse gas emissions by gas (excluding fluorinated gases and LUCF) Figure 103



Source: UNFCCC database.

Greenhouse gases and distance-to-target indicators for Lithuania Table A3.14

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Greenhouse gas emissions (without LUCF)	100,0	100,0	89,3	78,6	67,9	57,1	46,4	47,6	48,2	46,3	NA	NA
DTI 2010	0,0	0,0	– 10,3	– 20,6	– 30,9	– 41,3	– 51,6	– 50,0	– 49,0	– 50,5	NA	NA
CO_2 (without LUCF)	100,0	100,0	87,7	75,4	63,1	50,8	38,4	41,0	41,0	42,2	NA	NA
CH_4 (without LUCF)	100,0	100,0	92,7	85,5	78,2	70,9	63,6	60,0	64,7	46,8	NA	NA
N_2O (without LUCF)	100,0	100,0	98,1	96,1	94,2	92,3	90,3	88,4	86,4	84,5	NA	NA
F-gases	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Note: Total greenhouse gas emissions do not contain fluorinated gases.

Sectoral emission indicators (key sources) for Lithuania Table A3.15

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1.A.1. Energy industries (CO_2)	100,0	100,0	NA	NA	NA	NA	NA	NA	NA	48,2	NA	NA
1.A.2. Manufac. industries and constr.(CO_2)	100,0	100,0	NA	NA	NA	NA	NA	NA	NA	17,9	NA	NA
1.A.3. Transport (CO_2)	100,0	100,0	NA	NA	NA	NA	60,4	65,6	70,8	64,8	NA	NA
1.A.3. Transport (N_2O)	100,0	100,0	NA	NA	NA	NA	NA	NA	NA	11,8	NA	NA
1.A.4. Other sectors (fuel combustion) (CO_2)	100,0	100,0	NA	NA	NA	NA	165,9	176,2	171,8	19,7	NA	NA
1.A.4. Other sectors (fuel combustion) (CH_4)	100,0	100,0	NA	NA	NA	NA	179,4	224,2	403,6	306,4	NA	NA
1.A.4. Other sectors (fuel combustion) (N_2O)	100,0	100,0	NA	NA	NA	NA	NA	NA	NA	57,0	NA	NA
1.A.5. Other (fuel combustion) (CO_2)	100,0	100,0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1.B.1. Solid fuels (CH_4)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1.B.2. Oil and natural gas (CH_4)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.A. Mineral products (CO_2)	100,0	100,0	NA	NA	NA	NA	NA	NA	NA	80,5	NA	NA
2.B. Chemical industry (N_2O)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.B. Chemical industry (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.C. Metal production (CO_2)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.C. Metal production (PFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.E. Production of halocarbons & SF_6 (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.F. Consumption of halocarbons & SF_6 (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4.A. Enteric fermentation (CH_4)	100,0	100,0	NA	NA	NA	NA	NA	NA	NA	46,3	NA	NA
4.B. Manure management (CH_4)	100,0	100,0	NA	NA	NA	NA	NA	NA	NA	43,2	NA	NA
4.B. Manure management (N_2O)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4.D. Agricultural soils (N_2O)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6.A. Solid waste disposal on land (CH_4)	100,0	100,0	NA	NA	NA	NA	NA	NA	NA	42,0	NA	NA

Source: UNFCCC database.

Poland

Polish greenhouse gas emissions dropped by 23 % between 1988 and 1991 and declined by a further 7 % by 1999. CO_2 emissions from transport increased by 11 % since 1998.

Base year (1988):	564.3 Tg
In 1999:	400.2 Tg
Change base year–1999:	– 164.2 Tg – 29.1%

Distance-to-target indicator (DTI)
Greenhouse gas emissions in Poland decreased from the base year to 1999 by 29.1 %. Emissions dropped between the base year and 1991 by 22.5 %, and from 1992 to 1999 by a further 7 %. Polish greenhouse gas emissions were 26.4 index points below the Kyoto target path in 1999. Poland has chosen 1988 as the base year.

GDP has been increasing since 1992. The increase from 1990 to 1999 was almost 40 %. Since 1992, the trends in emissions and GDP have been opposite.

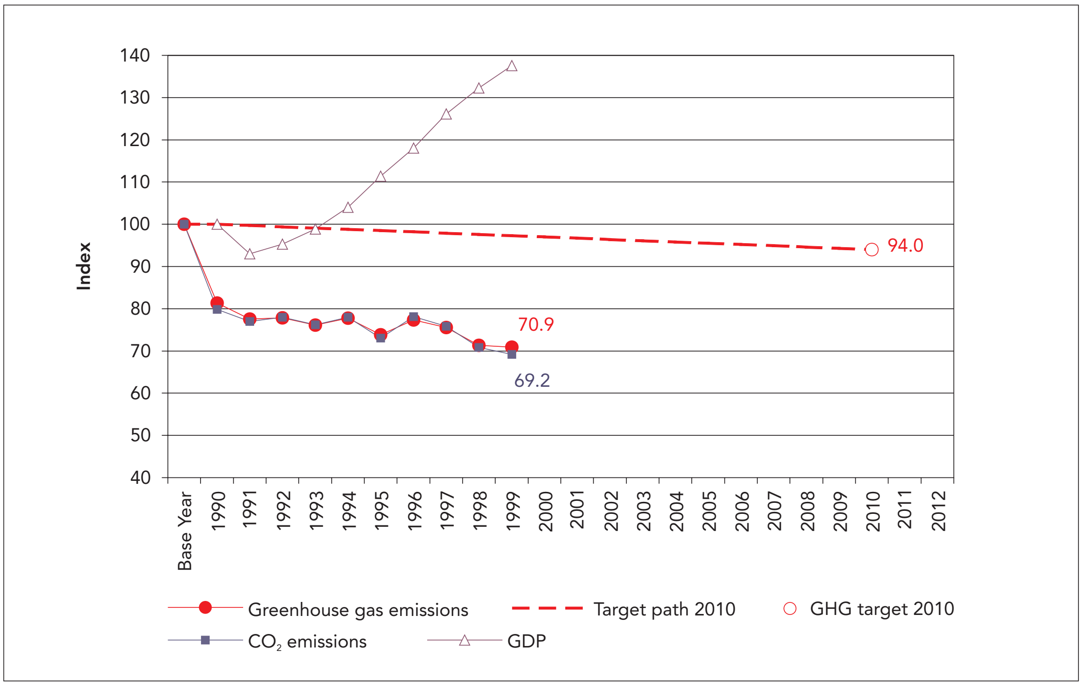
Greenhouse gas emissions by gas
CO_2 is the most important greenhouse gas with a share of more than 80 % in total greenhouse gas emissions. Methane and N_2O emissions are less important. The emissions of fluorinated gases have been reported since 1995. During this period, fluorinated gas emissions increased more than 20 times.

