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Analysis of greenhouse gas emission trends and projections in Europe 2004

European Environment Agency

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1 Introduction

Scope and purpose of the report

This report provides a detailed analysis and background information for the EEA report 'Greenhouse gas emission trends and projections in Europe 2004 — Progress by the EU and its Member States towards achieving their Kyoto Protocol targets'. The EEA report is published separately and is an indicator-based assessment of European Community and other EEA countries' ([1]) greenhouse gas emission trends, emission projections and existing and proposed policies and measures to reduce greenhouse gas emissions by 2010.

This report presents information on the actual (1990–2002) and projected progress (by 2010) of the European Union (EU) and its Member States and of other EEA countries towards achieving their emission targets under the UN Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol.

The information is aimed to provide policy-makers with the information necessary to identify the countries that are on track towards the targets, using domestic policies and measures as well as Kyoto mechanisms (based on limited available information). The report also identifies the socioeconomic sectors that are contributing most, the effectiveness of existing domestic policies and measures — both national and Community-wide — in reducing or limiting emissions, and the extent to which additional domestic policies and measures or the use of Kyoto mechanisms might be required to achieve the targets. The report focuses on trends and domestic policies and measures in the sectors energy supply and use excluding transport, transport, industry, agriculture, and waste management.

The report, prepared by EEA and its European Topic Centre on Air and Climate Change (ETC/ACC), also serves to support and complement the annual evaluation report of the European Commission to the Council and European Parliament, which is required under Council Decision No 280/2004/EC concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol ([2]) (see previous year report European Commission, 2003a). This Council decision came into effect on 18 March 2004. Therefore, for this year, this report is still based on information delivered by Member States under the previous Council decision (1999/296/EC). The EEA report provides additional analyses to the Commission's annual report.

The monitoring mechanism is an instrument to assess accurately and regularly the extent of progress being made towards the Community's commitments under the UNFCCC and the Kyoto Protocol. Progress is evaluated by the European Commission, in consultation with the Member States, and is based on national programmes supplied by the Member States and on other relevant information. The national programmes should include (a) information on actual progress and (b) information on projected progress, including domestic policies and measures, in line with the guidelines under the decision.

Member States are required by 15 January each year to submit GHG inventory data

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([1]) This report covers the 25 EU Member States and provides data for other EEA member countries (Bulgaria, Iceland, Liechtenstein, Norway, Romania and Turkey), where available.

([2]) OJ L 49, 19.2.2004, p. 1; European Commission, 2004c.

for the previous year but one and any updates of years before (including the base year 1990). In addition, Member States are required to report to the Commission, by 15 March 2005 and every two years thereafter ([3]):

(i) information on national policies and measures which limit and/or reduce greenhouse gas emissions by sources or enhance removals by sinks, presented on a sectoral basis for each greenhouse gas;

(ii) national projections of greenhouse gas emissions by sources and their removal by sinks as a minimum for the years 2005, 2010, 2015 and 2020, organised by gas and by sector, including 'with measures' and 'with additional measures' projections.

Reporting under the monitoring mechanism was voluntary for the new Member States before 1 May 2004, but has become mandatory after joining the EU. The central and eastern European countries are, however, already required to report greenhouse gas emissions and national programmes to the UNFCCC and this report uses this information.

Main changes from the 2003 report

This year (2004) the report is published for a third time. The information in the report published at the end of 2003 on trends and projections (EEA, 2003a) has been updated with the most recent emission inventories submitted by all Member States (by April 2004). New emission projections and national programmes have also been taken into account, as available by May 2004. For the first time, a more integrated view on emission past and projected trends is aimed at all levels of the report (i.e. at EU total, at sectoral and at MS levels).

Assessment approach

The evaluation of progress towards the targets has two main components:

(i) evaluation of actual progress in 2002 relative to the base year, based on an analysis of contributions of domestic policies and measures by sectors and countries to greenhouse gas emission trends;

(ii) evaluation of projected progress up to 2010, based on an analysis of adopted and future (planned or currently under discussion) domestic policies and measures at both national and Community levels: this evaluation is based on emission projections provided by Member States in their national programmes and on additional Community-wide projections.

A third element is a limited comparison, for energy-related carbon dioxide emissions, between projections (in 2010) from the Member States and recent EU-15-wide assessments (for 2010).

An additional analysis of the extent to which Member States are preparing to use the flexible mechanism of the Kyoto Protocol to fulfil their commitments is included in this report for the second time. The assessment is based on information provided by 11 Member States. In addition, the Commissions decisions on the national allocation plans notified under the European emissions trading directive have been taken into account. An analysis of the extent to which Member States intend to make use of land-use change and forestry (carbon sinks) to fulfil their commitments is also included in this report, although emissions from and removals by carbon sinks are not yet estimated according to internationally agreed methods (these recently agreed methods will be mandatory from 2005 on).

([3]) Note that Council Decision No 280/2004/EC came into effect on 18 March 2004. Therefore, for this year, this report is still based on information delivered by Member States under the previous Council decision (1999/296/EC).

These analyses are incorporated in separate chapters in this report. The use of Kyoto mechanisms is partly integrated into the progress evaluation. Apart from the two chapters and the partial inclusion of Kyoto mechanisms in the progress assessment, all information on emissions and emission projections in this report focuses on domestic policies and measures, excluding Kyoto mechanisms and emissions and removals from land-use change and forestry.

The report uses a number of indicators to address the following key questions (which are related to chapters in the report).

1. Which targets have to be achieved?

2. What is the actual and projected progress of countries in limiting greenhouse gas emissions?

3. What are the effects of existing and additional key domestic policies and measures taken in the EU to limit greenhouse gas emissions by 2010?

4. What are the key sectoral trends in the EU?

5. To what extent do countries expect to use the Kyoto mechanisms and carbon sinks by 2010 in addition to domestic policies and measures?

6. Is the reporting scheme of the EU sufficient for assessing the progress of greenhouse gas emissions reduction?

2 Targets

2.1 EU-15 Member States

Climate change, and avoiding its potential consequences, is addressed by the United Nations Framework Convention on Climate Change (UNFCCC) and remains a high priority in the EU. Achieving a stabilisation of atmospheric greenhouse gas (GHG) concentrations would require substantial (ca. 70 %) reductions in global greenhouse gas emissions (IPCC, 2001).

To take the first steps towards stabilisation of the world's climate, or at least a moderate sustainable climate change, the third Conference of the Parties (COP) to the UNFCCC, held in Kyoto in December 1997, adopted different binding targets of greenhouse gas emissions for industrialised (called 'Annex 1') Parties, including the European Community (EC), in the Kyoto Protocol. The Kyoto Protocol requires a 5 % reduction in developed countries' emissions from 1990 levels by 2008–12 ([4]) of six greenhouse gases (carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6)). Under the Kyoto Protocol the EU-15 agreed to reduce its greenhouse gas emissions by 8 % from 1990 levels by 2008–12 ([5]).

According to Council Decision 2002/358/EC ([6]), the EU-15 and its Member States agreed in 2002 on different emission limitation and/or reduction targets for each Member State according to economic circumstances, called the burden-sharing agreement. Eight Member States agreed to reduction targets by 2008–12 (Austria, Belgium, Denmark, Germany, Italy, Luxembourg, the Netherlands and the United Kingdom). Two Member States (Finland and France) agreed to stabilise greenhouse gas emissions by 2008–12, whereas five Member States (Greece, Ireland, Portugal, Spain and Sweden) agreed to limit their increases by 2008–12. The targets range from a reduction of 28 % for Luxembourg to allowed, but limited, increases of greenhouse gas emissions of 27 % for Portugal. The largest absolute emission reduction has to be achieved by Germany, of about 250 million tonnes of CO_2-equivalent ([7]) (Figure 2.1).

In the Convention itself, the Parties to the UNFCCC had agreed that industrialised countries to this Convention, including the EU and its Member States, had to adopt policies and measures with the aim of returning their anthropogenic CO_2 and other greenhouse gas emissions, individually or jointly (applying to the EU), by the year 2000 to 1990 levels.

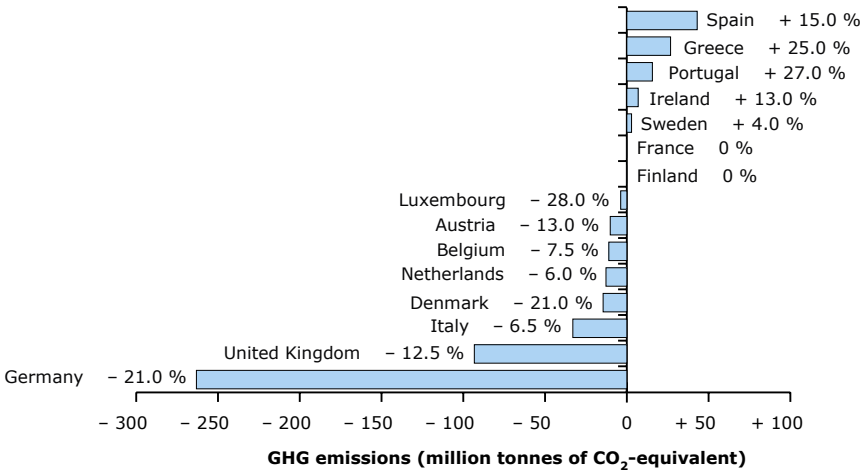
([4]) As an estimate for the commitment period 2008–12, projections for the year 2010 are presented later in this report.

([5]) The 8 % reduction target refers to the EU-15. The EU-15 inventory is the sum of the 15 Member States inventory. Also, the base-year is the sum of Member States' base years. For Finland and France, the base year is 1990 for emissions of all six greenhouse gases. For all other Member States of the EU-15, the base year is a combination of 1990 emissions of CO_2, CH_4 and N_2O and 1995 emissions of HFCs, PFCs and SF_6 (the 'F gases').

([6]) Council Decision 2002/358/CE of 25 April 2002 concerning the approval, on behalf of the European Community, of the Kyoto Protocol to the United Nations Framework Convention on Climate Change and the joint fulfilment of commitments thereunder (OJ L 130, 15.5.2002, p. 1).

([7]) All emission data provided in this report are in million tonnes of CO_2-equivalent.

Figure 2.1 Greenhouse gas emission targets of EU Member States for 2008–12 relative to base-year emissions under the EU burden-sharing decision ([8])



Source: EEA, 2004.

At the seventh Conference of the Parties (November 2001) of the UNFCCC, held in Marrakesh, agreement was reached on the implementation of the Kyoto Protocol and thus on many of the rules and guidelines for use of the Kyoto mechanisms (joint implementation, clean development mechanism, and international emissions trading) and of carbon sinks ([9]) for meeting the Kyoto targets.

2.2 New EU Member States and other EEA member countries

By April 2004, the EU, all old and new Member States (MS), the two candidate countries (Bulgaria and Romania) and the two other EEA countries (Iceland and Norway) had ratified the Kyoto Protocol. Liechtenstein has signed the Kyoto Protocol, but not ratified. Turkey has only ratified the UNFCCC very recently but not yet the Kyoto Protocol. Russia had also ratified by the end of 2004. Therefore the Protocol will enter into force early in 2005 since it now has been ratified by at least 55 Parties to the Convention, including developed countries accounting for at least 55 % of CO_2 emissions from this group in 1990.

The new EU Member States belong, within the UNFCCC, to the group of countries undergoing the process of transition to a market economy (except Cyprus and Malta) and most of them have targets under the Kyoto Protocol (Figure 2.2). The Czech Republic, Estonia, Latvia, Lithuania, Slovakia and Slovenia have a reduction target of 8 % from the base year, while Hungary and Poland have a reduction target of 6 %. Cyprus and Malta have no targets because they are not Annex 1 Parties to the UNFCCC.

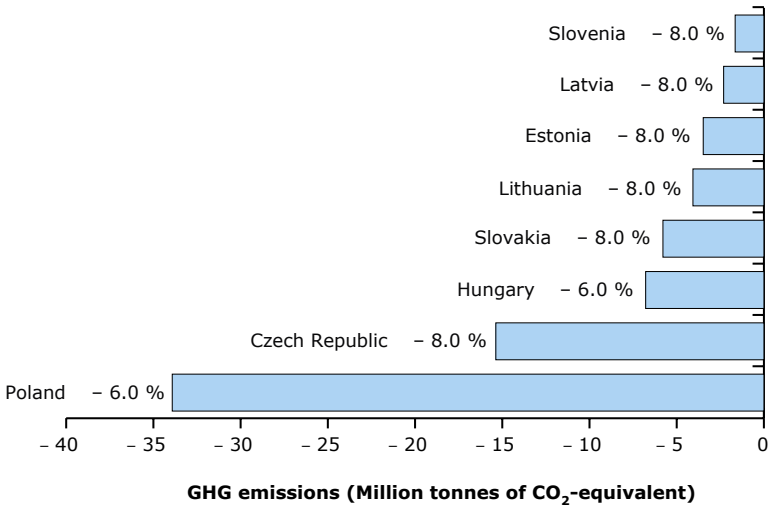
([8]) In Council Decision 2002/358/EC on the approval by the EU of the Kyoto Protocol, the different commitments of the Member States are expressed as percentage changes from the base year. In 2006, the respective emission levels will be expressed in terms of tonnes of CO_2-equivalent. In this connection, the Council of Environment Ministers and the Commission have in a joint statement agreed to take into account inter alia the assumptions in Denmark's statement to the Council conclusions from 16 and 17 June 1998 relating to base-year emissions.

([9]) Carbon sinks are officially called 'emissions and removals from land use, land-use change and forestry'. In the main part of this report, carbon sinks are not regarded in the assessment of progress. However, an overview on some Member States is given separately in Section 8. Furthermore, methods for calculating carbon sinks are still under development by the Intergovernmental Panel on Climate Change, and therefore the initial analysis will be revised in the coming years when additional data become available.

The additional EEA member countries Norway and Iceland are allowed to increase emissions under the Kyoto Protocol, by 1 % and 10 % respectively, from their base-year emissions. Liechtenstein has a target of – 8 %.

Poland has to achieve by far the largest absolute emission reduction of about 34 million tonnes of CO_2-equivalent.

Figure 2.2 Greenhouse gas emission targets of the new EU Member States for 2008–12 relative to base-year emissions under the Kyoto Protocol



Note: Countries with base years other than 1990 are Hungary (average 1985–87), Poland (1988) and Slovenia (1986). Cyprus and Malta have no targets.

Sources: GHG inventory submissions under the EC GHG monitoring mechanism and to the UNFCCC.

3 GHG emissions in the EU-23

In 2002, total EU-23 greenhouse gas (GHG) emissions declined by 1 %, compared with 2001; they were 7 % below 1990 and 9 % below base-year levels (Figure 3.1). The overall trend is dominated by the old Member States, which account for 85 % of total EU-23 greenhouse gas emissions. Due to large reductions in the new Member States, the share of the old Member States has increased since 1990.

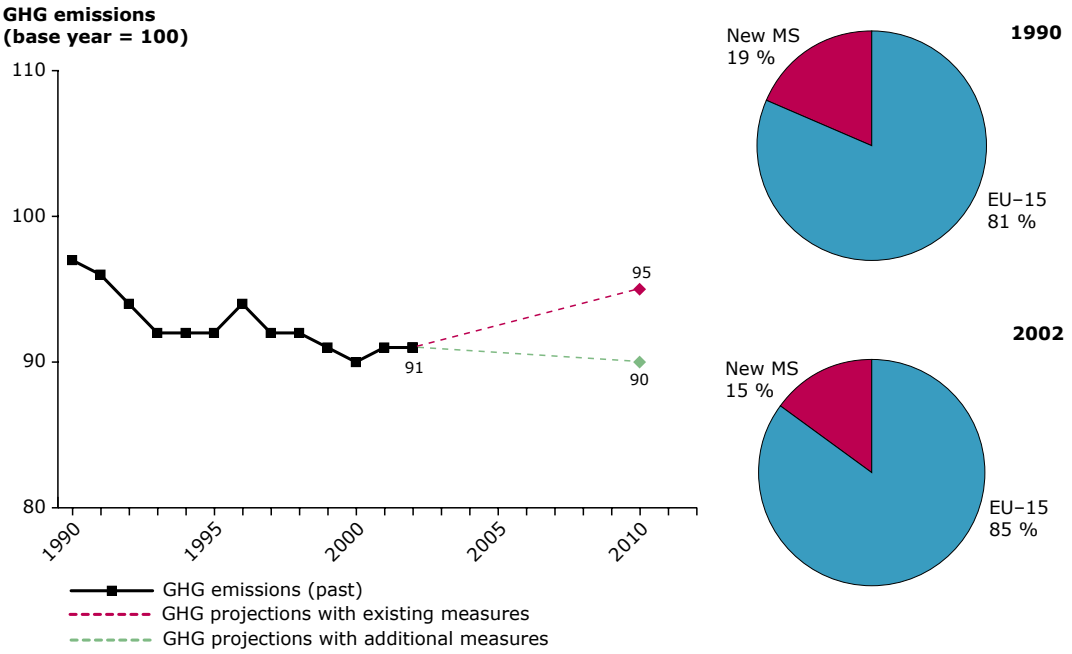
Emission projections suggest that, with existing measures, EU-23 GHG emissions will be about 5 % below base-year levels. With additional measures, GHG emissions are projected to slightly decrease below 2002 levels in 2010.

Figure 3.2 shows that carbon dioxide (CO_2) is by far the most important greenhouse gas, accounting for about 82 % of CO_2-equivalent greenhouse gas emissions covered by the Kyoto Protocol; second comes methane (CH_4) and third is nitrous oxide (N_2O). All gases declined between the base year and 2002; the largest decline was for methane.

Energy supply and use excluding transport is the largest sector accounting for almost 62 % of EU-23 GHG emissions; next are transport and agriculture ([10]). All sectors except transport had emission decreases between the base year and 2002.