CO_2 emissions declined by 31 % between the base year and 1999. CO_2 emissions from energy industries decreased by 30 %, whereas emissions from transport increased between by 11 %. CO_2 emissions from mineral products decreased by 17 %, emissions from metal production by 23 %.

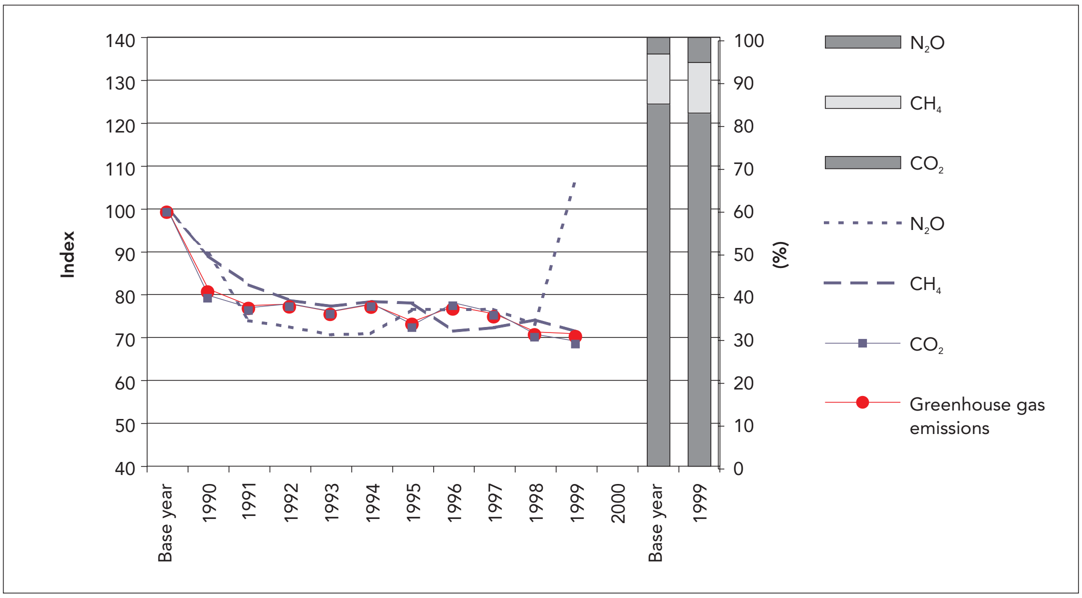
CH_4 emissions decreased by 28 % between the base year and 1999. Emissions from waste disposal were almost at the base-year level after rapid growth in recent years. CH_4 from enteric fermentation declined by 42 %. Fugitive CH_4 emission from oil and natural gas did not change significantly, but the emissions from solid fuels decreased by 44 %.

After a sharp increase between 1998 and 1999, N_2O emissions were 7 % above the base-year level in 1999. N_2O from agricultural soils decreased by 7.5 % between the base year and 1999. N_2O from chemical industry decreased by 40 %, whereas emissions from transport increased by 87 %. N_2O emissions from manure management are not reported.

Figure 104 **Polish greenhouse gas emissions compared with targets for 2000 and 2008–12 (excl. fluorinated gases and LUCF)**



Polish greenhouse gas emissions by gas (excluding fluorinated gases and LUCF) Figure 105



Source: UNFCCC database.

Greenhouse gases and distance-to-target indicators for Poland Table A3.16

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Greenhouse gas emissions (without LUCF)	100,0	81,4	77,5	77,9	76,1	77,8	73,8	77,4	75,5	71,3	70,9	NA
DTI 2010	0,0	– 18,6	– 22,2	– 21,5	– 23,0	– 21,0	– 24,7	– 20,8	– 22,4	– 26,3	– 26,4	NA
CO_2 (without LUCF)	100,0	79,9	77,0	78,0	76,2	78,0	73,0	78,2	75,9	70,8	69,2	NA
CH_4 (without LUCF)	100,0	89,2	82,4	78,8	77,4	78,6	78,3	71,7	72,6	74,4	71,7	NA
N_2O (without LUCF)	100,0	90,0	74,3	72,9	71,1	71,4	77,1	77,0	77,2	73,7	107,3	NA
F-gases	NA	NA	NA	NA	NA	NA	100,0	305,9	870,6	1217,6	2217,6	NA

Note: Total greenhouse gas emissions do not contain fluorinated gases.

Sectoral emission indicators (key sources) for Poland Table A3.17

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1.A.1. Energy industries (CO_2)	100,0	90,8	89,4	85,6	77,8	76,9	71,9	75,2	74,0	71,0	69,1	NA
1.A.2. Manufac. industries and constr.(CO_2)	100,0	81,8	61,1	61,2	86,9	108,8	111,9	122,6	115,0	103,8	87,5	NA
1.A.3. Transport (CO_2)	100,0	103,1	98,5	107,9	98,0	104,6	89,5	99,5	94,4	99,6	111,1	NA
1.A.3. Transport (N_2O)	100,0	100,0	121,0	200,0	120,0	100,0	131,0	145,0	136,0	167,0	187,0	NA
1.A.4. Other sectors (fuel combustion) (CO_2)	100,0	50,1	53,6	63,1	63,6	57,7	50,6	57,6	54,7	45,0	48,6	NA
1.A.4. Other sectors (fuel combustion) (CH_4)	100,0	60,0	135,4	20,0	434,7	280,0	418,2	410,3	401,9	397,1	383,0	NA
1.A.4. Other sectors (fuel combustion) (N_2O)	100,0	100,0	113,0	100,0	159,0	100,0	135,0	145,0	151,0	178,0	183,0	NA
1.A.5. Other (fuel combustion) (CO_2)	100,0	8,5	NA	NA	NA	85,3	41,3	29,8	26,2	25,1	14,2	NA
1.B.1. Solid fuels (CH_4)	100,0	76,6	72,8	60,2	67,6	69,4	71,1	71,5	71,4	60,0	56,2	NA
1.B.2. Oil and natural gas (CH_4)	100,0	95,1	81,1	80,5	83,5	83,9	90,5	95,9	94,0	95,5	93,4	NA
2.A. Mineral products (CO_2)	100,0	64,1	69,0	66,2	70,4	68,9	77,8	68,1	82,0	81,3	82,9	NA
2.B. Chemical industry (N_2O)	100,0	80,0	65,5	65,0	NA	70,0	79,0	81,1	78,6	64,5	60,4	NA
2.B. Chemical industry (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.C. Metal production (CO_2)	100,0	73,7	85,8	45,7	78,6	48,8	78,7	78,9	88,9	83,7	76,6	NA
2.C. Metal production (PFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.E. Production of halocarbons & SF_6 (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.F. Consumption of halocarbons & SF_6 (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4.A. Enteric fermentation (CH_4)	100,0	98,4	88,7	80,3	75,2	73,9	70,1	67,6	68,3	66,2	58,2	NA
4.B. Manure management (CH_4)	100,0	98,2	100,6	100,0	86,7	87,5	87,8	80,0	82,5	82,9	69,4	NA
4.B. Manure management (N_2O)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4.D. Agricultural soils (N_2O)	100,0	95,3	75,6	74,4	69,7	69,8	73,0	70,7	72,4	72,5	82,5	NA
6.A. Solid waste disposal on land (CH_4)	100,0	91,9	88,0	101,1	88,1	91,1	90,9	67,3	70,4	93,9	98,8	NA