Figure 3.3 shows the GHG emissions per capita in the EU-25 and by Member States in 1990 and 2002. In the EU-15, GHG emissions per capita decreased by 6 % from 11.6 tonnes in 1990 to 11.1 tonnes in 2002. This reduction is largely due to decreases in Germany (– 22 %) and the United Kingdom (– 17 %). There were also decreases in Belgium,

Figure 3.1 EU-23 greenhouse gas emissions and projections

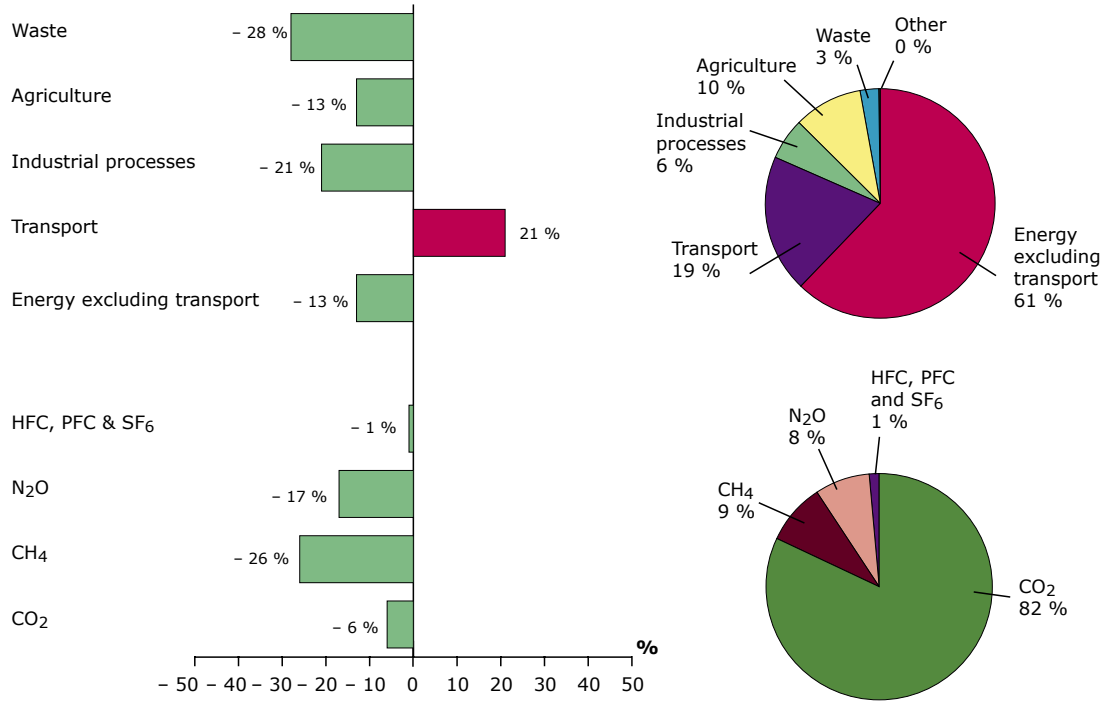


Note: Data exclude emissions and removals from land-use change and forestry. The figure refers to the base year as 100 in order to allow a consistent analysis of GHG emission trends and projections. Note that the base year of the EU-23 is a purely hypothetical value and has no legal implications. The base year has been taken as 100 in order to allow a consistent comparison between past emissions and projections.

Sources: GHG inventory submissions under the EC GHG monitoring mechanism and to the UNFCCC.

([10]) See Section 7 for explanations of the sectors.

Figure 3.2 Change in EU-23 emissions of greenhouse gases by sector and gas base year to 2002 and contribution by sector and gas in 2002



Note: The base year of the EU-23 is a purely hypothetical value and has no legal implications. The change base year to 2002 has been taken in order to provide a consistent analysis with Figure 3.1.

Sources: GHG inventory submissions under the EC GHG monitoring mechanism and to the UNFCCC.

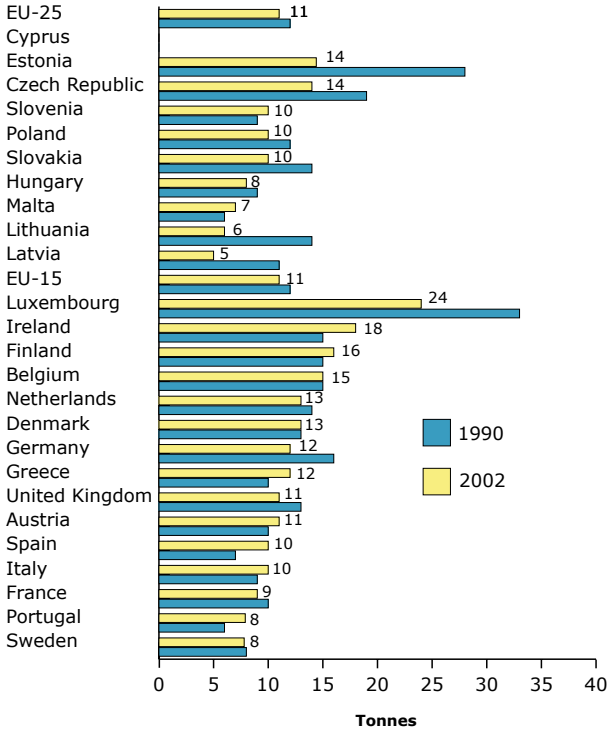
Denmark, France, Luxembourg, the Netherlands and Sweden. In seven EU-15 Member States, per capita emissions have increased between 1990 and 2002, with Portugal and Spain showing percentage increases of more than 30 %. The highest per capita emissions in 2002 were for Luxembourg (24 tonnes), and the lowest for Sweden (7.8 tonnes).

The new EU Member States have lower per capita emissions on average than the EU-15 Member States. All of the new Member States, except Malta and Slovenia, decreased per capita emissions substantially in the 1990s. The largest per capita emissions were for Estonia (14.4 tonnes), and the lowest for Latvia (5 tonnes).

Figure 3.4 shows the GHG emissions per GDP in the EU-25 and by Member States in 1990 and 2002 (where available). In the EU-15, GHG emissions per GDP decreased by 23 % from 689 tonnes per million euro in 1990 to 533 tonnes in 2002. In most old Member States the emissions per GDP decreased between 1990 and 2002; the only exceptions are Portugal and Spain. The highest per GDP emissions of the EU-15 Member States were for Greece (1 177 tonnes per million euro in 2002), and the lowest for Sweden (303 tonnes).

Despite substantial decreases between 1990 and 2002, per GDP emissions of the new EU Member States are well above the EU-15 average. The largest per GDP emissions are for Estonia (4 978 tonnes), and the lowest for Malta (910 tonnes). The main reason for the high per capita and per GDP emissions of Estonia is the high share of net electricity exports and the large share of coal-fired power production. In 2002, Estonian net exports of electricity were 9 % of total net power generation (Eurostat, 2003). All electricity is produced in thermal power production; solid fuels account for about 75 % of fuel input to thermal heat and power production. This leads to a very high share (82 %) of power and heat production in Estonian energy-related CO_2 emissions.

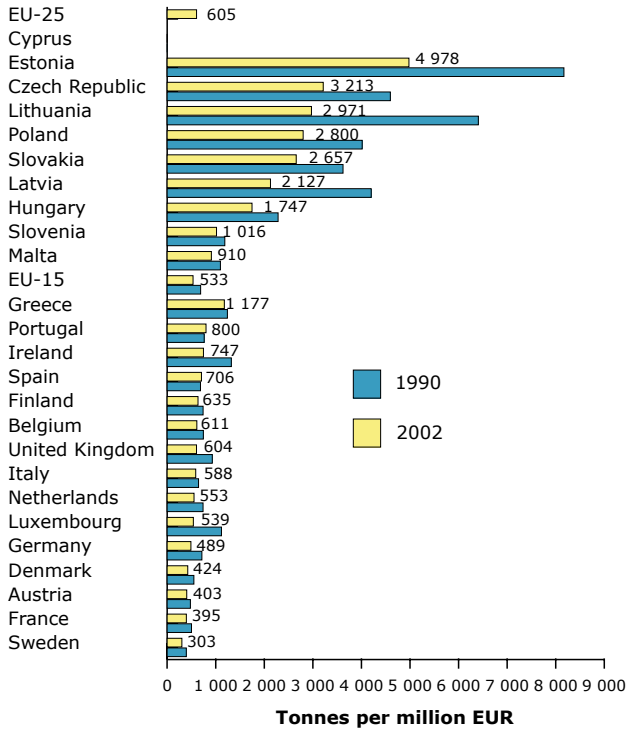
Figure 3.3 Greenhouse gas emissions per capita of EU-25 Member States for 1990 and 2002



Note: For Malta and Poland, emission data for 2002 refers to 2000 and 2001 respectively.

Sources: GHG inventory submissions under the EC GHG monitoring mechanism and to the UNFCCC, and Eurostat.

Figure 3.4 Greenhouse gas emissions per GDP of EU-25 Member States for 1990 and 2002



Note: Because of a lack of data, 1990 values refer to 1995 for Estonia, Hungary, Poland and Slovakia. For Malta and Poland, emission data for 2002 refers to 2000 and 2001 respectively.

Sources: GHG inventory submissions under the EC GHG monitoring mechanism and to the UNFCCC, and Eurostat.

4 Progress of EEA countries in limiting greenhouse gas emissions

This chapter evaluates actual and projected progress of the following countries:

(i) EU-15 and each of the EU-15 Member States in Section 4.1;

(ii) the eight new EU Member States which have a Kyoto target (Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia) in Section 4.2;

(iii) other EEA member countries (Bulgaria, Iceland, Liechtenstein, Norway and Romania) in Section 4.3.

Actual progress assessment relates past emission trends to the linear target path between the base year and 2010; projected progress calculates the gap between emission projections and the Kyoto target. Two types of projections are considered: (i) 'with existing measures' projections and (ii) 'with additional measures' projections. In addition, for those Member States which provided the relevant information, the use of Kyoto mechanisms is considered in the progress assessment.

4.1 EU-15 Member States

Actual progress

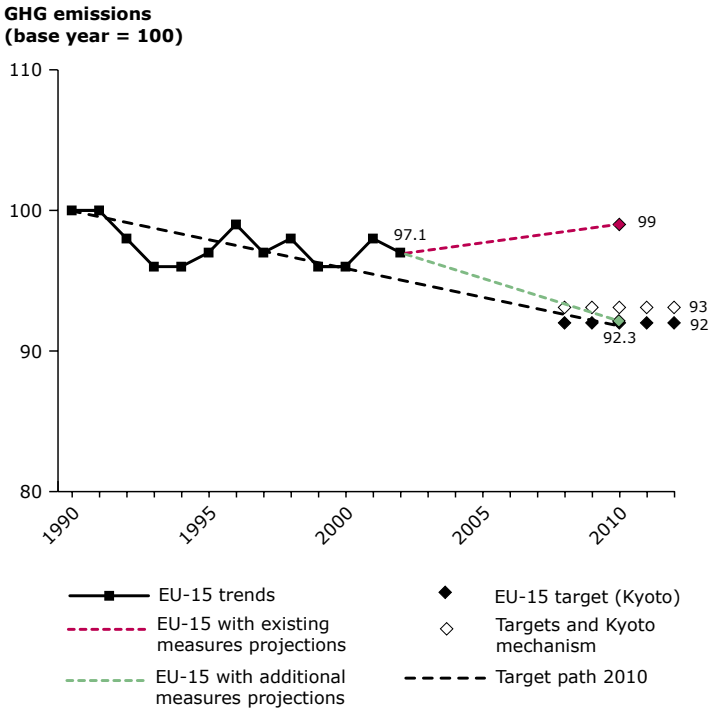
Total greenhouse gas emissions in the EU-15 ([11]) decreased by 2.9 % between the base year and 2002. After more than half of the available time span this is little more than a third of the way towards meeting the EU-15 greenhouse gas emission target of an 8 % reduction by the period 2008–12 (Figure 4.1).

After an initial decrease in total greenhouse gas emissions by about 4 % in the early 1990s, EU-15 emissions fluctuated between reduction levels of 1 and 4 % compared with the base-year level in the second half of the 1990s. A decrease of 0.5 % occurred between 2001 and 2002. A main reason for this was emission reductions in households and services due to warm outdoor temperatures in most old EU Member States, which reduced fossil fuel use for space heating. Energy-related emissions from industry declined in many Member States, in particular in Italy and the United Kingdom: low economic growth in general and a substantial decline of solid fuel use in steel production in Italy and the United Kingdom were important factors. Emissions increased in electricity and heat production, mainly due to a general increase of thermal power production (partly driven by low hydropower production in some Member States such as Italy and Spain) and a shift towards coal combustion in electricity plants (e.g. Germany). Emissions from transport increased in all Member States except for Germany and the United Kingdom.

In the Kyoto Protocol, the EU-15 agreed to reduce its greenhouse gas emissions by 8 % from 1990 levels between 2008 and 2012. Assuming a linear target path from 1990 to 2010, total EU-15 greenhouse gas emissions were 1.9 index points (distance-to-target indicator (DTI)) above this target path in 2002 (Figure 4.1). This is a small improvement, by 0.2 index points, compared with last year's analysis. The distance-to-target path of the EU-15 reduces to 1.4 index points if the planned use of Kyoto mechanisms is considered for those six Member States which have provided quantitative information in sufficient detail.

([11]) Total GHG emissions for the EU-15 are calculated by the aggregation of national GHG emissions reported by the 15 old EU Member States (MS) and are referred to as EU-15 emissions later in this report.

Figure 4.1 EU-15 greenhouse gas past emissions and emission projections compared with targets for 2008–12



Note: The target path is used to analyse how close 2002 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. Data exclude emissions and removals from land-use change and forestry. For the fluorinated gases, the EU-15 base year is the sum of 15 Member States' base years. Thirteen Member States have indicated to select 1995 as base year under the Kyoto Protocol; Finland and France indicate to use 1990. Therefore, the EU-15 base-year estimates for fluorinated gas emissions are the sum of 1995 emissions for 13 Member States and 1990 emissions for Finland and France.

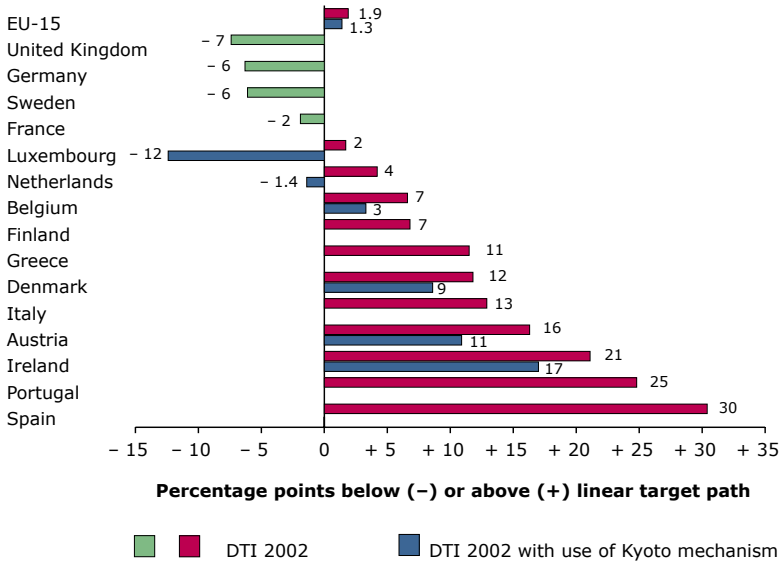
'Target with Kyoto mechanisms' is calculated by combining the Kyoto target with Kyoto units from JI and CDM following the provisions of the Kyoto Protocol Article 3(10) and (12) where 'Any emission reduction unit ... of Article 6 [JI] ...' and 'Any certified emission reductions ... of Article 12 [CDM] ... shall be added to assigned amount [target] for the acquiring Party'.

Sources: EEA, 2004; information provided under the EC GHG monitoring mechanism and in third national communications.

In 2002, four Member States (France, Germany, Sweden and the United Kingdom) were below their burden-sharing target paths excluding Kyoto mechanisms (Figure 4.2). Eleven Member States were above their burden-sharing target paths excluding Kyoto mechanisms: Austria, Belgium, Denmark, Finland, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain (Ireland, Portugal and Spain by more than 20 index points). The most important changes compared with last year's analysis are: Spain has now the largest deviation from the linear target path (in 2001, Ireland and Spain together had the largest deviations). Luxembourg's favourable DTI in 2001 turned into a slightly negative indicator because of the inclusion of fuel tourism in the time series. On the other hand, the negative indicator of France became positive in 2002.

If the planned use of Kyoto mechanisms is included in the progress assessment, then the distance-to-target path turns from positive to negative for Luxembourg (from + 1.7 to – 12.4 index points) and the Netherlands (from + 4.2 to – 1.2 index points). This means that Luxembourg and the Netherlands are on track towards meeting their burden-sharing if the planned Kyoto mechanisms are used. For the other four Member States which have provided quantitative information in sufficient detail, the planned use of Kyoto mechanisms does not change the distance to the linear target path substantially.

Figure 4.2 Distance-to-target (burden-sharing targets) for EU-15 Member States in 2002 excluding and including Kyoto mechanisms



Note: The distance-to-target indicator (DTI) measures the deviation of actual emissions in 2002 from the (hypothetical) linear path between base-year emissions and the burden-sharing target for 2010. A positive value suggests an under-achievement and a negative value an over-achievement in 2002. The DTI gives an early indication of progress towards the Kyoto and Member States' burden-sharing targets. As most Member States have not yet provided sufficient quantitative information on the use of Kyoto mechanisms (see Section 5), the DTI refers to the burden-sharing target excluding Kyoto mechanisms for all Member States. However, for those six Member States which provided sufficient quantitative information on the planned use of Kyoto mechanisms, a second DTI is provided in this figure showing the additional effects of the use of these mechanisms in 2002. Denmark monitors progress towards its national target under the EU burden-sharing agreement by adjusting for electricity trade in 1990, which would change its distance-to-target indicator to + 3.5 percentage points.

Source: EEA, 2004.

The emission reductions in the early 1990s were largely a result of considerable emission cuts in Germany and the United Kingdom, which together account for around 40 % of total EU-15 greenhouse gas emissions. The main reasons for the favourable trend in Germany were increasing efficiency in power and heating plants and the economic restructuring of the five new federal states following German unification. The reduction of greenhouse gas emissions in the United Kingdom was partly the result of the liberalisation of the energy market and subsequent changes in the choice of fuel used in electricity production from oil and coal to gas, and partly due to significant reductions in emissions of non-CO_2 greenhouse gas emissions, including implementation of N_2O abatement measures in the chemical industry. In both Member States, the special circumstances mentioned above (unification and liberalisation of electricity market) account for about 50 % of emission reductions for all six greenhouse gases, whilst specific policies and measures account for the remaining 50 % (Eichhammer *et al.*, 2001). Other important factors in Germany and the United Kingdom were emission reduction measures in adipic acid and HCFC production, the decline of coal mining, and emission reductions from landfills.

In 2002, greenhouse gas emissions in both Germany and the United Kingdom were lower than in 2001. In Germany, emissions from households and services decreased mainly due to the relatively warm winter season. The largest decreases in the United Kingdom occurred from manufacturing industries, households and services, and electricity and heat production.

France and Italy are the third and fourth largest emitters with shares of 13 % each. In 2002, France's greenhouse gas

emissions decreased by 1.4 % from 2001 levels, and were 1.9 % below 1990 levels. France achieved large reductions in N_2O emissions from the chemical industry, but CO_2 emissions from transport increased considerably between 1990 and 2002. Italian greenhouse gas emissions were stable in 2002, compared with 2001, but were 9 % above the base-year levels with increases primarily in the transport sector, electricity and heat production, and petroleum refining.

As the fifth largest emitter, Spain accounts for 10 % of total EU-15 greenhouse gas emissions. In 2002, emissions were 39 % above the base-year level. After the decline in the previous year, emissions continued to increase in 2002, compared with 2001. This increase was mainly due to lower hydropower production and resulting increases in thermal power production.

Projected progress with existing measures

For the EU-15, the aggregate projections of total greenhouse gas emissions for 2010 based on existing domestic policies and measures ([12]) show a small fall to 1.0 % below base-year levels (Figure 4.1). This means the current small emission reduction of 2.9 % achieved by 2002 on the base-year level is projected to be reversed to an increase by 2010. That development leads to a shortfall of 7.0 %, assuming only existing domestic policies and measures, in meeting the EU-15 Kyoto commitment of an 8 % reduction in emissions, from base-year levels, by 2010.

A 'with existing domestic measures' projection encompasses currently implemented and adopted policies and measures ([13]).