Source: Submissions by country (CRF tables), UNFCCC database.

Romania

Romanian greenhouse gas emissions declined sharply in 1991, but emission reductions seem to have levelled off.

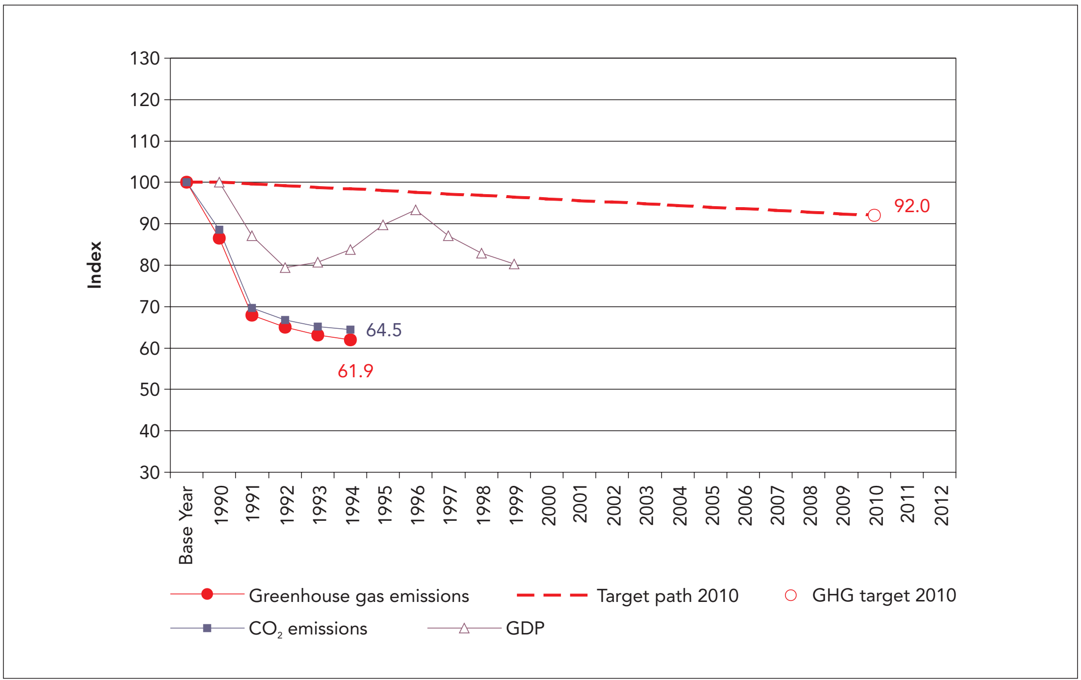
Base year (1989):	264.9 Tg
In 1994:	164.0 Tg
Change base year–1994:	– 100.9 Tg
	– 38.1 %

Distance-to-target indicator (DTI)
Romanian greenhouse gas emissions decreased from 1989 to 1994 by 38.1 %. Greenhouse gas emissions were reported for 1989 to 1994 only. Fluorinated gases were not reported. In 1994, Romanian greenhouse gas emissions were 34.5 index points below the Kyoto target path.

Information on emissions for IPCC sectors was very limited.

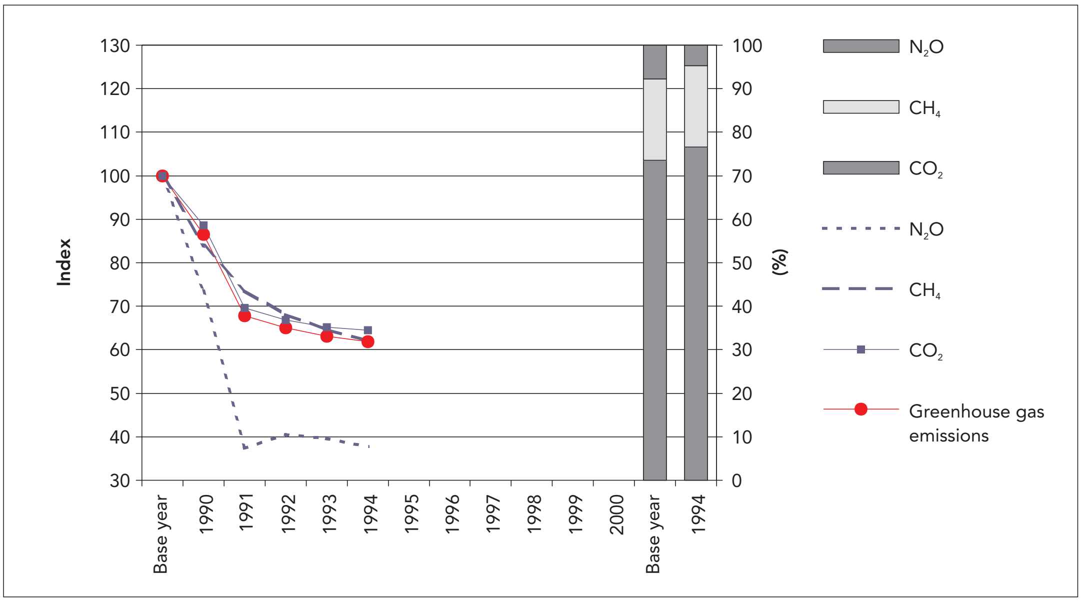
Greenhouse gas emissions by gas
The most important greenhouse gas is CO_2 with a share about 75 % in total greenhouse gases, methane contributes about 20 %, and the share of N_2O is about 5 %.