Sweden and the United Kingdom project that existing domestic policies and measures will be sufficient to meet their burden-sharing targets (Figure 4.3). Their relative gaps are – 4 % and – 1.4 %, respectively, meaning that these countries may even over-deliver on their targets. If these two countries did no more than meet their agreed targets, the EU-15 reduction would be just 0.6 %. This would lead to a shortfall of 7.4 %, from the EU-15 Kyoto target in 2010. Emissions in Austria, Belgium, Denmark, Finland, France, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain are all projected to be significantly above their commitments on the basis of their existing domestic measures. The relative gaps for these Member States range between more than + 30 % for Denmark and Spain to about + 6 % for Luxembourg.

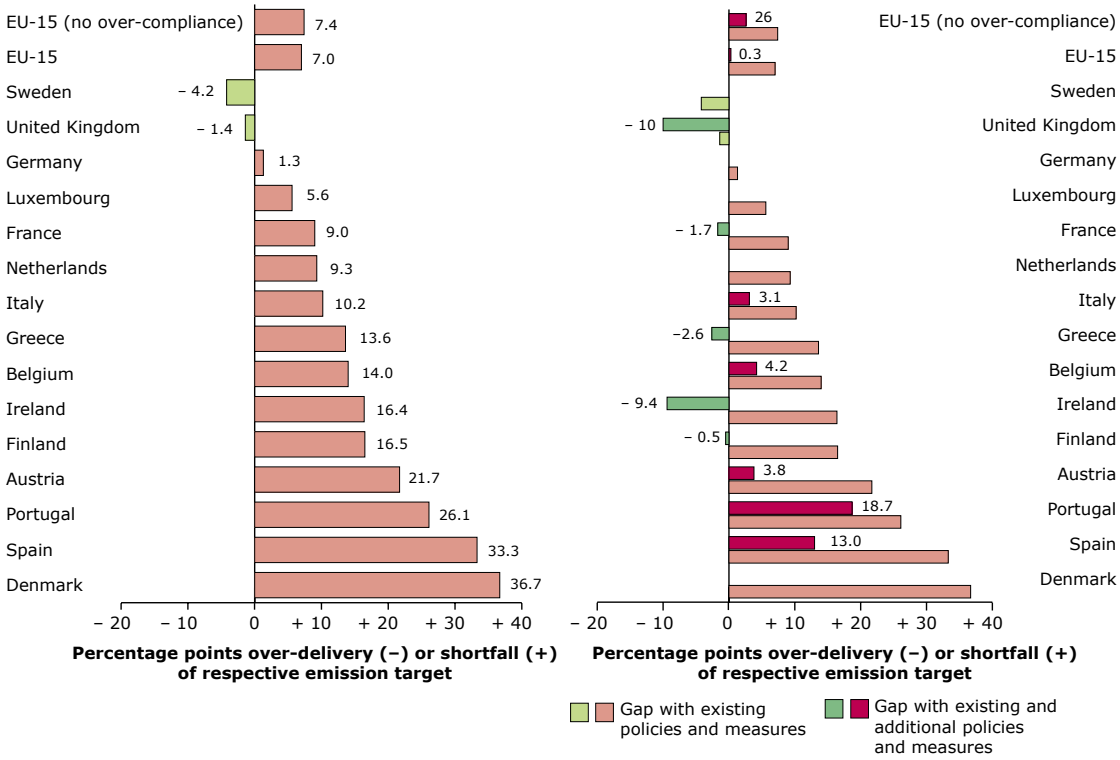
Compared with last year's analysis, the gap between the target and the projection based on existing domestic measures for the EU has improved slightly (some Member States have provided updated projections). The improvement is due, in particular, to a reduction in the existing domestic measures projections for Belgium, Ireland and the Netherlands. The projections reported for Denmark and Austria are also lower this year, compared with last year, though the contribution from these Member States is smaller. Other countries where there are differences from the projections reported last year are Greece, Portugal and Sweden, which have a higher 'with existing measures' projection this year.

In absolute terms, the most significant gap (of about 70 million tonnes of CO_2-equivalent) is for Spain, which is nearly one quarter of the gap for the EU-15 as a whole. Italy and France follow with absolute

([12]) Policies and measures in this section include only domestic national and EU common and coordinated policies and measures. Countries are also allowed to make use of the Kyoto mechanisms to achieve their UNFCCC and EU burden-sharing targets (see Section 5). Furthermore, countries can make use of carbon sequestration in soils, through changes in agricultural practices, and in forests, through forestry activities, to achieve the targets (see Section 8).

([13]) Existing policies and measures are those for which one or more of the following applies: (a) national legislation is in force; (b) one or more voluntary agreements have been established; (c) financial resources have been allocated; (d) human resources have been mobilised; (e) an official government decision has been made and there is a clear commitment to proceed with implementation.

Figure 4.3 **Relative gap (over-delivery or shortfall) between 'with existing domestic measures' projections and targets for 2010 for the EU-15 and Member States (left) and between projections based on existing and additional domestic policies and measures and 2010 targets for the EU-15 and Member States (right)**



Note: Germany's projections are preliminary results from a study provided in June 2003 (German Environmental Agency, 2003).

Sources: Information provided under the EC GHG monitoring mechanism and in third national communications.

gaps of about 50 million tonnes of CO_2-equivalent.

The 'with existing domestic measures' scenarios are not fully comparable between Member States for various reasons, including different cut-off dates for inclusion of existing domestic policies and measures, different underlying assumptions in the model (e.g. regarding energy price developments) and assumptions on the effectiveness of policies and measures. It is therefore useful to compare the projections for the EU aggregated from Member States' projections with the results of Community-wide emission projections (see Section 7.7).

Projected progress with additional measures

Most EU-15 Member States have also reported planned (additional domestic) policies and measures that they are developing to achieve further reductions in greenhouse gas emissions. Additional (planned) policies and measures are options under discussion with a realistic chance of being adopted and implemented in future. The effects of these additional domestic policies and measures are shown in Figure 4.3 under the assumption that they will be supplementary to the effect of existing policies and measures as previously described. In this report these projections are called 'with additional domestic measures' projections.

Savings from additional policies and measures being planned by Member States would result in total emission reductions of about 7.7 % from base-year level (Figure 4.1), almost sufficient to meet the shortfall for the EU-15 projected on existing domestic policies and measures. Assuming that all additional domestic policies and measures will actually be implemented

and will have the expected effect, this would lead to only a small shortfall of 0.3 percentage points in meeting the target of – 8 %.

Finland, France, Greece, Ireland and the United Kingdom project that with their additional domestic measures they can either meet or exceed their burden-sharing targets.

For Austria, Belgium, Denmark, Italy, Portugal and Spain, the savings identified from planned domestic policies and measures are not sufficient to achieve their burden-sharing targets. Germany, Luxembourg, the Netherlands and Sweden have not yet reported quantified savings from any additional domestic policies and measures that they are considering. In the case of Sweden, this is due to the fact that Sweden projects to already meet the Kyoto target with existing policies and measures.

The largest relative effect of additional domestic policies and measures is for Ireland (gap decreases from a 16 % shortfall to a 9 % over-delivery). Absolute reductions achieved with additional domestic policies and measures are largest for the United Kingdom, France, Spain and Italy, ranging from 64 to 37 million tonnes of CO_2-equivalent, though Spain and Italy still fall short of their commitments.

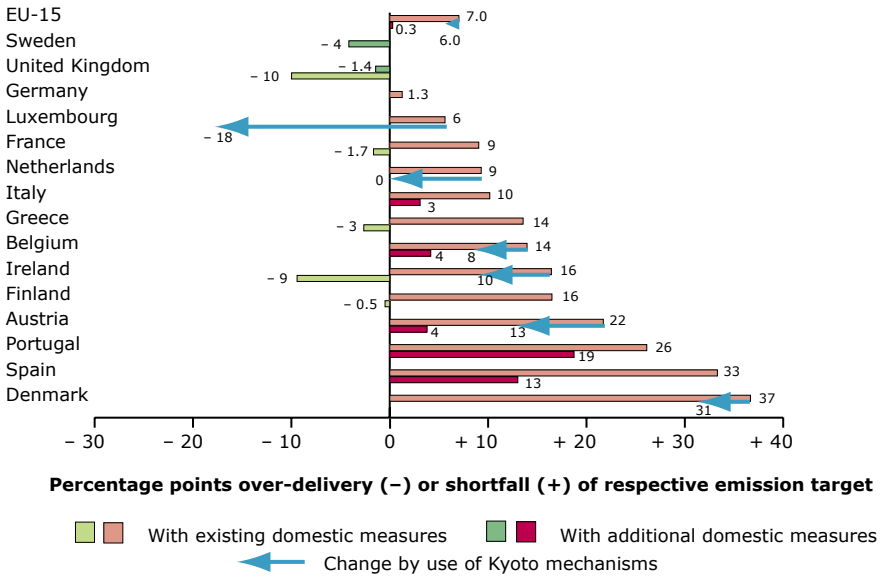
Under the 'with additional domestic measures' projections, four more Member States are projected to exceed their targets (Finland, France, Greece and Ireland), in addition to those already exceeding the target with existing domestic policies and measures (Sweden and the United Kingdom). If all these MS are assumed to meet, but not to exceed, their targets in the 'with additional domestic measures' projection, this would mean for the EU-15 a reduction below base-year emissions of 5.4 % and thus a 2.6 % shortfall on the EU-15 target (Figure 4.3).

Projected progress including Kyoto mechanisms

Under the Kyoto Protocol, Member States can use Kyoto mechanisms — emission trading, joint implementation, the clean development mechanism — to help meet their targets. A first estimate on the intention of Member States to use those instruments and a possible further closing of the gap is given in Figure 4.4. Up to now, of those Member States which have reported their intention to use the Kyoto mechanisms, only Austria, Belgium, Denmark, Ireland, Luxembourg and the Netherlands have provided quantitative information in sufficient detail (see Section 5). Therefore, only those six countries are included in Figure 4.4.

The figure shows that the Netherlands do not plan to implement additional domestic measures but intend to close the gap entirely by the use of Kyoto mechanisms. Luxembourg will close its gap with the intended use of Kyoto mechanisms and end up in an over-delivery without additional domestic measures. Austria will reduce its gap by 9 percentage points through the use of Kyoto mechanisms. This will not eliminate the gap with existing domestic measures but, if planned additional domestic measures are taken into account, it would result in an over-delivery of more than 5 %. Basically the same applies to Ireland and Belgium. Ireland will reduce, but not close, its gap by 6 percentage points through the use of Kyoto mechanisms without additional domestic measures and end up with an over-delivery of more than 15 % if all planned additional domestic measures are being implemented. Belgium will reduce its gap through acquisition of Kyoto units by about 6 percentage points. Taking into account additional domestic measures and the use of Kyoto mechanisms, Belgium will achieve an over-delivery of almost 2 %. Denmark will reduce its gap from almost 37 % to a little bit more than 31 % through the use of project-based Kyoto mechanisms. For the remaining gap it intends to make use of international emissions trading under the Kyoto Protocol. However, as these plans are at a very early stage they are not included in Figure 10. For the EU-15, the use of the Kyoto mechanisms by Austria, Belgium, Denmark, Ireland, Luxembourg and the Netherlands would reduce the gap of the EU-15 by about one percentage point.

Figure 4.4 **Relative gap (over-delivery or shortfall) between GHG projections based on existing and additional domestic policies and measures and 2010 targets and changes by the use of Kyoto mechanisms for the EU-15 and Member States**



Sources: Information provided under the EC GHG monitoring mechanism, in third national communications and in European Commission, 2004a.

GHG emissions and projections by gas

Carbon dioxide (CO_2) is by far the most significant greenhouse gas, accounting for 82 % of total EU-15 GHG emissions in 2002 (Figure 4.5). In the second half of the 1990s, EU-15 CO_2 emissions stabilised, with emissions in 2000 being close to 1990 levels (0.2 % below). Thus, the EU-15 aim of stabilising CO_2 emissions at 1990 levels by 2000 had been achieved. However, in 2002, EU-15 CO_2 emissions (excluding land-use change and forestry) were up 1.4 % from 1990 levels. According to 'with existing measures' projections, CO_2 emissions will be 4 % above the 1990 level in 2010. Additional measures are projected to bring down emissions to 2 % below 1990 levels ([14]).

Other gases contributing to EU-15 greenhouse gas emissions are:

- methane (CH_4, share of 8 % in total EU-15 greenhouse gas emissions, with a decrease of 22 % from 1990 to 2002), from agriculture (cattle and manure management), waste (waste disposal in landfill sites) and fugitive emissions from fuel (e.g. in gas distribution networks and coal mining); according to 'with existing measures' projections, CH_4 emissions will be 34 % below the 1990 level in 2010; additional measures are not projected to provide substantial further emission reductions;

- nitrous oxide (N_2O, share of 8 % in total EU greenhouse gas emissions, with a decrease of 17 % from 1990 to 2002), from agriculture (soils and manure management), industrial processes (mainly adipic and nitric acid production) and as a by-product of passenger car catalysts; according to 'with existing measures' projections, N_2O emissions will be 16 % below the 1990 level in 2010; additional measures are projected to further decrease emissions (by 5 percentage points).

- industrial fluorinated gases (hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6), share of 2 % in total EU greenhouse gas emissions), mainly from replacement of ozone-depleting substances; all fluorinated gases together decreased by 5 % between the base year

([14]) Several Member States did not report projections for all gases/scenarios. Therefore, the information on projections has to be interpreted with care.

and 2002; according to 'with existing measures' projections fluorinated gas emissions will more than double between the base year and 2010; additional measures are projected to limit the growth to about 50 % above base-year levels; the additional domestic measures limiting fluorinated gas growth include individual Member State regulations on F-gases, the EU industrial F-gas regulation, leakage limitation on refrigerant gases, and encouraging HFC substitution.

4.2 New EU Member States

Total greenhouse gas emissions for the 10 new EU Member States declined in 2002 by about 24 % below the 1990 level. For the eight new Member States which have a Kyoto target, greenhouse gas emissions were 33 % below their base-year levels (Figure 4.6). For eight new Member States GHG projections are available which suggest that GHG emissions will increase by 2010: both scenarios project GHG emissions to be about 20 % below base-year levels in 2010.

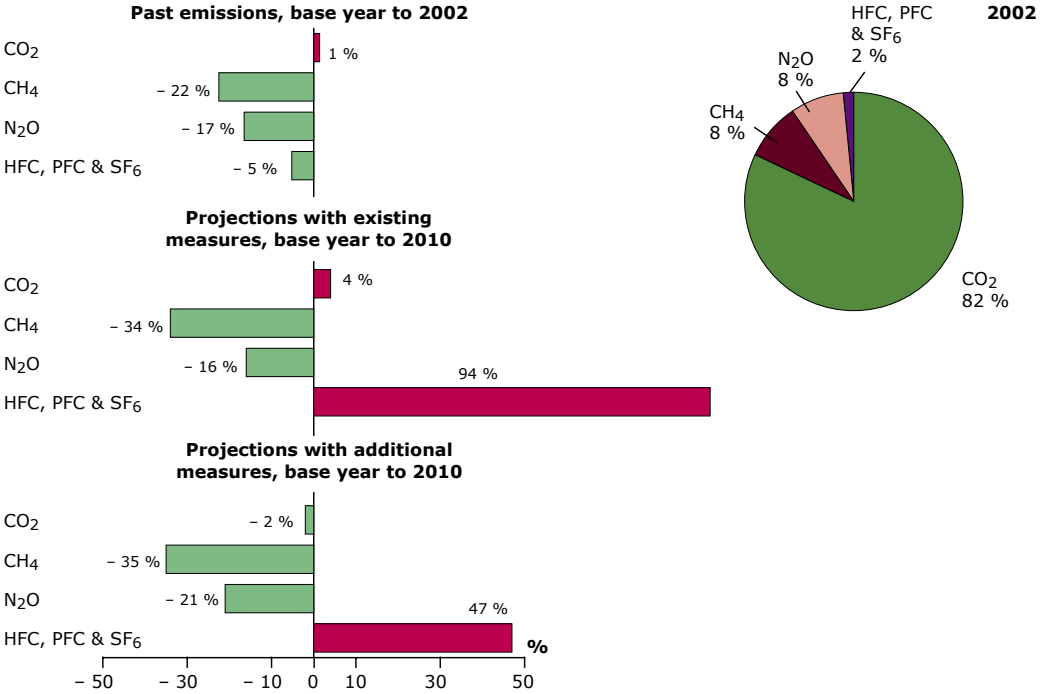
Actual progress

In 2002, Latvia, Lithuania and Estonia were 60 index points or more below their linear target path. Greenhouse gas emissions in these countries were cut by half compared with 1990 while the targets are only for an 8 % reduction by 2010. Only in Slovenia were emissions above the target path excluding land-use change and forestry (Figure 4.7). Slovenia is also on track if 'land-use change and forestry' is included.

Projected progress

The new EU Member States have until now not reported formally to the EU monitoring mechanism, so this section is based on third national communications to UNFCCC. Six

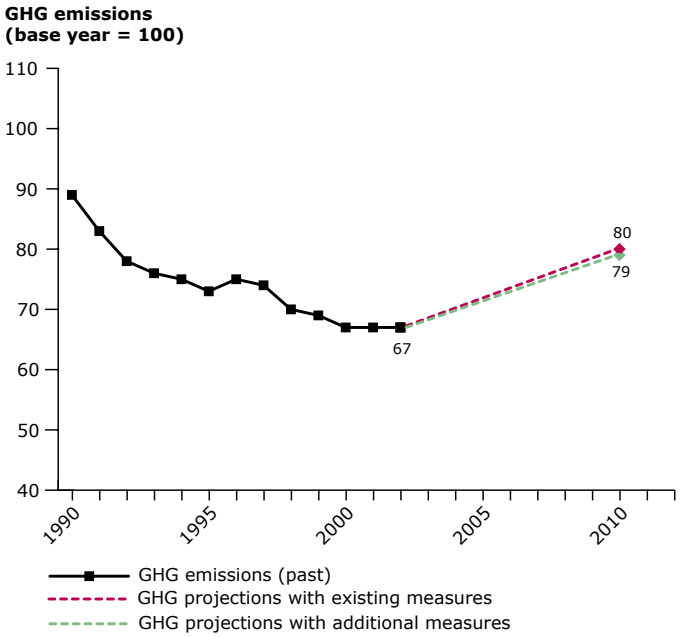
Figure 4.5 **Greenhouse gas emissions by gas (change base year to 2002) for the EU-15, projections with existing and with additional measures (base year to 2010), and share of gases in 2002**



Note: Several Member States did not report projections for all gases/scenarios. Therefore, the information on projections has to be interpreted with care.

Sources: EEA, 2004; information provided under the EC GHG monitoring mechanism and in third national communications.

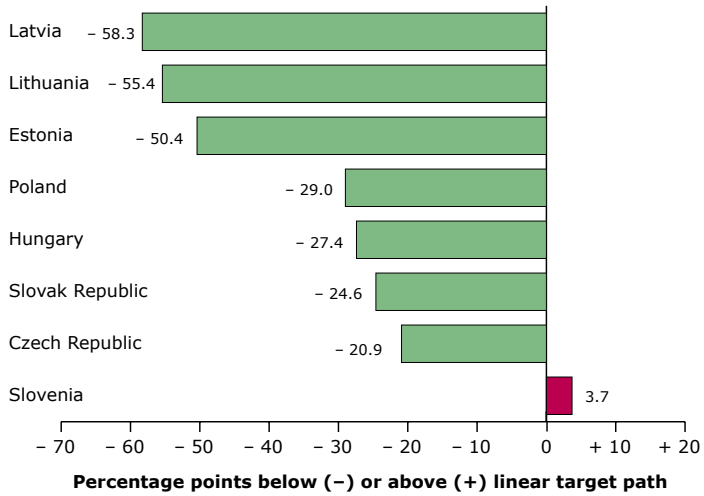
Figure 4.6 New EU Member States' greenhouse gas emissions and projections



Note: Excluding emissions and removals from land-use change and forestry. Past GHG emissions include the eight new Member States which have a Kyoto target (not Cyprus and Malta). GHG projections include eight new Member States (not Cyprus or Malta). Gap filling was applied for the Czech Republic (1991, 1993 and 1995), Lithuania (1991–97 and 1999–2001) and Poland (2002). Lithuania's projections are for energy only.