Figure 106 **Romanian greenhouse gas emissions compared with targets for 2000 and 2008–12 (excl. fluorinated gases and LUCF)**



Romanian greenhouse gas emissions by gas (excluding fluorinated gases and LUCF) Figure 107

Source: UNFCCC database.



Greenhouse gases and distance-to-target indicators for Romania Table A3.18

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Greenhouse gas emissions (without LUCF)	100,0	86,5	67,9	65,0	63,1	61,9	NA	NA	NA	NA	NA	NA
DTI 2010	0,0	– 13,5	– 31,7	– 34,2	– 35,7	– 36,5	NA	NA	NA	NA	NA	NA
CO_2 (without LUCF)	100,0	88,5	69,6	66,8	65,2	64,5	NA	NA	NA	NA	NA	NA
CH_4 (without LUCF)	100,0	83,8	73,6	68,0	64,6	62,0	NA	NA	NA	NA	NA	NA
N_2O (without LUCF)	100,0	73,4	37,4	40,6	39,5	37,7	NA	NA	NA	NA	NA	NA
F-gases	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Note: Total greenhouse gas emissions do not contain fluorinated gases.

Sectoral emission indicators (key sources) for Romania Table A3.19

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1.A.1. Energy industries (CO_2)	100,0	83,9	64,9	NA	NA	127,3	NA	NA	NA	NA	NA	NA
1.A.2. Manufac. industries and constr.(CO_2)	100,0	87,5	65,6	NA	NA	NA	NA	NA	NA	NA	NA	NA
1.A.3. Transport (CO_2)	100,0	119,3	95,3	86,6	95,0	98,1	NA	NA	NA	NA	NA	NA
1.A.3. Transport (N_2O)	100,0	101,5	127,6	NA	NA	NA	NA	NA	NA	NA	NA	NA
1.A.4. Other sectors (fuel combustion) (CO_2)	100,0	102,9	90,6	NA	NA	NA	NA	NA	NA	NA	NA	NA
1.A.4. Other sectors (fuel combustion) (CH_4)	100,0	99,3	75,9	NA	NA	NA	NA	NA	NA	NA	NA	NA
1.A.4. Other sectors (fuel combustion) (N_2O)	100,0	105,8	88,5	NA	NA	NA	NA	NA	NA	NA	NA	NA
1.A.5. Other (fuel combustion) (CO_2)	100,0	69,5	65,0	3374,3	3274,3	NA	NA	NA	NA	NA	NA	NA
1.B.1. Solid fuels (CH_4)	100,0	56,8	53,9	NA	NA	NA	NA	NA	NA	NA	NA	NA
1.B.2. Oil and natural gas (CH_4)	100,0	87,9	74,1	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.A. Mineral products (CO_2)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.B. Chemical industry (N_2O)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.B. Chemical industry (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.C. Metal production (CO_2)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.C. Metal production (PFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.E. Production of halocarbons & SF_6 (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.F. Consumption of halocarbons & SF_6 (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4.A. Enteric fermentation (CH_4)	100,0	87,3	76,8	NA	NA	68,7	NA	NA	NA	NA	NA	NA
4.B. Manure management (CH_4)	100,0	96,2	86,1	NA	NA	NA	NA	NA	NA	NA	NA	NA
4.B. Manure management (N_2O)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4.D. Agricultural soils (N_2O)	100,0	81,9	26,0	NA	NA	NA	NA	NA	NA	NA	NA	NA
6.A. Solid waste disposal on land (CH_4)	100,0	94,9	94,4	NA	NA	NA	NA	NA	NA	NA	NA	NA

Source: UNFCCC database.

Slovakia

Slovakian greenhouse gas emissions declined until 1994; since then they did not reduce significantly.

Base year:	72.6 Tg
In 2000:	48.5 Tg
Change base year–2000:	– 24.1 Tg – 33.2 %

Distance-to-target indicator (DTI)
Slovakian greenhouse gas emissions decreased from 1990 to 2000 by 33.2 %. From 1990 to 1994, emissions decreased by 28 %; since then, they have not reduced significantly. In 2000, Slovakia was 29.1 index point below its Kyoto target path.

GDP and emissions decoupled significantly in recent years. GDP is increasing since 1992, the increase from 1991 to 1999 was about 30 %.

Greenhouse gas emissions by gas
CO_2 is the most important greenhouse gas with a share of almost 85 % in total greenhouse gas emissions. Methane and N_2O emissions contribute around 7 % each. The share of fluorinated gases is below 1 %.

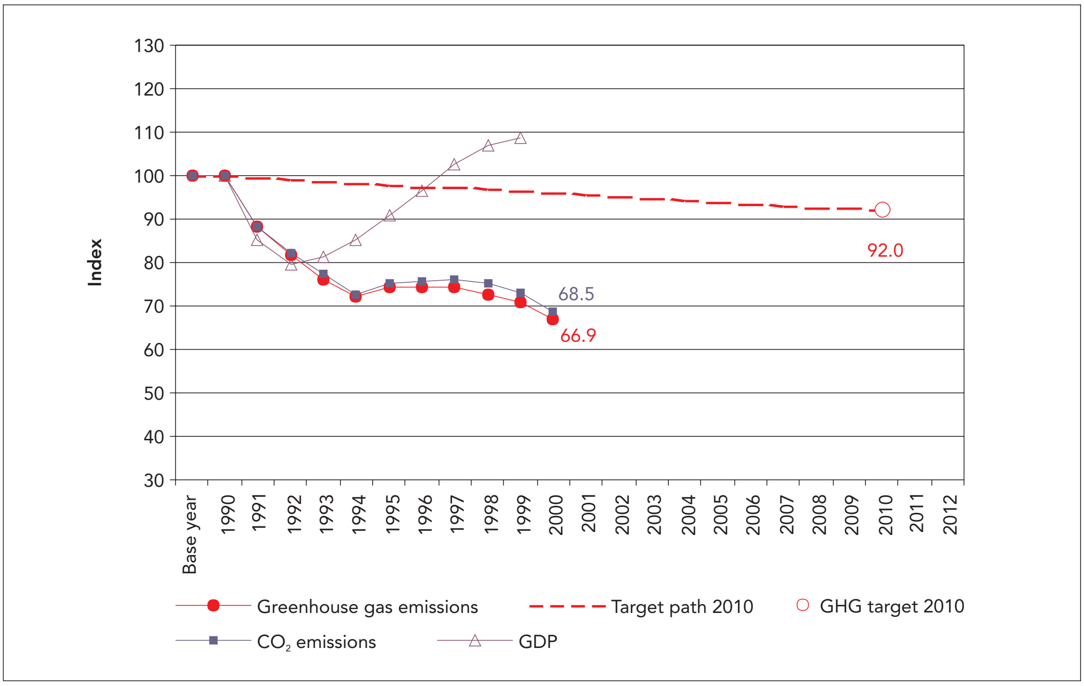
CO_2 emissions decreased by 31.5 % between 1990 and 2000. Emissions from energy industries and from transport declined by 36 % and 15 % respectively. CO_2 emissions from mineral products were almost stable between 1990–2000.

CH_4 emissions declined by 33 % between 1990 and 2000. Emissions from enteric fermentation dropped by 55 % mainly due to a reduction of cattle numbers. CH_4 emissions from solid waste disposal were only 4 % below 1990 levels in 2000.

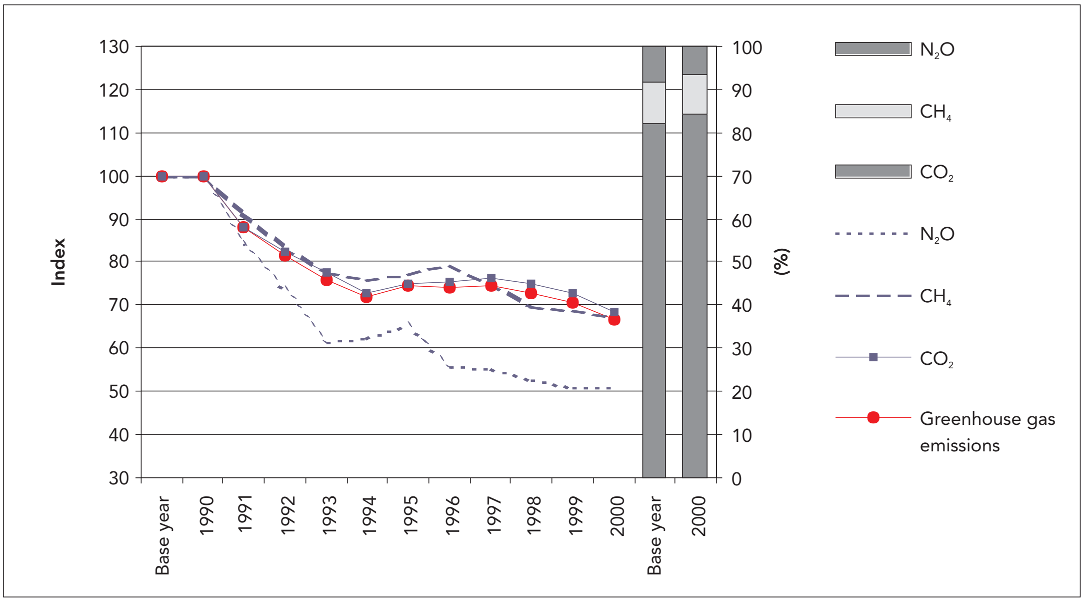
N_2O emissions decreased by 49 % between 1990 and 2000. Emissions from agricultural soils declined by 49 %. N_2O emissions from chemical industry decreased by 74 %. The emission decline was achieved mainly due to improved technology of nitric acid production. N_2O emissions from transport increased by 117 % mainly due to the growing number of cars with catalytic converters.

Fluorinated gas emissions decreased by 62 % between 1990 and 2000 mainly due to the modernisation of aluminium production.

Figure 108 **Slovakian greenhouse gas emissions compared with targets for 2000 and 2008–12 (excl. fluorinated gases and LUCF)**



Slovakian greenhouse gas emissions by gas (excluding fluorinated gases and LUCF) Figure 109



Source: Submissions by country (CRF tables).

Greenhouse gases and distance-to-target indicators for Slovakia Table A3.20

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Greenhouse gas emissions (without LUCF)	100,0	100,0	88,1	81,7	76,0	72,0	74,5	74,3	74,4	72,6	70,8	66,9
DTI 2010	0,0	0,0	– 11,5	– 17,5	– 22,8	– 26,4	– 23,5	– 23,3	– 22,8	– 24,2	– 25,6	– 29,1
CO_2 (without LUCF)	100,0	100,0	88,1	82,3	77,4	72,6	75,1	75,6	76,2	75,0	73,0	68,5
CH_4 (without LUCF)	100,0	100,0	91,3	83,1	77,4	75,6	77,1	79,3	74,9	69,8	69,1	67,1
N_2O (without LUCF)	100,0	100,0	84,3	73,8	61,5	62,3	65,3	55,9	55,4	52,6	50,9	50,8
F-gases	100,0	100,0	98,2	91,6	57,3	53,1	54,5	33,4	42,0	29,3	34,1	37,9

Note: Total greenhouse gas emissions do not contain fluorinated gases.