Sources: GHG inventory submissions under the EC GHG monitoring mechanism and to the UNFCCC.

Figure 4.7 Distance-to-target (Kyoto Protocol) for the new EU Member States in 2002



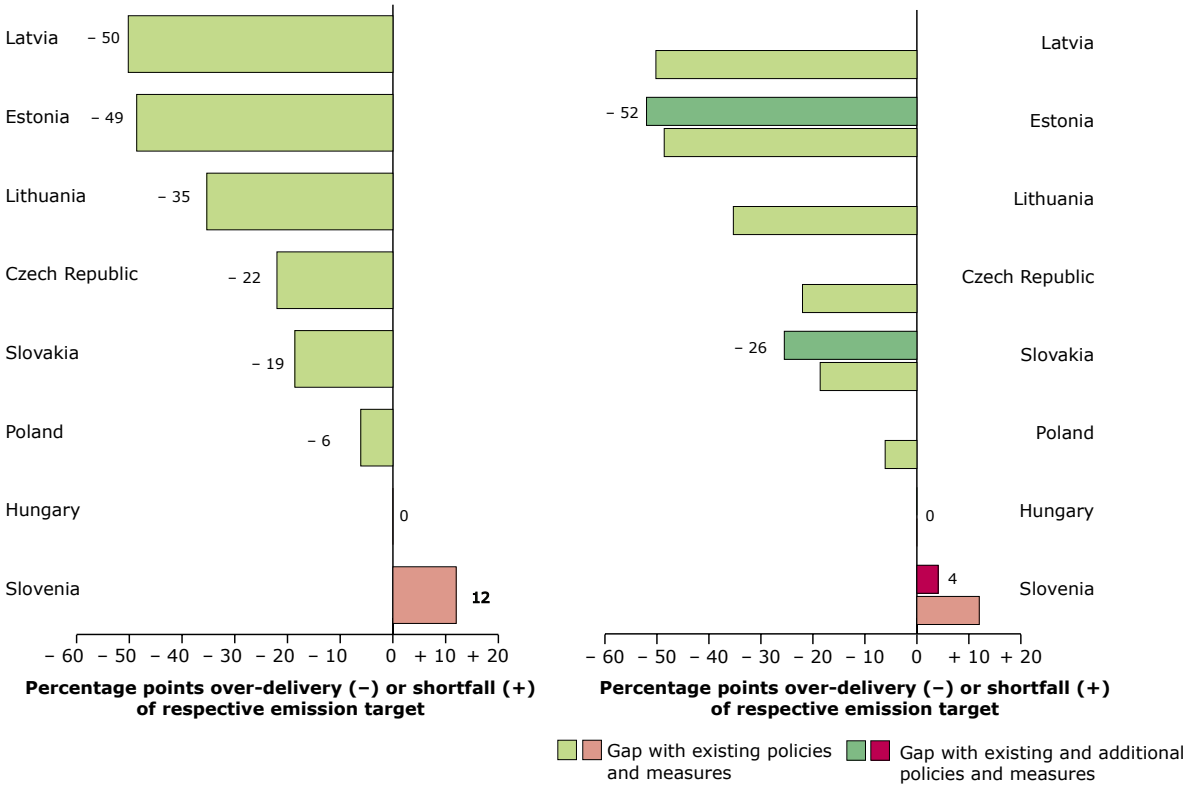
Note: Excluding emissions and removals from land-use change and forestry. The distance-to-target indicator (DTI) measures the deviation of actual emissions in 2002 from a (hypothetical) linear target path between 1990 and 2010. For Poland, no data is available for 2002; therefore the indicator refers to 2001. A positive value suggests an under-achievement by 2002 and a negative value an over-achievement in 2002. The DTI gives an early indication of progress towards the Kyoto targets. It assumes that the countries meet their targets entirely on the basis of domestic measures and it does not include emissions and removals from land-use change and forestry. Slovenia intends to use the carbon sinks for meeting the Kyoto target. Countries with base years other than 1990 are Hungary (average 1985–87), Poland (1988) and Slovenia (1986). Because of a lack of more recent data, for Poland the DTI refers to 2001.

Sources: GHG inventory submissions under the EC GHG monitoring mechanism and to the UNFCCC and national communications to the UNFCCC.

new Member States (the Czech Republic, Estonia, Hungary, Latvia, Poland and Slovakia) had submitted third national communications by June 2004. In addition, Slovenia has produced a final draft of its third national communication, on which the analysis is based. The analysis for Lithuania is based on a report commissioned in preparation for Lithuania's third national communication, projections with the corresponding base year are only provided for the energy sector. The Czech Republic, in its recently released document, National action plan 2004, approved by the Czech Government on 3 March 2004, presents three 'with measures' projections labelled as high, reference and low, and a reference scenario 'with additional measures' ([15]). Slovenia, in the draft third national communication, presents an updated 'with measures' scenario compared with the scenario in the first national communication.

Figure 4.8 shows the relative gap between projections based on existing and on additional domestic policies and measures, and the Kyoto commitments. All 'with existing measures' projections, except for Slovenia, result in emissions in 2010 being lower than the Kyoto commitments. For Estonia, Latvia and Lithuania, the emissions are projected to be significantly lower than in 1990.

Figure 4.8 Relative gap (over-delivery or shortfall) between projections and targets for 2010 for new EU Member States



Note: Projections exclude emissions and removals from land-use change and forestry. Projections for Poland and Lithuania include only the energy sector. Projections for Cyprus and Malta are not available. Slovenia intends to use the sinks in order to meet the Kyoto target.

Sources: National communications to the UNFCCC.

([15]) Only a short summary in English of the National action plan 2004 was available, with main assumptions and resulting tables with emission estimates (2005–20). Note that the updated projections in the National action plan 2004 differ from the projections in the third national communication.

In part, the projected reductions relative to base-year levels in most new Member States are the result of the economic restructuring that has already occurred in these countries. However, all countries have policies and measures in place to reduce greenhouse gas emissions. These are primarily aimed at efficient energy use and waste management but there are also a limited number of policies and measures in other sectors. Different types of policies and measures are used, although the use of voluntary agreements is limited. Policies and measures implemented or proposed in most new Member States include:

- clean air legislation to reduce air pollution — this generally has a beneficial effect on greenhouse gas emissions;
- energy market liberalisation;
- changes in building regulations to improve energy efficiency;
- harmonisation with EU environmental legislation;
- measures to reduce traffic growth;
- limits on the disposal of biodegradable waste to landfills.

Although seven of the new EU Member States project that they will meet their Kyoto commitments with existing domestic policies and measures, two of these countries provided 'with additional domestic policies and measures' on top of the existing measures. Slovenia is not expecting to meet its Kyoto commitment even with additional measures, but the Kyoto target will be met if land-use change and forestry is taken into account.

GHG emissions by gas and by sector

As in the EU-15, carbon dioxide (CO_2) is by far the most important greenhouse gas (about 82 %) in the new EU Member States; second comes methane (CH_4) and third is nitrous oxide (N_2O) (Figure 4.9). Fluorinated gas emissions are not yet reported consistently in most of the new Member States, but they do not contribute more than 1 % to national totals. All gases declined substantially between the base year and 2002 except the fluorinated gases.

Energy supply and use excluding transport is by far the largest sector accounting for almost three quarters of GHG emissions. Emissions declined by 38 % between the base year and 2002, mainly due to the restructuring or closure of heavily polluting and energy-intensive industries and efficiency improvements in households and services.

The main sector showing increases in greenhouse gas emissions was transport, partly counteracting the decreases that had occurred in other sectors. GHG emissions from transport were 9 % below base-year levels in 1995, but increased afterwards. In 2002, greenhouse gas emissions from transport were 12 % above 1990 levels.

The experience of the EU-15 cohesion States (Greece, Ireland, Portugal and Spain) seems to be confirmed in the new EU Member States: high economic growth turns relatively low transport levels to strong growth in greenhouse gas emissions from transport by copying the pattern of fuel-intensive transport structures from the trading partner countries.

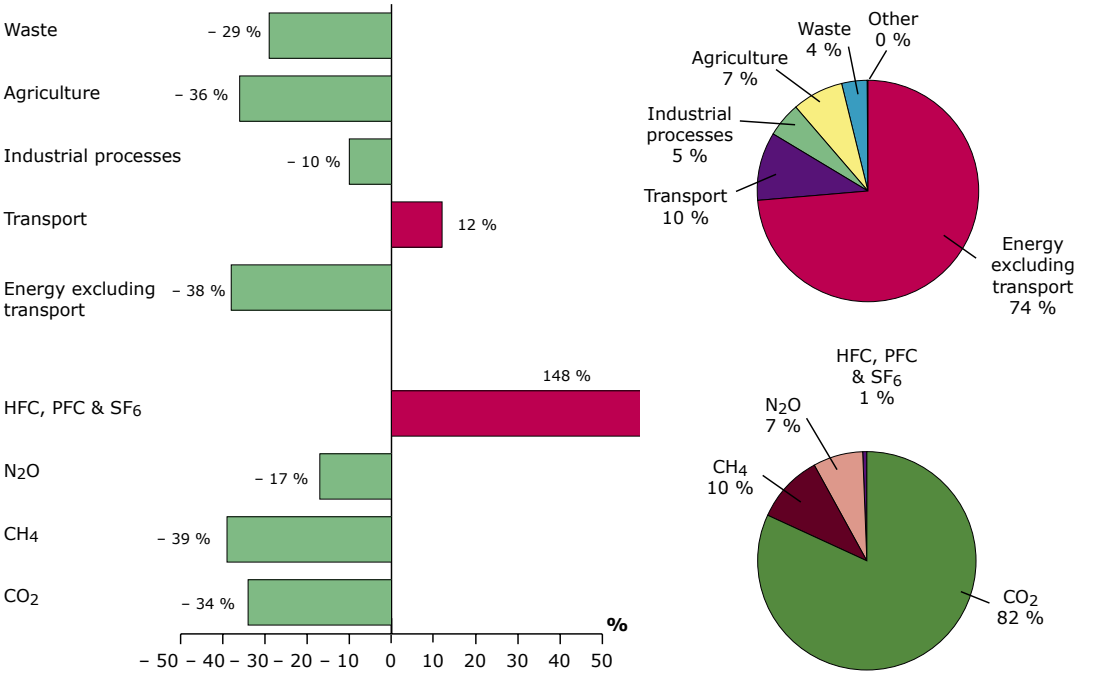
4.3 Other EEA member countries ([16])

Actual progress

Greenhouse gas emissions of the candidate countries Bulgaria and Romania were far below the base-year level in 2002. Romanian emissions were 48 % below the base-year level in 2002 and 41 % below the 1990 level. Bulgarian emissions were 56 % below the base-year level in 2002 and 49 % below the 1990 level in 2002. As the two candidate

([16]) Other EEA countries include the candidate countries Bulgaria, Romania and Turkey, and Iceland, Norway and Liechtenstein. No greenhouse gas data are available for Turkey.

Figure 4.9 Change in the new EU Member States of greenhouse gas emissions by sector and gas base year to 2002 and contribution by sector and gas in 2002



Note: GHG emissions include nine new Member States (not Cyprus). Gap filling was applied for the Czech Republic (1991, 1993 and 1995), Lithuania (1991–97 and 1999–2001), Malta (2001–02) and Poland (2002).

Sources: GHG inventory submissions under the EC GHG monitoring mechanism and to UNFCCC and national communications to the UNFCCC.

countries have an 8 % reduction target, they were far below their linear target path in 2002 (Figure 4.10).

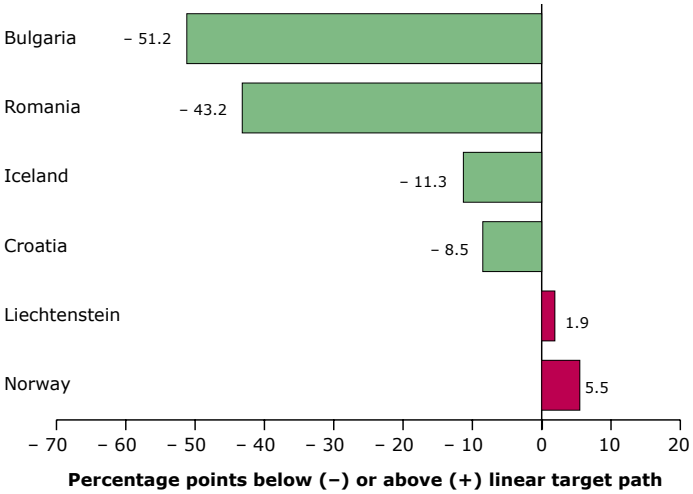
Croatia and Iceland have also reduced greenhouse gas emissions since 1990, whereas Norway shows an increase of 6 %. Therefore Croatia and Iceland are below their target paths, whereas Norway is above.

Projected progress

For those EEA countries which do not report to the EU monitoring mechanism, this section is based on third national communications to the UNFCCC. Four countries (Bulgaria, Iceland, Liechtenstein and Norway) had submitted third national communications by June 2004. In addition, Romania has provided the second national communication and the Norwegian Government submitted updated projections to the monitoring mechanism in 2004. For Croatia, no projections are available. Figure 4.11 shows that Norway projects a shortfall of 17 % from its Kyoto target of + 1 % both with existing measures (additional measures projections are not available). Liechtenstein projects that there will be no change in emissions relative to the base year, thus it will have an 8 % gap between GHG emissions with existing measures and its Kyoto target of – 8%. Romania ([17]) and Bulgaria project over-deliveries of more than 10 % over their Kyoto targets (– 8 %) with existing measures and with additional measures, respectively. Iceland shows an over-delivery of 3 % over its Kyoto target.

([17]) The projections of Romania are taken from the second national communication. More recent estimates, which will be included in the third national communication, indicate that the Romanian GHG emission projections will be substantially lower than projected in the second national communication.

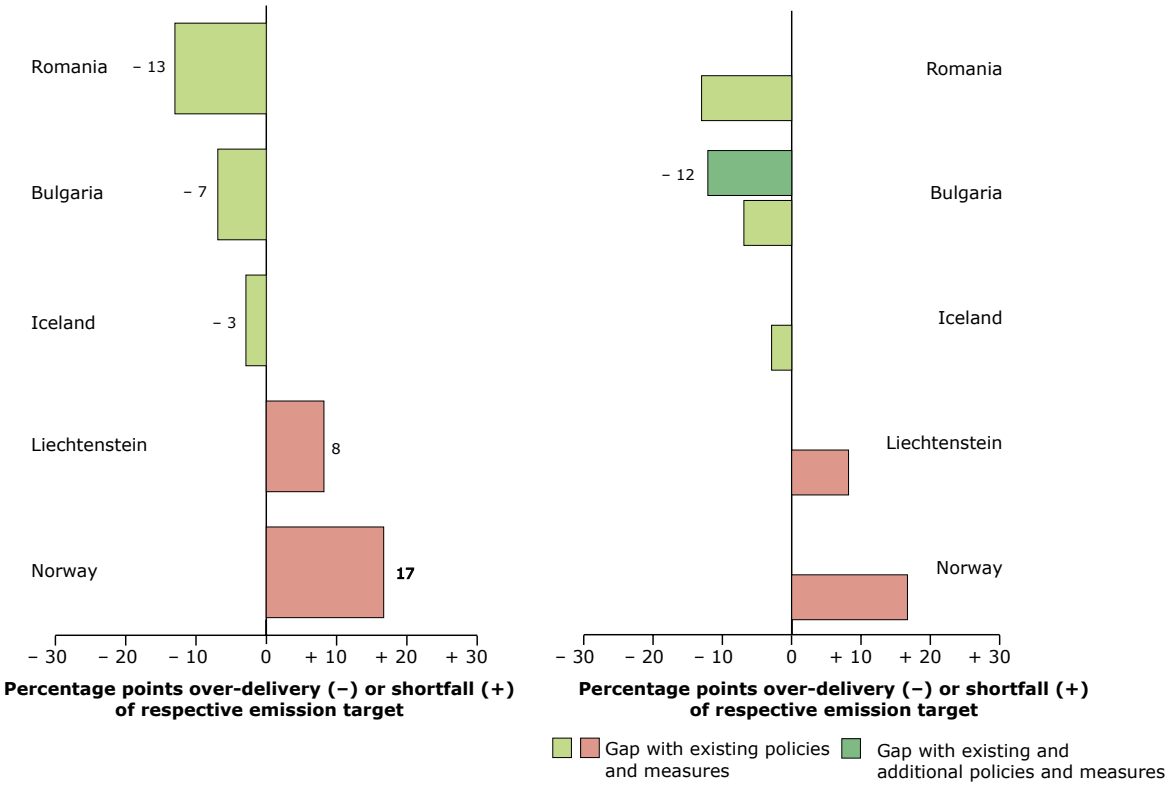
Figure 4.10 Distance-to-target (Kyoto Protocol) for other EEA countries in 2002



Note: The distance-to-target indicator (DTI) measures the deviation of actual emissions in 2002 from a (hypothetical) linear target path between 1990 and 2010. A positive value suggests an under-achievement by 2002 and a negative value an over-achievement in 2002. The DTI gives an early indication of progress towards the Kyoto targets. It assumes that the countries meet their targets entirely on the basis of domestic measures. Countries with base years other than 1990 are Bulgaria (1988) and Romania (1989). Because of a lack of more recent data, the DTI refers to years other than 2002 for the following countries: Iceland (2001) and Liechtenstein (1999).

Sources: GHG inventory submissions under the EC GHG monitoring mechanism and to the UNFCCC.

Figure 4.11 Relative gap (over-delivery or shortfall) between projections and targets for 2010 for other EEA countries



Note: Romania, Iceland, Liechtenstein and Norway did not provide 'with additional measures' projections.

Sources: National communications to the UNFCCC.

5 Use of Kyoto mechanisms in the EU-15 Member States

In addition to domestic measures, Member States are also allowed to make use of the flexible mechanisms under the Kyoto Protocol (Kyoto mechanisms) to achieve their EU burden-sharing targets by activities abroad. The Kyoto mechanisms are explained further in Box 1.

Box 1 Flexible mechanisms under the Kyoto protocol (Kyoto mechanisms)

Joint implementation (JI) is provided for under Article 6 of the Kyoto Protocol. It enables industrialised countries to work together to meet their emission targets. A country with an emissions reduction target can meet part of that target through a project aimed at reducing emissions in any sector of another industrialised country's economy. Any such projects need to have the approval of the countries involved and must result in emission reductions that would not otherwise have occurred in the absence of the JI project. The use of carbon sinks (e.g. forestry projects) is also permitted under JI.