Sectoral emission indicators (key sources) for Slovakia Table A3.21

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1.A.1. Energy industries (CO_2)	100,0	100,0	89,3	82,5	77,0	70,4	72,4	73,4	73,5	69,4	67,3	64,4
1.A.2. Manufac. industries and constr.(CO_2)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1.A.3. Transport (CO_2)	100,0	100,0	83,4	77,9	76,8	81,2	86,3	87,5	90,6	97,6	95,1	85,2
1.A.3. Transport (N_2O)	100,0	100,0	82,1	74,2	73,8	136,7	158,5	176,4	197,8	231,4	235,4	216,6
1.A.4. Other sectors (fuel combustion) (CO_2)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1.A.4. Other sectors (fuel combustion) (CH_4)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1.A.4. Other sectors (fuel combustion) (N_2O)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1.A.5. Other (fuel combustion) (CO_2)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1.B.1. Solid fuels (CH_4)	100,0	100,0	86,8	74,0	74,3	76,0	78,7	80,2	82,0	82,9	78,4	76,3
1.B.2. Oil and natural gas (CH_4)	100,0	100,0	95,4	87,9	91,4	90,8	98,3	102,9	103,9	99,1	102,1	99,6
2.A. Mineral products (CO_2)	100,0	100,0	78,9	85,7	82,7	88,6	95,4	87,7	93,3	117,4	117,2	98,7
2.B. Chemical industry (N_2O)	100,0	100,0	94,1	85,2	71,6	113,0	124,0	27,5	28,5	26,7	28,0	25,9
2.B. Chemical industry (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.C. Metal production (CO_2)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.C. Metal production (PFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.E. Production of halocarbons & SF_6 (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.F. Consumption of halocarbons & SF_6 (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4.A. Enteric fermentation (CH_4)	100,0	100,0	86,7	74,7	63,6	59,5	60,9	58,3	53,6	48,1	46,1	45,0
4.B. Manure management (CH_4)	100,0	100,0	92,8	83,9	77,0	72,8	73,6	71,0	65,1	57,6	55,2	54,0
4.B. Manure management (N_2O)	100,0	100,0	90,3	78,7	67,9	63,4	64,3	62,0	56,8	49,9	47,6	46,3
4.D. Agricultural soils (N_2O)	100,0	100,0	81,1	70,7	57,8	53,5	55,8	55,7	55,9	53,6	51,6	52,5
6.A. Solid waste disposal on land (CH_4)	100,0	100,0	100,0	100,0	100,0	100,0	101,2	118,6	101,4	91,1	92,6	96,0

Source: Submissions by country (CRF tables).

Slovenia

Slovenia is the only candidate country having increased its greenhouse gas emissions in the 1990s. Compared to the base year (1986), greenhouse gas emissions were slightly lower in 1996. CO_2 emissions from transport more than doubled between 1986 and 1996.

Base year (1986):	19.9 Tg
In 1996:	19.8Tg
Change base year–1996:	– 0.1 Tg – 0.7 %

Distance-to-target indicator (DTI)
Slovenian greenhouse gas emissions declined by 7.8 % from 1986 to 1990, but were 7.7 % above 1990 levels in 1996. Slovenian greenhouse gas emissions were 2.9 index points above the Kyoto target path in 1996. GDP increased by about 18 % from 1992 to 1996.

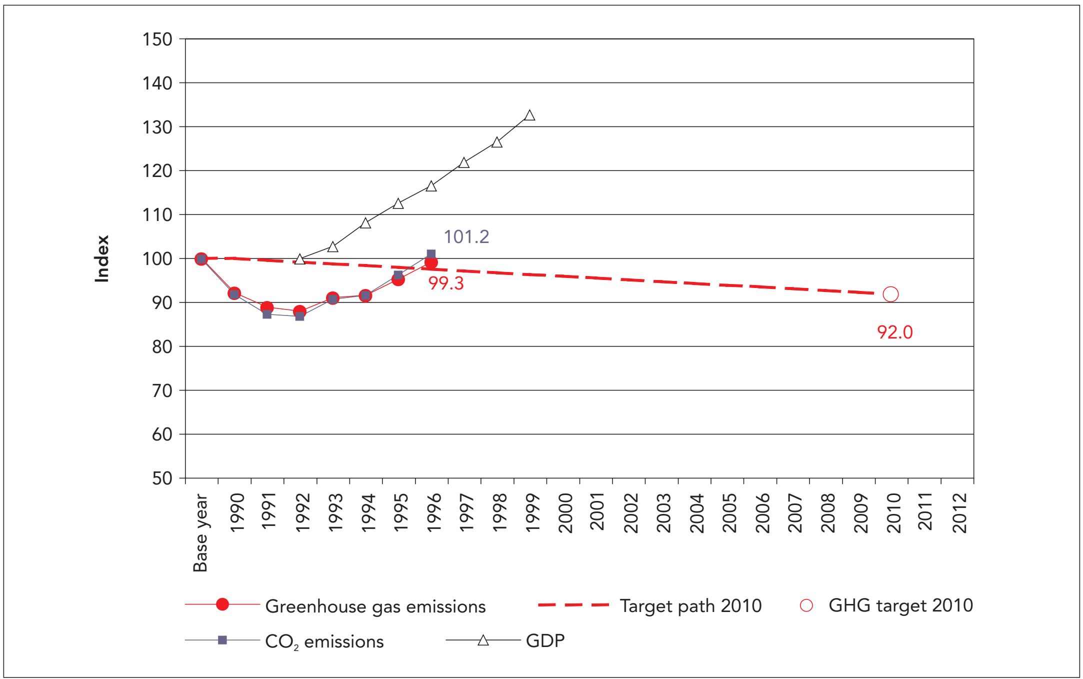
Greenhouse gas emissions by gas
CO_2 is the most important greenhouse gas with a share of 80 % in total greenhouse gas emissions. Methane and N_2O emissions contribute around 9 % each. The share of fluorinated gases is below 1 %.

CO_2 emissions increased by 1 % between the base year and 1996 (but 10 % between 1990 and 1996). Emissions from energy industries decreased by 15 %, whereas CO_2 emissions from transport increased by 109.5 %. Energy-related CO_2 emissions from industry declined by 43 % between base year and 1996, whereas emissions from small combustion increased by 41.5 %.

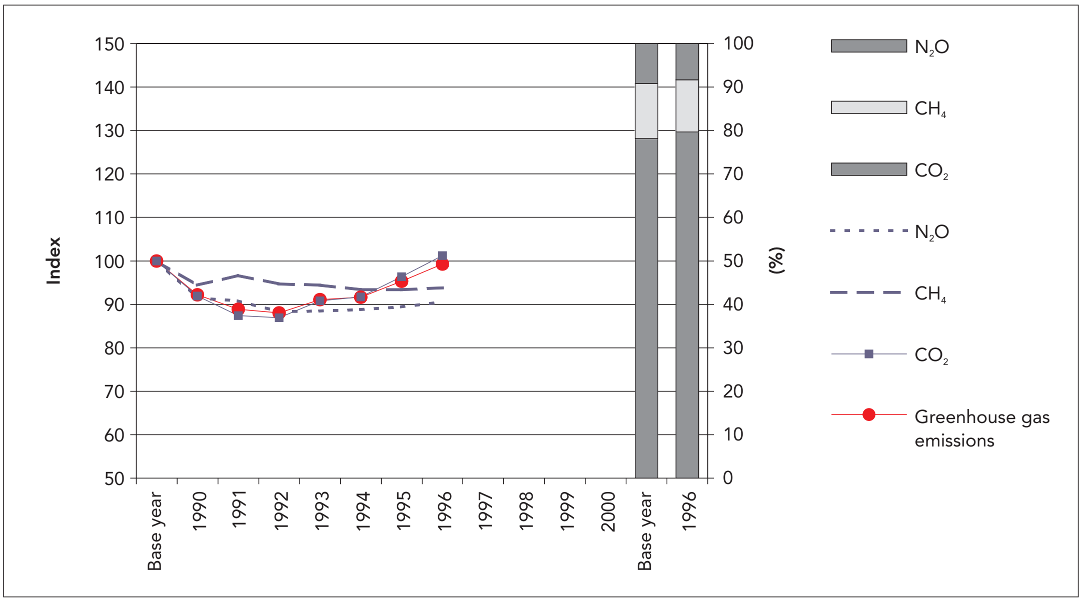
Methane emissions decreased between base year and 1990 by 6 % and until 1996 did not change significantly. Emissions from enteric fermentation and from manure management decreased by 11 % and 29 % respectively, but CH_4 from solid waste disposal on land increased by 27 %.

N_2O emissions were 9.5 % below base-year level in 1996. Emissions from agricultural soils have been stable since 1990, but emissions from transport increased by more than 200 %. Fluorinated gas emissions increased by 46 % between the base year and 1996.

Figure 110 **Slovenian greenhouse gas emissions compared with targets for 2000 and 2008–12 (excl. fluorinated gases and LUCF)**



Slovenian greenhouse gas emissions by gas (excluding fluorinated gases and LUCF) Figure 111



Source: UNFCCC database, EMEP database, (IPCC Tables).

Greenhouse gases and distance-to-target indicators for Slovenia Table A3.22

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Greenhouse gas emissions (without LUCF)	100,0	92,2	88,9	88,0	91,1	91,6	95,3	99,3	NA	NA	NA	NA
DTI 2010	0,0	– 7,8	– 10,7	– 11,2	– 7,7	– 6,8	– 2,7	1,7	NA	NA	NA	NA
CO_2 (without LUCF)	100,0	91,9	87,4	86,9	90,8	91,7	96,3	101,2	NA	NA	NA	NA
CH_4 (without LUCF)	100,0	94,4	96,7	94,7	94,4	93,4	93,3	93,8	NA	NA	NA	NA
N_2O (without LUCF)	100,0	91,4	90,8	88,3	88,4	88,8	89,4	90,5	NA	NA	NA	NA
F-gases	100,0	93,1	109,4	87,9	90,8	101,8	163,5	145,6	NA	NA	NA	NA

Note: Total greenhouse gas emissions do not contain fluorinated gases.

Sectoral emission indicators (key sources) for Slovenia Table A3.23

	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1.A.1. Energy industries (CO_2)	100,0	93,7	84,5	93,0	92,7	86,7	90,8	85,0	NA	NA	NA	NA
1.A.2. Manufac. industries and constr.(CO_2)	100,0	73,2	70,4	61,6	57,2	59,8	59,7	57,4	NA	NA	NA	NA
1.A.3. Transport (CO_2)	100,0	132,7	125,4	129,2	149,1	167,7	180,8	209,5	NA	NA	NA	NA
1.A.3. Transport (N_2O)	100,0	124,3	120,6	111,1	122,7	181,5	250,1	344,7	NA	NA	NA	NA
1.A.4. Other sectors (fuel combustion) (CO_2)	100,0	79,0	94,8	83,7	107,7	102,1	110,2	141,5	NA	NA	NA	NA
1.A.4. Other sectors (fuel combustion) (CH_4)	100,0	75,4	82,2	76,0	72,3	66,9	64,6	65,6	NA	NA	NA	NA
1.A.4. Other sectors (fuel combustion) (N_2O)	100,0	80,4	83,2	75,5	70,7	76,3	69,3	69,9	NA	NA	NA	NA
1.A.5. Other (fuel combustion) (CO_2)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1.B.1. Solid fuels (CH_4)	100,0	84,4	78,7	85,3	78,3	74,7	75,8	72,4	NA	NA	NA	NA
1.B.2. Oil and natural gas (CH_4)	100,0	47,9	45,6	45,6	44,1	43,7	52,3	52,0	NA	NA	NA	NA
2.A. Mineral products (CO_2)	100,0	93,6	78,0	67,4	54,4	69,7	71,8	74,4	NA	NA	NA	NA
2.B. Chemical industry (N_2O)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.B. Chemical industry (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.C. Metal production (CO_2)	100,0	169,1	141,8	151,7	154,4	162,2	146,6	137,3	NA	NA	NA	NA
2.C. Metal production (PFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.E. Production of halocarbons & SF_6 (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2.F. Consumption of halocarbons & SF_6 (HFC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4.A. Enteric fermentation (CH_4)	100,0	96,3	93,8	89,7	88,2	88,2	88,7	88,9	NA	NA	NA	NA
4.B. Manure management (CH_4)	100,0	102,8	100,9	99,2	95,9	87,3	78,9	71,3	NA	NA	NA	NA
4.B. Manure management (N_2O)	100,0	95,8	93,1	90,2	88,6	89,3	89,6	90,2	NA	NA	NA	NA
4.D. Agricultural soils (N_2O)	100,0	92,7	93,9	93,3	95,1	93,9	93,2	92,5	NA	NA	NA	NA
6.A. Solid waste disposal on land (CH_4)	100,0	98,9	112,6	111,4	117,7	120,1	125,3	126,7	NA	NA	NA	NA

Source: UNFCCC database, EMEP database, (IPCC Tables).

Annex 4: Summary of candidate countries greenhouse gas emissions data

This annex gives a short summary of the CO_2, CH_4 and N_2O candidate countries' emission data used in this report. Greenhouse gas emission data, as referred to in this report, do not include emissions and removals from LUCF.