Article 12 of the Kyoto Protocol sets out a clean development mechanism (CDM). This is similar to joint implementation, but project activities must be hosted by a developing country. As with JI, CDM projects must result in reductions that are additional to those that would have been achieved in the absence of the project. They also have the additional aim of promoting sustainable development in the host developing country. The CDM is supervised by an Executive Board, which approves projects. CDM projects have been able to generate credits since January 2000 and these can be banked for use during the first commitment period (2008–12). The rules governing CDM projects allow only certain types of sinks project (afforestation and reforestation), and countries will not be able to use credits generated by nuclear power projects towards meeting their Kyoto targets. To encourage small-scale projects, special fast-track procedures are being developed.

Emissions trading (ET): Article 17 of the Kyoto Protocol allows countries that have achieved emissions reductions over and above those required by their Kyoto targets to sell the excess to countries finding it more difficult or expensive to meet their commitments. In this way, it seeks to lower the costs of compliance for all concerned.

Information from Member States on the use of Kyoto mechanisms

Twelve Member States (Austria, Belgium, Denmark, Finland, Ireland, Italy, the Netherlands, Portugal, Slovenia, Spain, Sweden and the United Kingdom) have provided information on their intended use of the Kyoto mechanisms through a questionnaire sent out in 2002 and 2003 under the EC mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol (Council Decision No 280/2004/EC) or as part of their third national communication. In addition, the Commission decisions (European Commission, 2004a) on the national allocation plans notified under

the European emissions trading directive (2003/87/EC) and individual national allocation plans have been taken into account ([18]).

Ten countries have already decided to use the Kyoto mechanisms (Table 5.1). Additionally, the United Kingdom will allow domestic companies to use Kyoto mechanisms for compliance with their obligations under the European emissions trading scheme but expects — like Sweden — to achieve its burden-sharing target through domestic action. Two countries (Finland and Sweden) have not yet taken final decisions on the use of Kyoto mechanisms. However, activities to implement project-based mechanisms have also been started in these countries. France and Germany provided neither a questionnaire nor information on the use of Kyoto mechanisms in their national allocation plans. Therefore, it is assumed that they intend to achieve their burden-sharing targets without using Kyoto mechanisms. Greece did not yet provide a questionnaire or a national allocation plan.

Out of the new Member States, only Slovenia has provided a questionnaire. Slovenia intends to use Kyoto mechanisms as an investor country but did not yet decide on the possible contribution of these mechanisms to its Kyoto target. Those new Member States whose national allocation plans are not yet available either did not provide information in their national allocation plans on the use of Kyoto mechanisms or stated that they do not intend to use them as investors.

In the questionnaires, only Denmark, Ireland, the Netherlands and Portugal provided quantitative estimates on the use of Kyoto mechanisms which were affirmed or updated in the national allocation plans. Italy provided information in its third national communication and its national allocation plan. Austria, Belgium, Luxembourg and Spain provided information on the intended use of flexible mechanisms in their national allocation plans.

Austria intends to purchase 7.0 million tonnes of CO_2-equivalent credits from project-based Kyoto mechanisms per year of the first commitment period under the Kyoto Protocol. Austria has set a maximum of 50 % for use of Kyoto mechanisms to cover its reductions commitment (gap between base-year emissions and target). Belgium's federal government plans the acquisition of 8.2 million Kyoto units from JI and CDM projects. Denmark estimates so far a contribution of 3.7 million tonnes of CO_2-equivalent per year from project-based activities abroad and of 20 million to 25 million tonnes of CO_2-equivalent per year from all Kyoto mechanisms ([19]). Ireland plans to purchase 3.7 million tonnes of CO_2-equivalent per year during the commitment period to comply with its burden-sharing target. According to its third national communication, Italy expects to contribute with 12 million tonnes of CO_2-equivalent per year to its burden-sharing target through the use of JI and CDM. According to Italy's national allocation plan, up to 69.2 million tonnes of CO_2-equivalent may be obtained by the use of Kyoto mechanisms. Luxembourg intends to purchase 3 million Kyoto units per year of the first commitment period. The Netherlands is currently planning to use Kyoto mechanisms to purchase an average of 20.0 million tonnes of CO_2-equivalent reductions per year during the commitment period. Portugal estimates in the questionnaire a total contribution from the use of Kyoto mechanisms of 0.68 million to 1.3 million tonnes of CO_2-equivalent per year, but stated in its national allocation plan that up to 5.1 million Kyoto units

([18]) It has to be highlighted that the information on the intended use of Kyoto mechanisms is changing quite rapidly with each Commission decision on national allocation plans. The assessment below is as of 20 October 2004. Decisions taken hereafter are not taken into account.

([19]) It is expected that the main part of the gap in the period 2008–12 will be closed with the use of the flexible mechanisms under the Kyoto protocol as well as through emissions trading under the EU ETS. The split between the individual flexible mechanisms and EU allowances will depend on actual CO_2 prices and will not be known before the end of the first commitment period.

Table 5.1 Planned use of Kyoto mechanisms in the EU-15 Member States

Member State	Planned use of Kyoto mechanisms	Which Kyoto mechanisms? (ET, CDM, JI)	Achieving the burden-sharing target through domestic action (no use of Kyoto mechanisms)?	Projected emission reduction 2008–12 through the use of Kyoto mechanisms ([a]) (million tonnes of CO_2-equivalent per year)
Austria	Yes	Priority on JI and CDM	No	7.0 ([b])
Belgium	Yes Trading simulation to gain experiences	CDM, JI	No	8.2
Denmark	Yes	ET, CDM, JI	No	3.7 ([c])
Finland	Not yet decided (pilot programme to gain experience)	Not yet decided	Not yet decided	Not yet decided
Ireland	Yes	ET	No	3.7 ([d])
Italy	Yes	ET, CDM, JI	No	12.0–69.2
Luxembourg	Yes	ET, CDM, JI	No	3.0
Netherlands	Yes	ET not yet decided, CDM, JI	No	20.0 ([e]) (CDM and JI)
Portugal	Yes	ET, CDM, JI	No	0.68–1.3
Slovenia	Yes	ET, CDM, JI	n.a.	Not yet decided
Spain	Yes	Priority on ET and CDM	No	20.0
Sweden	Not yet decided, under consideration	ET, CDM, JI	Yes	No estimate provided
United Kingdom	Use of Kyoto mechanisms allowed at company level, no acquisition by government planned	ET, CDM, JI	Yes	No projected estimate as the amount will depend on private action

Notes:

([a]) The projected emission reduction through the use of Kyoto mechanisms for Austria, Belgium, Denmark Ireland, Luxembourg and the Netherlands stems from the Commission decisions on the national allocation plans of those countries (COM(2004) 500 final and COM(2004) 681 final). The Commission has based its decision on information provided in the NAPs and/or in further correspondence during the assessment of the NAPs. The figures for Italy, Portugal and Spain are derived from the questionnaire, the third national communication or the national allocation plan (for details see below).

([b]) Austria assumes in the questionnaire a maximum of 50 % of the efforts required for compliance with its burden-sharing target to be accomplished by means of JI and CDM.

([c]) The amount provided by Denmark in the questionnaire for the total use of flexible mechanisms under the Kyoto Protocol and the emissions reductions expected under the EC emissions trading directive is 20 million to 25 million tonnes of CO_2-equivalent per year. About 4 million tonnes of CO_2-equivalent per year of this amount can be achieved with the budgets already allocated for purchase of JI and CDM credits (see below).

([d]) Ireland states in the questionnaire that it intends to purchase 3.7 million tonnes of CO_2-equivalent per year from international emissions trading.

([e]) The Netherlands expects in the questionnaire a contribution of 100 million tonnes of CO_2-equivalent from project-based activities in 2008–12 (20.0 million tonnes of CO_2-equivalent per year). By the end of 2003, 79.0 million tonnes of CO_2-equivalent had already been contracted.

Sources: Questionnaires submitted under the EC GHG monitoring mechanism; third national communications; national allocation plans; European Commission, 2004a.

might be necessary to close the remaining gap to its burden-sharing target. Finally, Spain intends to acquire 20 million tonnes of CO_2-equivalent per year of the commitment period.

The status of preparation for the use of JI and CDM project-based activities differs greatly between Member States: only six Member States have already allocated resources for the use of Kyoto mechanisms (Austria, Belgium, Denmark, Finland, the Netherlands and Sweden). Austria, Belgium, Denmark and the Netherlands allocated the largest budgets (EUR 288 million, EUR 120 million, EUR 126 million and EUR 736 million for the five-year commitment period). The total budget allocated by all Member States that provided respective information amounts to about EUR 1 300 million. Assuming a price of EUR 7.40 per tonne of CO_2-equivalent — which is the average implied price level the Commission has taken into account in its decision on the national allocation plans of Austria, Denmark and the Netherlands — those resources would be able to contribute with 35 million tonnes of CO_2-equivalent per year of the commitment period to the EU-15 Kyoto target.

Table 5.2 shows that a number of Member States have also started to implement legal arrangements such as the preparation of national legal frameworks or bilateral/multilateral agreements for JI/CDM programmes (Austria, Belgium, Denmark, Finland, the Netherlands, Spain and Sweden). Up to now, most agreements or contracts have been arranged for joint implementation projects; however, two countries (the Netherlands and Spain) prefer CDM project activities.

At the present time, only a few Member States are at an advanced stage of preparation for the use of Kyoto mechanisms. In the assessment of national allocation plans the Commission has evaluated the state of advancement against the following aspects.

(a) Does the plan indicate how many Kyoto units the Member State intends to purchase for the period 2008–12?

(b) Does the plan indicate which Kyoto units (JI, CDM, and international emission trading) will be used to what extent?

(c) Does the plan present information on the state of advancement of relevant legislation?

(d) Has the Member State established and notified to the UN a designated national authority?

(e) Does the plan show that implementing provisions (operational programmes, institutional decisions) are in place at the national level?

(f) Have any credit purchase contracts been signed or any credit purchase tenders been initiated?

(g) Has the Member State set up or made any financial contributions to carbon purchase funds?

(h) Does the plan specify how much money has been committed at this stage? […]

The Commission finds that the intended use of the Kyoto mechanisms is not substantiated where a Member State has not signed any contracts or initiated any carbon purchase tenders, has not designated a national authority, has no operational programme in place, and has not committed any or sufficient budgetary resources' (European Commission, 2004a, pp. 4 and 5).

Of those Member States on whose national allocation plans the Commission decided in July and October 2004 and that foresee the use of Kyoto mechanisms, only Austria, Denmark and the Netherlands substantiated sufficiently the intended use of Kyoto mechanisms. Belgium, Ireland and Luxembourg have indicated how many Kyoto units they intend to purchase but did not comply with other criteria. However, in additional letters, the authorities of these countries have notified to the Commission further commitments which substantiate the intended use of Kyoto mechanisms, such as establishing designated national authorities and allocation of financial resources in the

Table 5.2 Preparations for the use of project based activities by EU Member States

Member State	Preparation of JI/CDM programmes	Bilateral/multilateral agreements, memorandum of understanding or contracts arranged with countries		Allocated budget
		JI	CDM	
Austria	Legal framework and programmes under preparation	Czech Republic, Slovakia, Bulgaria, Romania	No arrangements yet	Up to EUR 288 million for 2003–12 ([a])
Belgium	Flemish region: preparation of legal framework and start of pilot projects in 2003 Walloon region: CDM project currently launched	No arrangements yet	No arrangements yet	EUR 120 million
Denmark	1 JI project contracted, several JI projects in progress No CDM projects (funds will not be available until 2004)	Slovakia, Romania, Ukraine, Latvia, Estonia, Bulgaria, Moldova, Czech Republic, Hungary, Lithuania, Russia, Poland	Malaysia, Thailand, South Africa	EUR 126 million for public procurement programme of JI and CDM credits 2003–07
Finland	Pilot programme 3 JI projects under consideration	Estonia, Latvia, Lithuania, Poland, Ukraine		EUR 8.5 million
Ireland	No preparation of JI/CDM programmes	Not applicable	Not applicable	Not applicable
Italy	No specific information provided	Morocco	Libya	No information provided
Netherlands	ERUPT CERUPT Multilateral and Regional Financial Institutions, Participation in PCF ([b]), Community Development Carbon Fund, Private Financial Institutions, bilateral contracts	Romania, not legally binding: Romania, Bulgaria, Estonia, Hungary, Slovakia, Croatia, participation in PCF ([b])	Not legally binding: Bolivia, Colombia, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Uruguay, Indonesia, participation in PCF ([b])	EUR 736 million among them: IFC ([c]): EUR 44 million IBRD ([d]): EUR 70 million CAF ([e]): EUR 45 million Rabobank: EUR45 million EBRD: EUR 32 million PCF: EUR 15 million CDCF ([f]): EUR 4 million
Portugal	—	No arrangements yet	No arrangements yet	None
Spain	Pilot phase for JI/CDM expected to start in 2003, priority on CDM, preparation of legal framework	No arrangements yet	No arrangements yet	None
Sweden	5 CDM projects in different stages of development, 3 or 4 projects shall be selected from 15 JI proposals Participation in PCF ([g]) and Basrec ([h])	Bilateral agreements concluded with Romania; negotiations with Estonia, Russia Lithuania in progress. Multilateral agreement in Baltic Sea Region for high quality JI projects with ICE, NOR, SWE, DEN, GER, FIN, EST, LAT, LIT).	No arrangements yet	EUR 9.6 million (SEK 88 million) in CDM-SCILIP ([i]), EUR 4.4 million (SEK 40 million) in JI-SCILIP, EUR 8.9 million (USD 10 million)) in PCF
United Kingdom	—	No arrangements yet	No arrangements yet	None

Notes:

([a]) Amount indicated in PointCarbon 25 March 2004 ('The budget managed by Kommunalkredit Public Consulting GmbH, is worth EUR 1 million in 2003, rising to EUR 11 million in 2004, EUR 24 million in 2005 and EUR 36 million in 2006, although this includes administrative fees. The government expects that it will earmark EUR 36 million each year from then on until 2012.'). Whereas, response to questionnaire and Austrian national strategy foresees annually up to EUR 36 million starting in 2003.
([b]) Prototype Carbon Fund of the World Bank.
([c]) International Finance Cooperation.
([d]) International Bank for Reconstruction and Development.
([e]) Corporación Andina de Fomento.
([f]) Community Development Carbon Fund.
([g]) Prototype Carbon Fund of the World Bank.
([h]) Baltic Sea region energy cooperation on JI and emissions trading.
([i]) Swedish International Climate Investment Programme.

Sources: Questionnaires submitted under the EC GHG monitoring mechanism; third national communications; European Commission, 2004a.

budgets for 2005. Taking into account these commitments, together with a lowering of the total quantity of allowances, the Commission has raised no objections to Belgium's, Ireland's and Luxembourg's national allocation plans.

The stage of preparation for the use of Kyoto mechanisms in other Member States is substantially less advanced. Either the information provided in the questionnaire is incomplete, the budgets allocated are comparatively small or the acquisition of project-based mechanisms is at a very early stage.

Therefore, only Austria's, Belgium's, Denmark's, Ireland's, Luxembourg's and the Netherlands' contribution of Kyoto mechanisms is considered for the closure of the gaps between GHG projections and 2010 targets. For the EU-15, the use of Kyoto mechanisms in Austria, Belgium, Denmark, Ireland, Luxembourg and the Netherlands amounts to 45.6 million tonnes of CO_2-equivalent per year of the commitment period. This amount corresponds to about 13 % of the total required emission reduction for the EU-15 of 339 million tonnes of CO_2-equivalent per year during the first commitment period or 1 percentage point of the EU-15 Kyoto target of – 8 % ([20]).

([20]) If the intended use of Italy, Portugal and Spain — which is not substantiated sufficiently so far — would also be taken into account, up to 136 million tonnes of CO_2-equivalent per year of the commitment period might be contributed through Kyoto units. This is equivalent to 41 % of the total required reduction for the EU-15 or 3.3 percentage points of the Kyoto target.

6 Key domestic policies and measures

6.1 Common and coordinated policies and measures of the EU

The European Climate Change Programme (ECCP) analysed the most environmentally beneficial and cost-effective additional policies and measures enabling the EU to meet its – 8 % target under the Kyoto Protocol. A second report on the progress of the ECCP was published in May 2003 ([21]) and since then three important measures have been adopted by the EU institutions:

- the directive linking project-based mechanisms to GHG emission trading;
- the Council decision for monitoring Community GHG emissions and for implementing the Kyoto Protocol; and
- the directive on the promotion of cogeneration.

In addition, legislative work in the EU institutions is at an advanced stage of preparation for other proposals, such as the proposal for a regulation on fluorinated gases, the proposal for a framework directive on eco-efficiency requirements for energy-using products and the proposal for a directive on energy end-use efficiency and energy services, which was adopted by the Commission in December 2003 (see Table 6.1). This last proposal also integrates 'related to the promotion of energy-efficient public procurement', which was originally considered as a separate ECCP initiative.

The legislative measures currently in force or already proposed by the Commission would — according to the ex ante ECCP estimates — result in potential emissions reductions of about 350 million to 430 million tonnes of CO_2-equivalent in the EU-15. Some of the adopted CCPMs are already considered in the projections of Member States but others are still missing.

If all of these measures were adopted and implemented by Member States in a comprehensive and timely manner this reduction potential would materialise and would contribute to cover the gap between the 'with existing measures' projection and the EU target. However, this ex ante evaluation of the potential is uncertain for several reasons.

- Potential measures have not all been analysed in the same way and some have been analysed in more depth.
- For some measures, the estimated potential is based on reaching certain indicative targets, or levels of penetration, which will need to be achieved in practice (e.g. CHP and biofuels targets). In many cases, the ultimate success of the measures will be dependent on overcoming a range of political, behavioural and information barriers.
- The interactions between different measures have not necessarily been taken into account and, in some cases, the policies needed to promote the different measures may be in conflict with one another.
- Legislation always looks different after its approval than when proposed by the European Commission for the first time.

It is therefore recognised that the effectiveness of the measures needs to be closely monitored and their implementation reviewed if necessary.