Bulgaria	**Base year**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
	CO_2 equivalent [Tg = million tons]											
Greenhouse gas emissions (without LUCF)	157,1	137,7	115,7	103,7	102,1	92,6	98,1	101,9	89,8	80,7	77,6	NA
CO_2 (without LUCF)	103,9	84,1	66,0	59,2	61,9	59,2	62,3	66,8	58,7	52,3	48,4	NA
CH_4 (without LUCF)	28,0	29,6	28,4	26,2	23,6	17,2	18,6	17,4	14,8	13,7	10,1	NA
N_2O (without LUCF)	25,2	24,0	21,2	18,3	16,7	16,2	17,1	17,7	16,3	14,7	19,0	NA

Czech Republic	**Base year**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
	CO_2 equivalent [Tg = million tons]											
Greenhouse gas emissions (without LUCF)	192,0	192,0	180,1	166,0	159,7	150,5	150,9	154,5	158,2	148,0	139,8	146,7
CO_2 (without LUCF)	164,0	164,0	154,3	141,4	136,2	127,7	128,8	132,8	137,4	128,3	121,1	127,9
CH_4 (without LUCF)	16,7	16,7	14,9	14,0	13,3	12,8	12,6	12,5	12,0	11,4	10,6	10,7
N_2O (without LUCF)	11,3	11,3	10,9	10,6	10,2	9,9	9,6	9,2	8,8	8,4	8,1	8,2

Estonia	**Base year**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
	CO_2 equivalent [Tg = million tons]											
Greenhouse gas emissions (without LUCF)	43,5	43,5	40,6	29,9	23,5	24,5	22,3	23,5	23,7	21,5	19,7	19,7
CO_2 (without LUCF)	38,1	38,1	35,9	26,1	20,6	21,4	19,3	20,3	20,2	18,3	16,8	16,8
CH_4 (without LUCF)	4,4	4,4	3,7	3,0	2,4	2,6	2,6	2,8	3,0	2,8	2,5	2,5
N_2O (without LUCF)	1,0	1,0	1,0	0,8	0,5	0,5	0,4	0,4	0,4	0,4	0,4	0,4

Hungary	**Base year**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
	CO_2 equivalent [Tg = million tons]											
Greenhouse gas emissions (without LUCF)	101,6	86,6	87,9	79,1	79,0	77,2	77,9	79,2	76,8	82,7	85,7	83,8
CO_2 (without LUCF)	83,7	71,7	67,4	60,6	60,8	59,2	59,8	60,5	58,9	57,6	60,1	59,4
CH_4 (without LUCF)	14,0	11,4	19,2	17,0	16,6	16,3	16,6	17,1	16,6	14,3	14,3	11,6
N_2O (without LUCF)	4,0	3,5	1,3	1,5	1,5	1,7	1,5	1,6	1,4	10,9	11,3	12,7

Latvia	**Base year**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
	CO_2 equivalent [Tg = million tons]											
Greenhouse gas emissions (without LUCF)	31,0	31,0	24,9	20,4	16,8	15,3	13,4	12,7	11,9	12,1	11,3	10,6
CO_2 (without LUCF)	23,5	23,5	18,5	14,9	12,9	11,9	10,1	9,5	8,6	8,3	7,5	6,8
CH_4 (without LUCF)	4,1	4,1	4,0	3,3	2,4	2,1	2,1	2,0	2,1	2,6	2,5	2,5
N_2O (without LUCF)	3,4	3,4	2,4	2,2	1,6	1,3	1,2	1,2	1,2	1,2	1,2	1,3

Lithuania	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	CO_2 equivalent [Tg = million tons]											
Greenhouse gas emissions (without LUCF)	51,5	51,5	46,0	40,5	35,0	29,5	23,9	24,6	24,9	23,9	NA	NA
CO_2 (without LUCF)	39,5	39,5	34,7	29,8	24,9	20,1	15,2	16,2	16,2	16,7	NA	NA
CH_4 (without LUCF)	7,9	7,9	7,4	6,8	6,2	5,6	5,1	4,8	5,1	3,7	NA	NA
N_2O (without LUCF)	4,1	4,1	4,0	3,9	3,8	3,8	3,7	3,6	3,5	3,4	NA	NA

Poland	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	CO_2 equivalent [Tg = million tons]											
Greenhouse gas emissions (without LUCF)	564,3	459,0	437,4	439,4	429,6	438,9	416,5	436,5	426,2	402,5	400,2	NA
CO_2 (without LUCF)	476,6	380,7	367,0	371,6	363,2	371,6	348,2	372,5	361,6	337,5	329,7	NA
CH_4 (without LUCF)	65,9	58,8	54,4	52,0	51,1	51,8	51,6	47,3	47,8	49,0	47,3	NA
N_2O (without LUCF)	21,7	19,5	16,1	15,8	15,4	15,5	16,7	16,7	16,7	16,0	23,3	NA

Romania	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	CO_2 equivalent [Tg = million tons]											
Greenhouse gas emissions (without LUCF)	264,9	229,1	179,8	172,2	167,2	164,0	NA	NA	NA	NA	NA	NA
CO_2 (without LUCF)	194,8	172,5	135,7	130,2	127,1	125,6	NA	NA	NA	NA	NA	NA
CH_4 (without LUCF)	49,5	41,5	36,4	33,7	32,0	30,7	NA	NA	NA	NA	NA	NA
N_2O (without LUCF)	20,6	15,1	7,7	8,3	8,1	7,8	NA	NA	NA	NA	NA	NA

Slovakia	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	CO_2 equivalent [Tg = million tons]											
Greenhouse gas emissions (without LUCF)	72,6	72,6	63,9	59,3	55,2	52,3	54,1	53,9	54,0	52,7	51,4	48,5
CO_2 (without LUCF)	59,7	59,7	52,7	49,2	46,2	43,4	44,9	45,2	45,6	44,8	43,6	40,9
CH_4 (without LUCF)	6,7	6,7	6,1	5,6	5,2	5,1	5,2	5,3	5,0	4,7	4,6	4,5
N_2O (without LUCF)	6,1	6,1	5,2	4,5	3,8	3,8	4,0	3,4	3,4	3,2	3,1	3,1

Slovenia	Base year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
	CO_2 equivalent [Tg = million tons]											
Greenhouse gas emissions (without LUCF)	19,9	18,3	17,7	17,5	18,1	18,2	19,0	19,8	NA	NA	NA	NA
CO_2 (without LUCF)	15,6	14,3	13,6	13,5	14,1	14,3	15,0	15,7	NA	NA	NA	NA
CH_4 (without LUCF)	2,5	2,4	2,4	2,4	2,4	2,4	2,4	2,4	NA	NA	NA	NA
N_2O (without LUCF)	1,8	1,7	1,7	1,6	1,6	1,6	1,6	1,6	NA	NA	NA	NA

European Environment Agency

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