Climate change continues to be integrated into other policy areas of the EU and climate change measures are being implemented by the Commission. The most important results of the past year are:

- the assessment of national allocation plans under the emissions trading directive;

([21]) http://europa.eu.int/comm/environment/climat/second_eccp_report.pdf

Table 6.1 ECCP measures

Proposed measure	Status of implementation	Entry into force	Starting to deliver (estimate)
Cross-cutting issues			
Directive establishing a scheme of GHG emission trading within the Community	Adopted by Council and Parliament ([a])	2003	2005
Effective implementation of IPPC (integrated pollution prevention and control directive)	Work on an IPPC reference document on generic energy efficiency techniques to start by end 2004 Ongoing work on various sector-specific BAT (best available techniques) reference documents Revision of published BAT reference documents to start in early 2005	In preparation	
Linking project-based mechanisms to GHG emissions trading	Proposal adopted by the Commission ([b]), agreed upon by Council and Parliament and to be adopted in the second half of 2004	2004	2005
Decision for monitoring Community GHG emissions and for implementing the Kyoto Protocol	Adopted by Council and Parliament ([c])	2004	—
Energy			
Directive on taxation of energy products	Adopted by the Council ([d])	2003	2005
Directive on energy performance of buildings	Adopted by Council and Parliament ([e])	2003	2006
Directive on the promotion of electricity from renewable energy sources	Adopted by Council and Parliament ([f])	2001	2003
Proposal for a framework directive on eco-efficiency requirements for energy-using products	Proposal adopted by the Commission ([g]) First reading completed; common position adopted by the Council	—	
Proposal for a directive on energy end-use efficiency and energy services	Proposal adopted by the Commission ([h])	—	
Directive on the promotion of cogeneration (CHP)	Adopted by Council and Parliament ([i])	2004	2006
Public awareness campaign and campaign for take-off	Included in 2003 work plan 'Intelligent energy for Europe' Will start in late 2004.	—	
Transport			
Voluntary agreement of the car manufacturers from EU, Japan and Korea to reduce fleet average CO_2 emissions to 140 g/km by 2008/09 (pre-ECCP)	Monitored through yearly report Fourth review in 2003 ([j])	1998	1999
Shifting the balance between modes of transport, in particular towards rail transport	Rail infrastructure package ([k]), the second railway package ([l]) and the proposal for the third railway package ([m]), in accordance with the White Paper on a common transport policy; adopted	2001–06	2003–08
Proposal for improvements in infrastructure use and charging	Proposal to amend the current 'Eurovignette' directive adopted by the Commission ([n])		
Promotion of the use of bio-fuels for transport	Adopted by Council and Parliament ([o])	2003	2005
Proposal on special tax arrangements for diesel fuel used for commercial purposes and on the alignment of excise duties on petrol and diesel fuel	Proposal adopted by the Commission ([p])	—	
Proposal on a regulation on the granting of Community financial assistance to improve the environmental performance of the freight transport system (Marco Polo I and II programmes)	Proposal adopted by the Commission ([q])		

Proposed measure	Status of implementation	Entry into force	Starting to deliver (estimate)
Agriculture			
Common rules for direct support schemes under the common agricultural policy and establishing certain support schemes for farmers (carbon credit for energy crops)	Adopted ([r])	2003	2005?
Support for rural development from the European Agricultural Guidance and Guarantee Fund (EAGGF)	Adopted ([s])		
Industry			
Proposal for legislative action on fluorinated gases	Proposal adopted by the Commission ([t]) in co-decision	—	
Waste			
Landfill directive	Adopted ([u])	1999	2000

Notes:

([a]) Directive 2003/87/EC of 13 October 2003 (OJ L 275, 25.10.2003, p. 32).
([b]) COM(2003) 403 of 23 July 2003.
([c]) Decision No 280/2004/EC (OJ L 49, 11.2.2004, p. 1).
([d]) Directive 2003/96/EC (OJ L 283, 31.10.2003, p. 51).
([e]) Directive 2002/91/EC (OJ L 1, 4.1.2003, p. 65).
([f]) Directive 2001/77/EC (OJ L 283, 27.10.2001, p. 33).
([g]) COM(2003) 453 of 23 July 2003.
([h]) COM (2003) 739 final.
([i]) Directive 2004/8/EC (OJ L 52, 21.2.2004, p. 50).
([j]) COM(2004) 78 final of 11 February 2004.
([k]) Directives 2001/12/EC, 2001/13/EC and 2001/14/EC (OJ L 75, 15.3.2001, pp. 1, 26 and 29).
([l]) Regulation (EC) No 881/2004 of 29 April 2004 (OJ L 164, 30.4.2004, p. 1), corrigendum (OJ L 220, 21.6.2004, p. 3). Directive 2004/49/EC of 29 April 2004 (OJ L 164, 30.4.2004, p. 44), corrigendum (OJ L 220, 21.6.2004, p. 16). Directive 2004/50/EC (OJ L 164, 30.4.2004, p. 114), corrigendum (OJ L 220, 21.6.2004, p. 40). Directive 2004/51/EC (OJ L 164, 30.4.2004, p. 164), corrigendum (OJ L 220, 21.6.2004, p. 58).
([m]) http://europa.eu.int/comm/transport/rail/package2003/new_en.htm
([n]) COM(2003) 448 of 23 July 2003.
([o]) Directive 2003/30/EC (OJ L 123, 17.5.2003, p. 42).
([p]) COM(2003) 410 of 24 July 2002.
([q]) Regulation (EC) No 1382/2003 (OJ L 196, 2.8.2003, p. 1).
([r]) Regulation (EC) No 1782/2003 (OJ L 270, 21.10.2003, p. 1).
([s]) Regulation (EC) No 1783/2003 (OJ L 270, 21.10.2003, p. 70).
([t]) COM (2003) 492 of 11 August 2003.
([u]) Directive 1999/31/EC (OJ L 182, 16.7.1999, p. 1).

- a progress report regarding the EU's progress to meet its renewable target and the announcement of a number of additional actions in this field;
- the yearly monitoring report regarding the voluntary commitments of the car manufacturers' associations;
- implementation of the work programme 'Intelligent energy for Europe';
- sustainable transport, energy efficiency and renewables are taken up as priority areas in the Commission's future cohesion policy;
- new opportunities to address climate change and the promotion of biomass production in the Commission's proposal for a regulation on rural development.

6.2 Main savings from domestic policies and measures of the EU-15 Member States

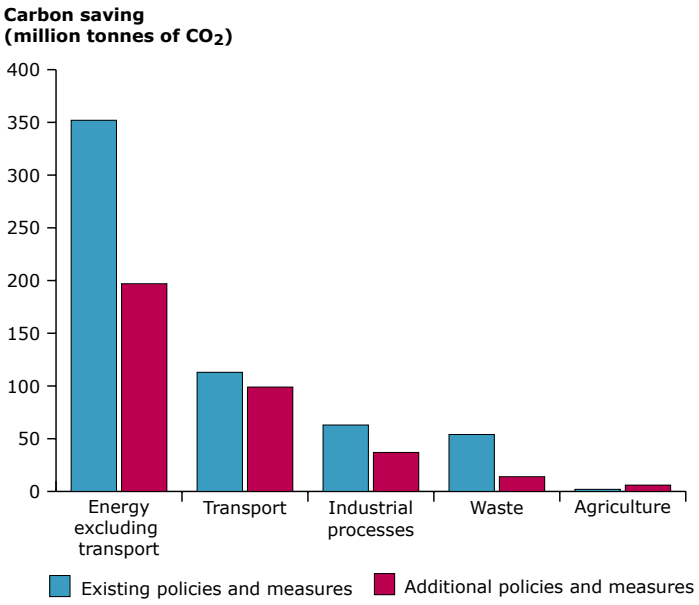
Member States have provided information on which policies and measures (PAMs) are included in their 'with existing domestic measures' projections ([13] p. 16) and in their 'with additional domestic measures' projections. The type of policies and measures can be either common and coordinated policies and measures or specific national policies and measures. In some cases, this distinction is clear from

the information reported by the Member States but, in general, more information on whether policies are common or coordinated policies and measures would improve the standard of reporting.

Figure 6.1 provides an overview of the estimated effects of national policies and measures on total EU greenhouse gas emissions in each of the main sectors. All Member States provided quantified sectoral emission savings for at least some sectors, except Denmark. Not all Member States quantified the savings from all policies and measures; 11 Member States have provided information on the savings from at least some implemented policies and measures and 12 Member States report quantified savings from planned policies and measures. The level of reporting on savings was improved upon compared with last year's monitoring mechanism submissions.

Policies and measures in the energy sector (all energy-related emissions except transport) account for 60 % of the total savings from implemented domestic measures and 56 % of the planned domestic measures savings for the EU as a whole. The high contribution of this sector is because the majority of both implemented and planned policies and measures are targeted at moving to cleaner and more efficient energy production or making energy use more efficient. Transport measures are expected to deliver the second highest savings, followed by the effect of measures on industrial processes. As transport is the most rapidly growing source of greenhouse gases, the measures implemented and planned by Member States only go a small way to addressing this and provide 19 % and 28 % of the total savings from implemented and planned policies and measures respectively. Finally, savings

Figure 6.1 EU-15 projected greenhouse gas emission savings by sector in 2010



Note: Member States did not provide quantification for all reported policies and measures. This figure shows the savings only for those measures with quantified reductions of emissions. However, all policies and measures are included in the total projections and in the sectoral projections presented in Section 7 of the report. Therefore the savings shown in this figure are lower than the projections for emission reductions by sector presented in Section 7.

Sources: Information submitted under the EC GHG monitoring mechanism and in third national communications.

from measures in the waste and agriculture sectors are expected to be small over the period in question.

Comparing the results for 2004 with last year's findings under the monitoring mechanism reveals that:

- the savings from the energy sector excluding transport have increased for both additional and existing policies and measures compared with last year;
- the percentage increase in savings is significant for the transport sector;
- the emissions savings for the EU-15 for policies and measures in the waste, agriculture and industrial processes sectors have been subject to little or no change.

Key policies and measures of the EU-15 Member States related to the policy areas of the European Union

From the EU-wide common and coordinated policies and measures (see Section 6.1) 10 policy areas have been identified/derived. These policy areas cover all sectors: energy, waste, transport, F-gases and agriculture. Table 6.2 presents an overview on activities EU-15 Member States have been taken in those policy areas with their domestic policies and measures. Qualitative reporting on the polices and measures was of a high standard for the EU-15 with all Member States reporting on two or more of the key policies.

A greater number of Member States reported policies in their 'with existing domestic measures' projection than in their 'with

Table 6.2 Activities of the EU-15 Member States in EU-wide policy areas

EU-15 Member State	Renewable energy		CHP		Cross-sectoral energy tax		Energy-efficient appliances		Building standards		ACEA agreement		Integrated transport policy		F-gas abatement measures		Fertiliser and manure management		Landfill directive	
	Ex.	Add.	Ex.	Add.	Ex.	Add.	Ex.	Add.	Ex.	Add.	Ex.	Add.	Ex.	Add.	Ex.	Add.	Ex.	Add.	Ex.	Add.
Austria	X	X	X	X	X		X	X	X	X	X		X		X	X	X		X	X
Belgium	X		X	X			X		X				X		X		X	X	X	
Denmark	X		X		X		X		X		X				X		X		X	
Finland	X	X			X				X	X	X		X				X		X	X
France	X	X	X				X		X	X	X					X	X	X	X	
Germany	X		X		X		X	X	X		X				X	X	X		X	
Greece	X	X	X				X	X	X		X				X				X	
Ireland	X	X		X		X				X		X				X	X			
Italy	X	X		X	X		X		X		X					X		X		
Luxembourg	X				X															
Netherlands	X		X		X		X		X		X				X	X				X
Portugal	X	X		X			X		X	X	X								X	
Spain	X		X				X		X								X		X	
Sweden	X		X		X		X		X	X					X				X	
United Kingdom	X		X	X	X		X	X	X			X	X		X		X		X	

Notes:

X indicates that the Member State has reported the policy.
Ex. = implemented or adopted policy (existing).
Add. = planned or proposed policy (additional).

Sources: Information submitted under the EC GHG monitoring mechanism and in third national communications.

additional domestic measures' projection; therefore more of the EU-wide policies are reported as adopted or implemented than planned. Policies to promote renewable energy were the most frequently reported, with all Member States taking action in this area.

Member States' projections of emission reductions in the energy and industry sectors are likely to be significantly affected by the introduction of emissions trading and particularly by the link between emissions trading and the Kyoto mechanisms. The majority of projections submitted by Member States do not take account of the introduction of emissions trading in 2005. Once that system is operational, one would expect emission reductions to take place where it is most cost effective to do so. In some cases, such as the Netherlands, emission reductions may well be outside the Member State concerned.

The new Member States were not obliged to formally report under this year's monitoring mechanism, thus an assessment of reporting on policies and measures was based on the national communications. Based on the available information, the level of implementation of the EU-wide policies is lower for the new Member States than for the EU-15. Table 6.3 shows that the pattern of policy uptake follows that of the EU-15: the new Member States report more policies as implemented or adopted than as planned. As for the EU-15, renewable energy policies are the most frequently reported. F-gas abatement policies are reported for Poland alone and Slovenia is the only new Member State to report on the ACEA, and cross-sectoral energy tax policies.

For the EU-15, the matrix assessment of Member States' policies and measures identified six broad areas of policy intervention that are both widespread and are projected to deliver substantial greenhouse gas emission reductions. In the energy supply and use sectors, these were the use of renewable energy, CHP, energy efficient appliances and building standards; in transport, the EU-wide ACEA agreement; and for the waste sector, the landfill directive. This section examines the contribution of these key policies and measures to greenhouse gas emission reductions across the EU.

All EU-15 Member States have provided at least some information on these six policies and measures, except Denmark,

Table 6.3 Activities of the new Member States in EU-wide policy areas

New Member State	Renewable energy		CHP		Cross-sectoral energy tax		Energy-efficient appliances		Building standards		ACEA agreement		Integrated transport policy		F-gas abatement measures		Fertiliser and manure management		Landfill directive	
	Ex.	Add.	Ex.	Add.	Ex.	Add.	Ex.	Add.	Ex.	Add.	Ex.	Add.	Ex.	Add.	Ex.	Add.	Ex.	Add.	Ex.	Add.
Czech Republic	X	X					X												X	
Estonia			X					X	X											X
Hungary	X			X				X						X				X		
Latvia	X		X				X		X									X	X	
Lithuania	X												X							
Poland	X	X												X		X			X	
Slovenia	X		X	X	X		X		X		X						X		X	
Slovakia	X								X								X		X	

Notes:

X indicates that the Member State has reported the policy.
Ex. = implemented or adopted policy (existing).
Add. = planned or proposed policy (additional).

Sources: Information submitted under the EC GHG monitoring mechanism and in third national communications.

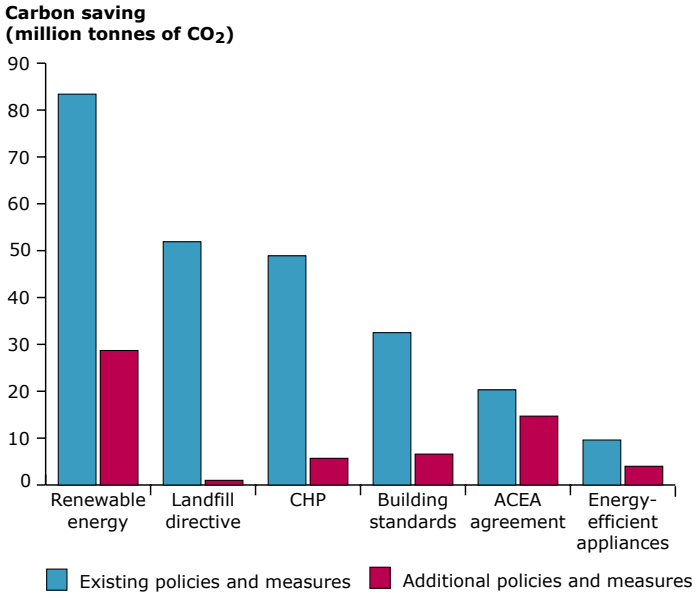
Luxembourg and Belgium where savings are not allocated to policies in the information supplied. The savings shown for the EU-15 in Figure 6.2 are the sum of those presented in the tables from Member States giving details of and savings allocated to policies. Eleven Member States provided savings covering these policies for the 'with existing domestic measures' projections and nine Member States covered the key policies in the 'with additional domestic measures' projections. A range of different policies and measures provide the rest of the savings in Member States.

EU-15 emission savings from the key policies in the 'with existing domestic measures' projections show that renewable energy policies generate the most carbon savings, by a significant margin, with renewable energy policies being particularly successful for Spain. The landfill directive has the next largest impact, though the majority of the savings can be attributed to Germany and France.

Out of the six policies, renewable energy has the highest impact for the 'additional domestic measures' projections, as was the case for implemented policies, with Italy making the greatest contribution to savings. The ACEA agreement has a significant role in generating savings in planned policies, with the United Kingdom providing the majority of the savings for this policy.

In total, when savings from both scenarios are combined, these six key policies are expected to deliver savings of about 307 million tonnes of CO_2. They are therefore very important in helping the EU achieve its emission commitments. Renewable energy policies show the largest savings (112 million tonnes of CO_2). The CHP directive and landfill directive, which are both specific common or coordinated policies, are also expected to make a significant contribution to carbon reduction (55 million tonnes of CO_2 and 53 million tonnes of CO_2 respectively).

Figure 6.2 Aggregated savings for the six key policies in the projections with existing domestic measures and with additional domestic measures



Note: The reported effects of single quantified measures do not necessarily sum to the projections for the total effect of all reported measures. Therefore, the amounts for additional domestic measures are not the difference between the 'with existing domestic measures' projections and the 'with additional domestic measures' projections. Also, for the same reason, hypothetical 'without measures' projections cannot be derived as a large proportion of policies and measures have not been quantified.

Sources: Information submitted under the EC GHG monitoring mechanism and in third national communications.

Comparing the results for 2004 with last year's findings under the monitoring mechanism reveals that:

- the reported saving for 2004's existing renewable energy policies and measures is 30 million tonnes lower than for last year;
- this year, EU-15 Member States reported a significant increase in savings from existing measures in CHP and building standards;
- there was little change in the savings reported for the landfill directive, ACEA agreement and energy efficiency policies.

6.3 Emissions trading

The EU emissions trading scheme was established by Directive 2003/87/EC ([22]) and EU-wide emissions trading will begin on 1 January 2005. The scheme is a cap and trade scheme. The directive covers CO_2 emissions from large stationary sources including the power and heat generators, oil refineries, ferrous metals, cement, lime, glass and ceramic materials, and pulp and paper (see Annex I to the directive), which are estimated to emit 46 % of the Community's CO_2 emissions in 2010.

Member States have to allocate most of the allowances to the more than 12 000 installations covered free of charge. The allocation has to be based on a national allocation plan developed in accordance with common criteria (see Annex III to the directive). In addition, Member States may auction a percentage of allowances, increasing over time.

Holding of allowances will be recorded in registries in each Member State. Four months after the end of each year, operators will be required to hand over allowances, equivalent to their installation's emissions during the preceding year, to the national authority.

Operators of installations will be free, if they so wish, to buy or sell their allowances. If an operator can reduce emissions, the excess allowances can be traded. The operator of an installation which increases its emissions beyond its allocation must acquire additional allowances, to cover those emissions from the market, thereby ensuring that the overall target will be met.

If an operator does not hold sufficient allowances, harmonised non-compliance penalties will apply of EUR 40 and, from 2008, EUR 100 per tonne of excess emissions in addition to the requirement for the shortfall to be made up (Article 16). In this way, emission reductions can be made where it is most economically efficient for them to take place, right across the EU.

After the first period (2005–07), allocation of allowances will take place for the five-year period 2008–12 consistent with the commitment periods of the Kyoto Protocol. The EU emissions trading scheme will be implemented in the 15 old and 10 new Member States and may apply to the EEA member countries. It can be linked to other international emission trading schemes providing the countries involved are included in Annex B to the Kyoto Protocol and have also ratified the Protocol (Article 25).

Allowances can be transferred between any person within the Community including persons in countries which are linked to the European emissions trading scheme (Article 12). Allowances that are handed over to the national authorities for compliance will be transferred to a cancellation account and cannot be traded or used for compliance any more.

The EU emissions trading scheme takes a total climate impact approach. The pilot phase (2005–07) of the scheme is specifically restricted to industrial sectors with significant CO_2 emissions and where emissions of other greenhouse gases are negligible. However, it would be possible

([22]) http://europa.eu.int/eur-lex/pri/en/oj/dat/2003/l_275/l_27520031025en00320046.pdf

to include other sectors and greenhouse gases where this is not the case providing it is on a CO_2-equivalent basis. Article 30 of the directive explicitly foresees a review in 2006 which should consider '… how and whether [it] should be amended to include other relevant sectors inter alia chemicals, aluminum and transport sectors and emissions of other greenhouse gases …'.

In April 2004, the parliament adopted changes to the proposal for a so-called linking directive (2003(COM) 403 final) ([23]) which allows for the use of emission credits from the project based Kyoto mechanisms joint implementation and clean development mechanism (see Chapter 5). This directive was formally approved by the EU foreign ministers in September 2004. The linking of the Kyoto mechanisms will reduce costs for the companies participating in emissions trading. It will also promote the transfer of environmentally sound technology to developing countries.

The directive allows companies in the EU trading scheme to use the credits from such projects, once they are issued, up to a percentage of their allowed emissions. The limit will be decided by each Member State and will guarantee that they take significant action at home to meet their reduction commitments and use the Kyoto mechanisms to meet only part of these commitments.

Companies will be able to use all credits that are issued in accordance with the Kyoto Protocol's rules under the EU emissions trading scheme. Excepted are credits from nuclear energy projects, which are also disallowed under the Kyoto Protocol, and credits from 'carbon sinks' (see Chapter 8). The use of credits from 'carbon sinks' will be reviewed by the Commission in 2006. The directive also requires Member States to ensure that the environmental and social impacts of large hydroelectric power projects are addressed through the application of relevant international criteria and guidelines when they approve such projects.

6.4 Energy taxation

In October 2003, after six years of negotiations in the Council, the directive (2003/96/EC) for restructuring the Community framework for the taxation of energy products and electricity was adopted by the Council. The directive extends the Community system of minimum rates to coal, natural gas and electricity, and increases to some extent the existing minimum rates for fuels and heating oil from their 1992 level. By creating a common framework for the taxation of (nearly) all energy products in the Community, the directive aims primarily at improving the functioning of the internal market, but it also has the objective of ensuring greater respect for the environment, while at the same time combating unemployment through encouraging so-called green tax reforms in Member States (Eurostat, 2004).

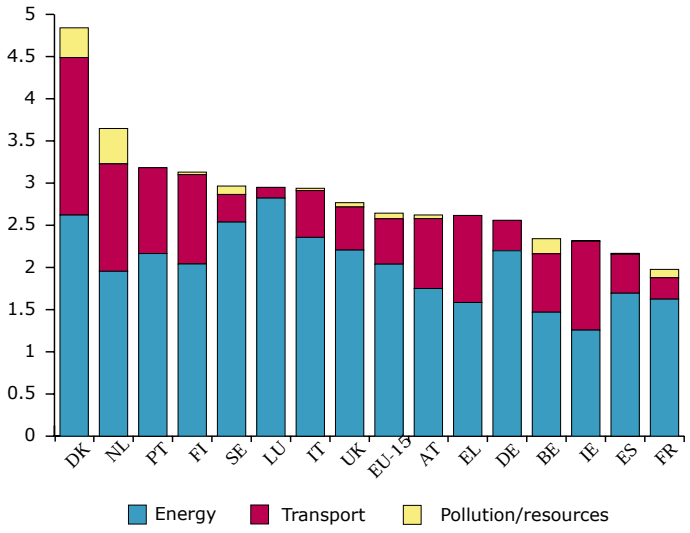
All EU-15 Member States apply energy taxes, but the scope of them is still limited if compared with other taxes and social contributions and with GDP. In 2002, revenues from energy taxes in the EU-15 accounted for 5 % of total revenues from taxes and social contributions and 2 % of GDP. Between 1995 and 2002, energy tax revenues have slightly decreased in relation to total taxation and to GDP. However, in five EU-15 Member States (Austria, Denmark, Germany, the Netherlands, Sweden) the importance of energy taxes increased between 1995 and 2002 (Eurostat, 2004).

Figure 6.3 shows that energy taxes are by far the most significant taxes of all environmental taxes in the EU-15, representing more than three quarters of environmental tax revenue. Within the EU-15 Member States the shares of energy taxes range from 1.3 % in Ireland to 2.8 % in Luxembourg.

A prominent example of energy taxes is the ecological tax reform (ETR) in Germany. With the ETR set in force in April 1999, the German Federal Government is aiming

([23]) http://europa.eu.int/cgi-bin/eur-lex/udl.pl?REQUEST=Seek-Deliver&LANGUAGE=en&SERVICE=eurlex&COLLECTION=com&DOCID=503PC0403&FORMAT=pdf

Figure 6.3 Environmental tax revenues 2002 in % of GDP



Source: Eurostat, 2004

at incentives for energy saving, energy efficiency and promotion of renewable energy sources. All energy sources except coal and other solid fuels are covered by different eco tax rates. Until 2003, tax rates of EUR 0.15 per litre of petrol and diesel and of EUR 0.2 per kWh of electricity has been introduced by yearly steps. The revenues from the ETR are almost fully returned to taxpayers by using them for gradual reduction and stabilisation of employer and employee pension contributions.

Two years after entering into force, a study commissioned by the German Ministry of Finance estimated the following effects of the German ETR (DIW, 2001): CO_2 emissions from energy use (covering all sectors) are estimated to be about 2 % (17 million tonnes of CO_2-equivalent) lower compared with a reference scenario without ETR (assuming current high world energy prices). The CO_2 savings of 17 million tonnes of CO_2-equivalent refer to each year of the period 2003–10 (i.e. after the ETR has achieved its highest tax rates). More recent data seem to prove the positive environmental effect of the ETR: fuel consumption in road transport decreased in Germany by almost 3 % between 2000 and 2003, sales of solar thermal plants for warm water treatment have large growth rates resulting in 4.2 million square metres of working solar collectors in 2002.

Germany's ETR has been further developed recently. Some reduced eco tax rates included in the ETR by 2003 have been adapted and environmentally questionable tax reductions or subsidies have started to be removed (BMU, 2004).

7 Sectoral emission trends and projections in the EU-15

This chapter provides an analysis of GHG trends and projections for the following sectors.

1. *Energy supply and use excluding transport*: this sector corresponds to IPCC Sector 1 'Energy', except 1.A.3. 'Transport', and includes mainly energy supply in electricity and heat production and refineries, and energy use in manufacturing industries, households and services; fugitive emissions from energy are also included in this sector.

2. *Transport*: this sector corresponds to the IPCC source category 1.A.3 'Transport' and includes mainly road transport, but also rail and domestic aviation and navigation (it does not include international aviation and navigation).

3. *Agriculture*: this sector corresponds to IPCC sector 4 'Agriculture' and includes mainly enteric fermentation and soils (it does not include energy-related emissions from agriculture).

4. *Industrial processes*: this sector corresponds to IPCC sector 2 'Industrial processes' and includes mainly process-related emissions from mineral production (cement), the chemical industry (nitric and adipic acid production) and fluorinated gases (it does not include energy-related emissions from industry).

5. *Waste*: this sector corresponds to IPCC sector 6 'Waste' and includes mainly emissions from landfills (it does not include waste incineration used for electricity and heat production, which is included in the energy sector).

7.1 Overview

Energy supply and use excluding transport is by far the largest sector, accounting for 61 % of total EU-15 greenhouse gas emissions (mainly CO_2 from fossil fuel combustion in electricity and heat production, refineries, manufacturing industries, households and services). Total GHG emissions from energy supply without transport were 5 % below 1990 levels in 2002, but are projected to increase again to 3 % below 1990 levels by 2010, in the 'with existing measures' scenario (Figure 7.1). In the 'with additional measures' scenario emissions are projected to be 11 % below 1990 levels in 2010 ([24]).

- The largest reductions in absolute terms were achieved in 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 unification. Emissions decreased by 69 million tonnes, or 11 %, from the 1990 level.

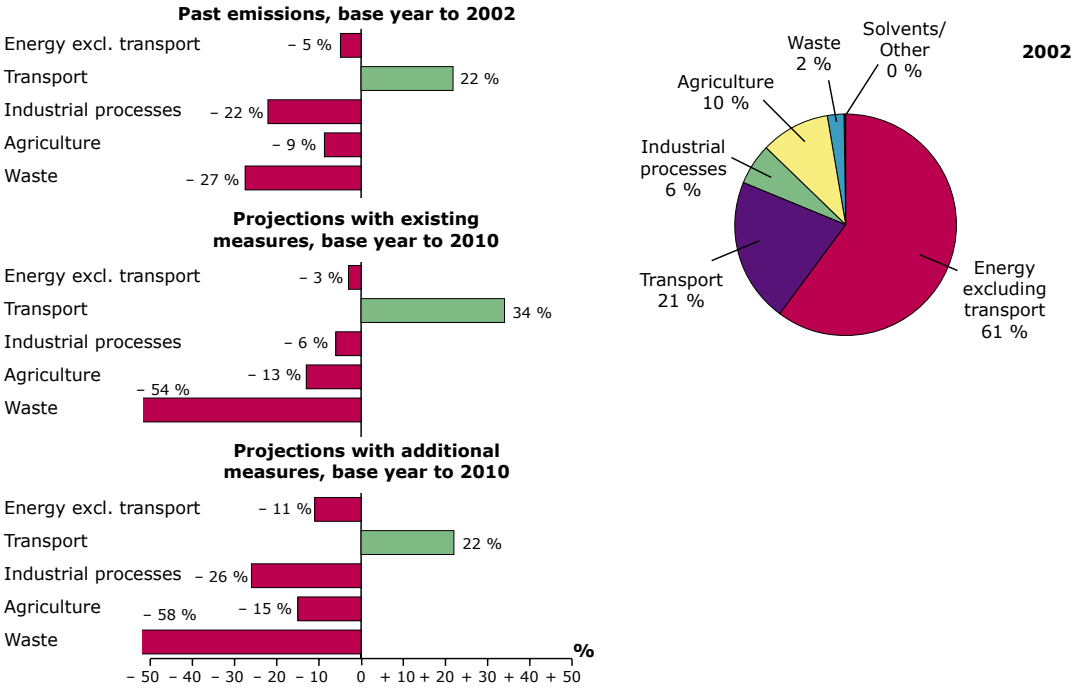
- Emissions also decreased due to the decline of coal mining (CH_4), fuel use from manufacture of solid fuels and military fuel use (both CO_2).

- CO_2 emissions from public electricity and heat production were 25 million tonnes of CO_2-equivalent or 3 % above 1990 levels. The 8 % reduction achieved in the 1990s has been lost due to considerable growth of coal-fired power production in recent years.

- After an increase in 2001, CO_2 emissions from households and services decreased in 2002, mainly due to relatively warm temperatures in the winter season in

([24]) Several Member States did not report projections for all sectors/scenarios. Therefore, the information on projections has to be interpreted with care.

Figure 7.1 **Change in EU-15 greenhouse gas emissions by sector base year to 2002, sector projections with existing and 'with additional measures' base year to 2010, and share of sectors in 2002**



Note: Several Member States did not report projections for all sectors/scenarios. Therefore, the information on projections has to be interpreted with care.

Sources: Information submitted under the EC GHG monitoring mechanism and in third national communications.

many Member States, which decreased fuel use for space heating. In 2002, CO_2 emissions from households were 1 % above the 1990 level and CO_2 emissions from services were 3 % below.

- CO_2 emissions from oil refining increased almost every year in the 1990s and were 17 % above the 1990 level in 2002.

Transport accounts for 21 % of total EU-15 GHG emissions (mainly CO_2 from fossil fuel combustion, but also N_2O). Total GHG emissions from transport were 22 % above 1990 levels and are projected to further increase to 34 % above 1990 levels by 2010 in the 'with existing measures' projections. 'With additional measures' emissions are projected to remain at 2002 levels until 2010. The rapid increase of transport-related GHG emissions (excluding international transport) is mainly due to the growth of road transport demand in almost all Member States. In 2002, CO_2 emissions from road transport had increased by 146 million tonnes, or 23 %, compared with 1990. Nitrous oxide emission increases from transport are mainly due to the increased use of catalytic converters, which reduce emissions of air pollutants but emit N_2O as a by-product. However, for newer catalytic converters, N_2O emissions have been reduced dramatically.

Agriculture accounts for 10 % of total EU-15 GHG emissions (mainly CH_4 from enteric fermentation and manure management and N_2O from soils and manure management). In 2002, total GHG emissions from agriculture were 9 % below 1990 levels and are projected to further decrease to 13 % below 1990 levels by 2010 in the 'with existing measures' projections. 'With additional measures' emissions are projected to be 15 % below 1990 levels by 2010. The main reasons for declining agricultural emissions are decreasing cattle numbers and declining fertiliser and manure use.

Industrial processes account for 6 % of total EU-15 GHG emissions (mainly CO_2 from cement production, N_2O from the

chemical industry, HFCs). In 2002, total GHG emissions from industrial processes were 22 % below base-year levels, but are projected to increase to 6 % below base-year levels by 2010 in the 'with existing measures' projections. 'With additional measures' emissions are projected to be 26 % below base-year levels by 2010. Cement production dominates the trend until 1997. Factors for declining emissions in the early 1990s were low economic growth and cement imports from eastern European countries. Between 1997 and 1999, the trend is dominated by reduction measures in adipic acid production in Germany, France and the United Kingdom. In addition, between 1998 and 1999, large reductions were achieved in the United Kingdom due to reduction measures in HCFC production.

Waste management accounts for 2 % of total EU-15 GHG emissions (mainly CH_4 from waste disposal sites). In 2002, total GHG emissions from waste management were 28 % below 1990 levels and are projected to further decrease to 54 % below 1990 levels by 2010 in the 'with existing measures' projections. 'With additional measures' emissions are projected to be 58 % below base-year levels by 2010. The decline of biodegradable waste being landfilled and the growing share of CH_4 recovery from landfill sites are the main reasons for falling emissions.

The largest changes of the emission sources are given in Annex 3 (Figure A3.1). Sectoral changes are discussed in more detail in the next sections.

7.2 Energy supply and use excluding transport ([25])

Energy supply and use excluding transport is by far the largest sector, accounting for 61 % of total EU-15 greenhouse gas emissions (mainly CO_2 from fossil fuel combustion in electricity and heat production, refineries, manufacturing industries, households and services). Total GHG emissions from energy supply and use excluding transport were 5 % below 1990 levels in 2002 (Figure 7.2). Compared with 2001, GHG emissions from energy excluding transport decreased by 0.9 %, which was mainly due to warm outdoor temperatures in the winter season.

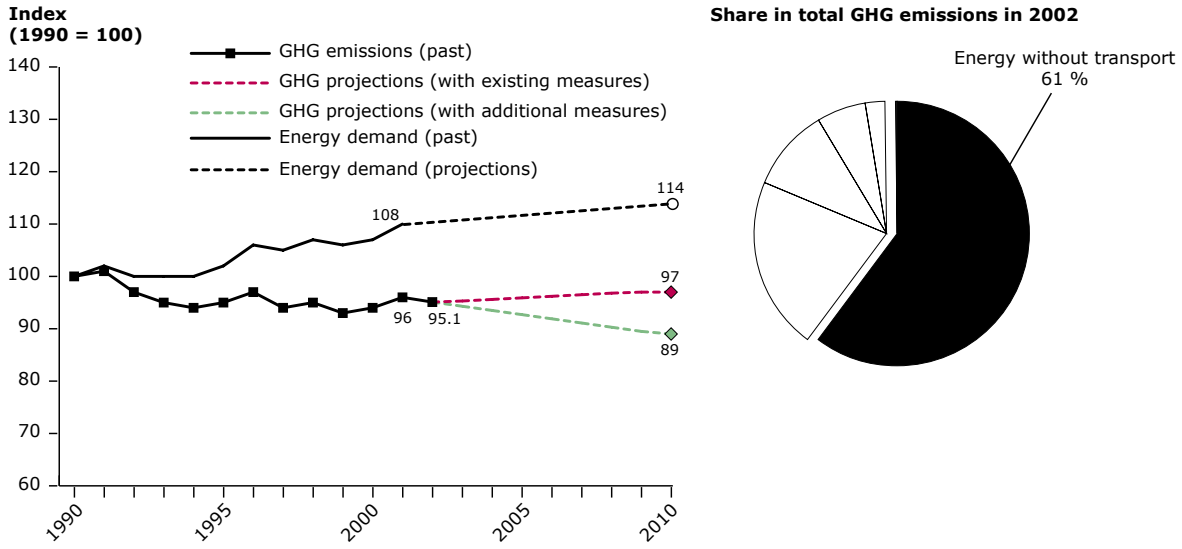
The decline in the early 1990s is primarily the result of reductions in Germany (efficiency improvements in electricity and heat production and the restructuring of the industry) and the United Kingdom (fuel switch in electricity and heat production), but also due to low economic growth. Over the whole period 1990–2001, energy consumption excluding transport increased by 10 %, real GDP by 27 %. This means that both energy consumption and GDP have decoupled from energy-related GHG emissions excluding transport. Figure 7.3 shows that five Member States achieved emission reductions between 1990 and 2001 (Luxembourg, Germany, Sweden, the United Kingdom and France). Almost all Member States decoupled GHG emissions from energy consumption at least to a certain extent; emissions grew more rapidly than energy consumption only in Ireland and Greece.

Emission projections provided in Figure 7.2 have to be interpreted with care because the projections of Germany, the largest emitter in the EU, are missing ([26]). Based on figures for the EU-14, aggregated total greenhouse gases from energy supply and use excluding transport are projected to increase to 3 % below 1990 levels by 2010 in the 'with existing domestic measures' projections. GHG emission projections 'with additional measures' are even more limited, because data is available only for nine EU-15 Member States. Based on this data, 'with additional domestic measures' projections, GHG emissions decrease to about 11 % below 1990 levels by 2010.

([25]) This sector includes energy supply and use, except energy use for transport. This corresponds to Sector 1 'Energy', except 1.A.3 'Transport', according to UNFCCC guidelines for greenhouse gas inventories

([26]) This is because the preliminary information provided by Germany in mid-2003 contained total greenhouse gas emission projections, but no projections by sector.

Figure 7.2 **EU-15 past and projected greenhouse gas emissions from energy supply and use excluding transport, compared with energy consumption excluding transport, and the share of the sector in total GHG emissions**



Note: GHG projections for the EU-15 are calculated on the basis of projections reported by 14 Member States. The percentage change 2002–10 of the EU-14 is applied to the EU-15. Sectoral emission projections are missing for Germany.

Sources: EEA, 2004; European Commission, 2003c; Eurostat.

The largest reductions, with existing domestic measures, are projected for Luxembourg and the United Kingdom (31 % and 15 %). Austria, Belgium, Denmark, Finland, France, Greece, Ireland, the Netherlands, Portugal and Spain project increasing emissions, some of them even with additional domestic measures (Figure 7.3).

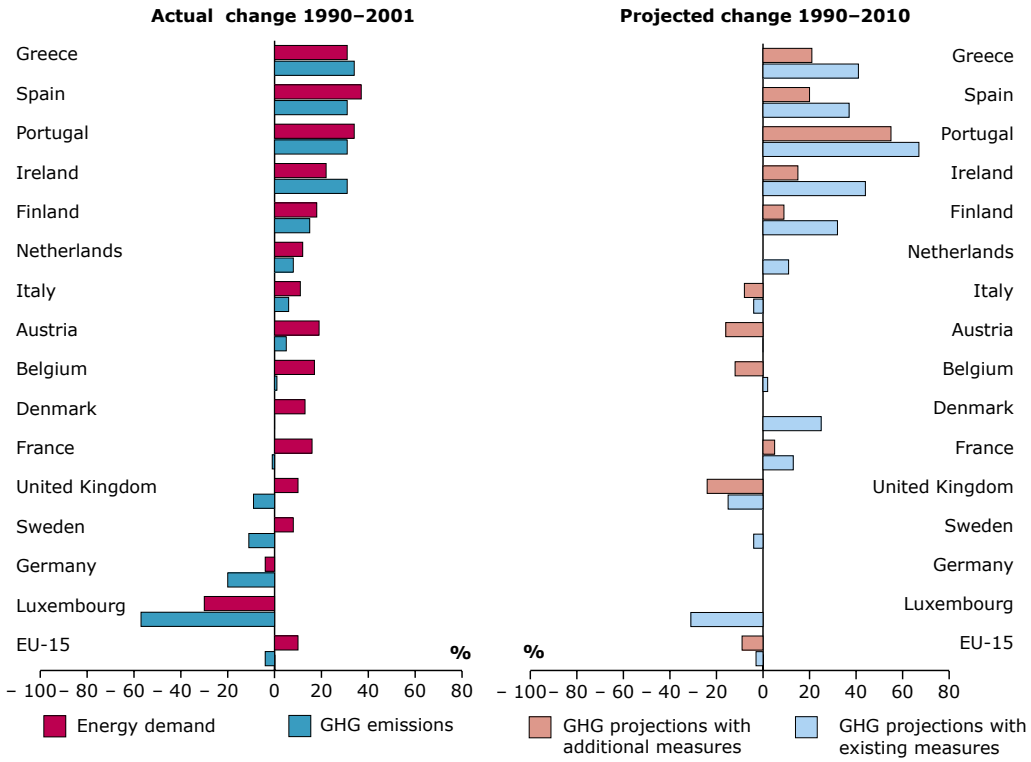
Figure 7.4 provides a breakdown of projected greenhouse gas savings in the energy sector by 2010. Savings from policies and measures acting on energy industries are the most significant, accounting for 66 % of savings from existing measures in the energy sector excluding transport and 38 % from additional measures, with countries such as Germany, Italy and Spain continuing to move to cleaner fuels. Policies and measures applied to the end-use sectors of manufacturing industries and to commercial, residential and agricultural energy use also make significant contributions to savings in the energy sector. This possibly reflects the fact that in the EU as a whole there are many zero or low-cost options for improvements in energy efficiency that can make industry and commerce more competitive. These are stimulated by economic instruments and voluntary agreements.

Comparing this year's results with last year's findings under the monitoring mechanism reveals that:

- reported emission savings in the energy industry sector have increased significantly for both existing and additional policies and measures;
- savings in the 'other energy' sector have increased by around 20 million tonnes each for existing and additional policies and measures;
- there has been a slight increase in reported savings from the manufacturing industry sector.

All Member States, except Belgium, Denmark and Luxembourg, have provided information on key policies and measures, including quantification of their emission savings. For the energy supply and use sector excluding transport, Member States' key policies and measures are in the

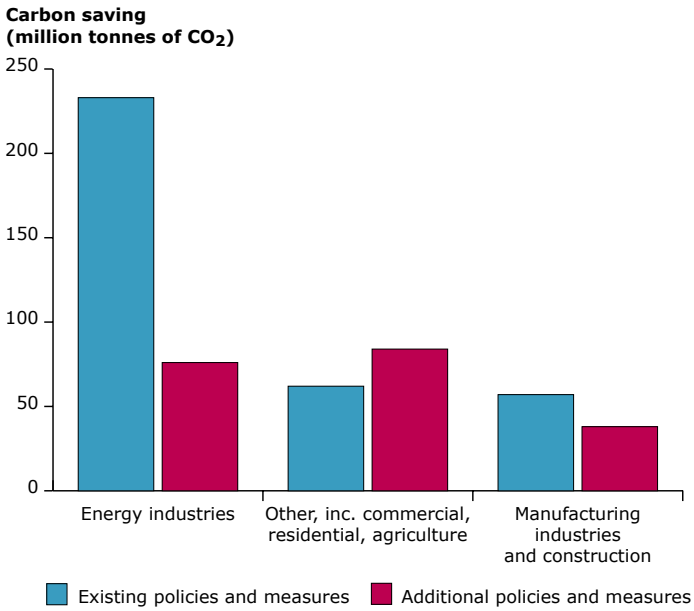
Figure 7.3 **Actual and projected change in EU-15 GHG emissions from energy supply and use excluding transport, compared with energy consumption excluding transport**



Note: GHG projections for the EU-15 are calculated on the basis of projections reported by 14 Member States. The percentage change 2002–10 of the EU-14 is applied to the EU-15. Sectoral emission projections are missing for Germany.

Sources: EEA, 2004; Eurostat; information submitted under the EC GHG monitoring mechanism and in third national communications.

Figure 7.4 **EU-15 projected greenhouse gas emission savings in energy supply and use excluding transport**



Note: Member States did not provide quantification for all reported policies and measures.

Sources: Information submitted under the EC GHG monitoring mechanism and in third national communications.

following areas: renewable energy, CHP, building standards and energy-efficient appliances (Figure 7.5).

Key policies and measures in the energy industries sector

Savings from existing renewable energy policies and measures play the major role, amounting to about 83 million tonnes of CO_2-equivalent. For additional measures as well, the largest savings are projected to come from renewable energy. Savings from existing measures on building standards and CHP are each estimated to amount to almost 81 million tonnes of CO_2-equivalent. More information on policies related to renewable energy and CHP is provided in the next section.

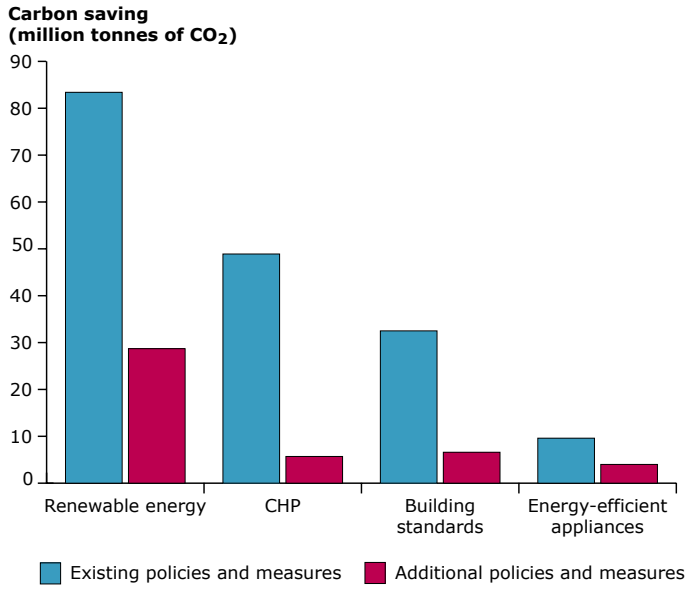
Key policies and measures on energy use in manufacturing industries

The reduction in CO_2 emissions from manufacturing industries in the past was due to an improvement in energy intensity (ratio of energy use to value added) in industry of about 1 % per year over the past decade (EEA, 2002a). This was due to structural changes in favour of higher value-added products, changes in some industries to less energy-intensive processes, improvements in the energy efficiency of processes and import substitution. Only part of these developments was due to specific policies and measures aimed at reducing greenhouse gas emissions. The improvement in energy intensity is projected to continue or be enhanced, with the help of existing and additional policies and measures. The promotion of CHP in industry is also expected to reduce energy intensity.

Key existing policies and measures for other energy use, including households

The decoupling of CO_2 emissions from the number of dwellings in the past decade (see Section 7.2.3) was mainly due to efficiency improvements through thermal insulation of buildings, fuel switch and increases in solar thermal energy production and biomass district heating. Member States project that these efficiency improvements

Figure 7.5 EU-15 projected greenhouse gas emission savings from key policies in energy supply and use



Note: Member States did not provide quantification for all reported policies and measures.

Sources: Information submitted under the EC GHG monitoring mechanism and in third national communications.

will continue, helped by policies and measures. A key policy is the EU directive on the energy performance of buildings, which includes minimum standards for new buildings and for existing buildings when they are renovated, and the requirement for all buildings to have energy performance certificates. Other key policies are the EU appliances labelling scheme and schemes for energy efficiency standards. Some Member States already have similar policies and measures in place.

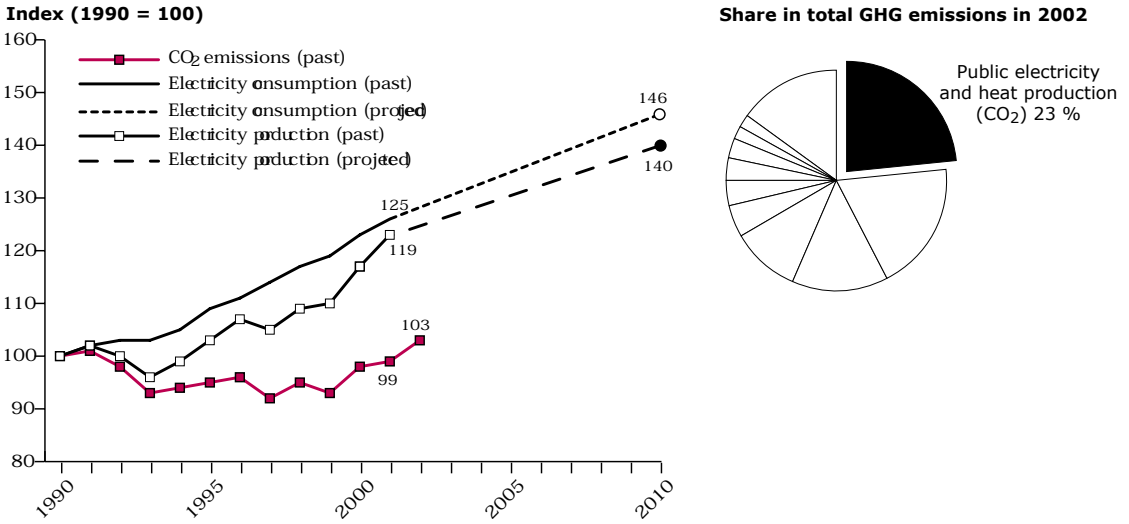
7.2.1 Energy supply by electricity and heat production

Public electricity and heat production is the largest source of CO_2 emissions, accounting for 23 % of the EU-15 total. Between 1990 and 2002, CO_2 emissions from electricity and heat production increased by 3 % in the EU-15. The main driving force of this source is electricity production and consumption.

In the EU-15, final electricity consumption increased by 26 % between 1990 and 2001 (Figure 7.6) and is projected to further increase to 46 % above the 1990 level by 2010 in the Primes baseline projections (European Commission, 2003c). Electricity production in public thermal power plants increased by 23 % between 1990 and 2001 and is projected to further increase to 40 % above the 1990 level by 2010 according to the Primes baseline scenario. Carbon dioxide emissions from electricity and heat production decoupled considerably from electricity consumption and production. 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, and efficiency improvements. In recent years, no further decoupling took place. In 2002, CO_2 emissions from electricity and heat production grew by 4 % compared with 2001, which was mainly due to an increase in thermal power production (in some Member States, such as Spain and Italy, due to lower hydro power production) and an increase in solid fuels for thermal power production (e.g. Germany).

In several Member States, CO_2 emissions from electricity and heat production declined during the past decade, whilst electricity consumption increased in all Member States by more than 10 %

Figure 7.6 EU-15 CO_2 emissions from public electricity and heat production compared with electricity consumption and electricity production in thermal power plants (past and projected) and share of CO_2 emissions in total GHG emissions



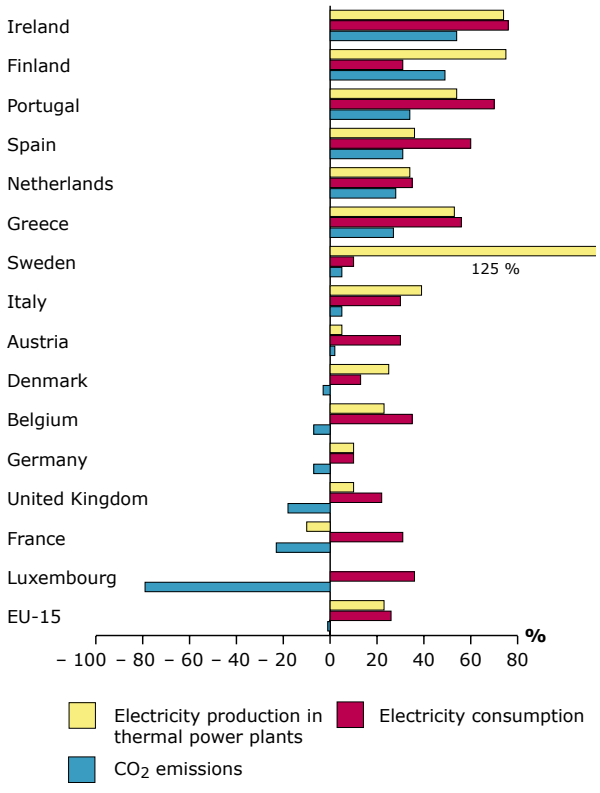
Sources: EEA, 2004; European Commission, 2003c; Eurostat.

(Figure 7.7). Only Germany and Sweden managed to limit growth in electricity consumption to 10 %. Thermal power production increased in all Member States except France. A decoupling of electricity production in thermal power plants and CO_2 emissions occurred in all Member States. In Germany and the United Kingdom, accounting for about 40 % of EU-15 emissions, emission decreases were mainly due to improved efficiency in Germany's coal-fired power plants and the fuel switch from coal to gas in power production in the United Kingdom. The remarkable decoupling between thermal power production and CO_2 emissions in Sweden was mainly due to a shift towards biomass (see also Figure 7.9).

Figure 7.8 shows that CO_2 emissions decoupled slightly from fuel combustion in public electricity and heat production. This is due to a shift from solid fuels to gaseous fuels. The share of solid fuels in total fuel combustion decreased from 71 % in 1990 to 57 % in 2002, whereas the share of gaseous fuels increased from 10 % to 27 %. Figure 7.9 shows that all Member States emissions decoupled to a certain extent from fuel combustion.

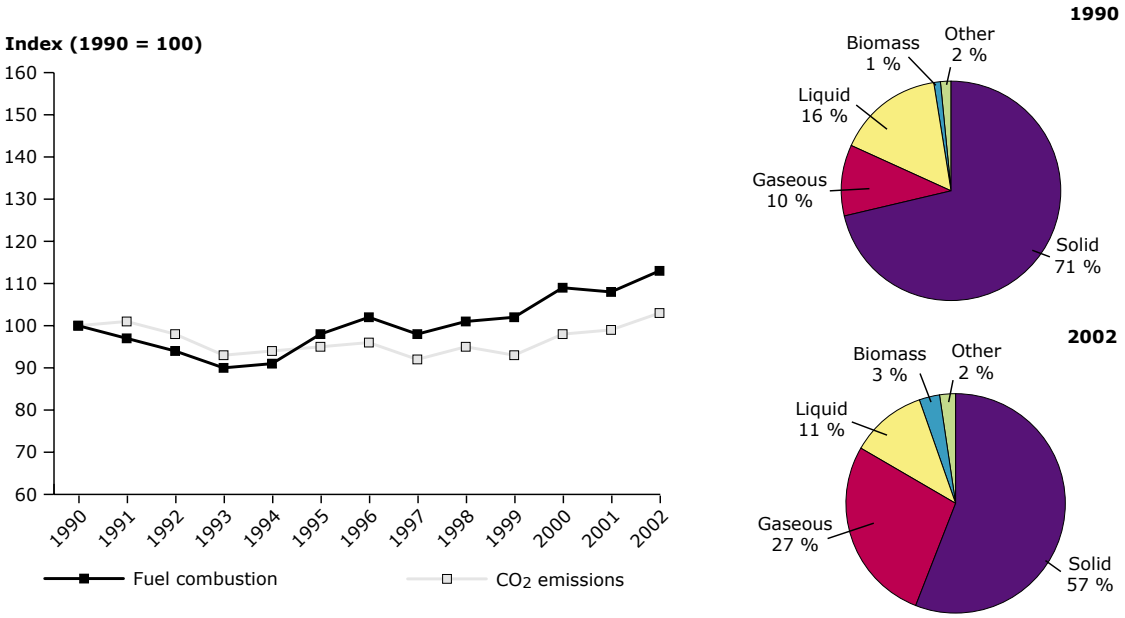
Table 7.1 includes CO_2 emissions of the largest combustion installations in the EU-15 according to the European pollutant emission register (EPER). It shows that the 10 largest CO_2 emitters are responsible for about 18 % of the total CO_2 emissions of all combustion installations as reported under the EPER. A total of 666 combustion installations have reported CO_2 data for 2001.

Figure 7.7 EU-15 CO_2 emissions from public electricity and heat production compared with electricity consumption and electricity production in thermal power plants (change 1990–2001)



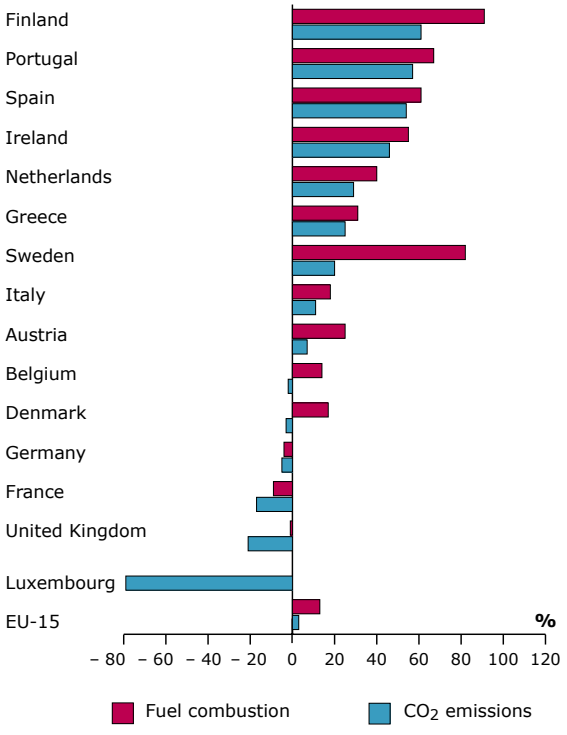
Sources: EEA, 2004; Eurostat.

Figure 7.8 **EU-15 CO_2 emissions from public electricity and heat production compared with fuel combustion and share of fuel use in electricity and heat production 1990 and 2002**



Source: EEA, 2004.

Figure 7.9 **EU-15 CO_2 emissions from public electricity and heat production compared with fuel combustion (change 1990–2002)**



Source: EEA, 2004.

Table 7.1 CO_2 emissions of the 10 largest combustion installations in 2001

Facility	Country	Million tonnes	Share in total sector
VEAG Kraftwerk Jänschwalde	Germany	25.00	2.6 %
RWE Rheinbraun Aktiengesellschaft Weisweiler	Germany	22.60	2.4 %
RWE Rheinbraun AG	Germany	20.20	2.1 %
RWE Energie AG Kraftwerk Frimmersdorf	Germany	20.10	2.1 %
AES Drax Power Ltd	United Kingdom	16.40	1.7 %
RWE Energie AG Kraftwerk Neurath	Germany	16.20	1.7 %
Centrale Termoelettrica Federico II (BR SUD)	Italy	15.30	1.6 %
PPC SA, SES AG, Dimitriou	Greece	13.90	1.4 %
VEAG Kraftwerk Schwarze Pumpe GmbH	Germany	12.90	1.3 %
E.ON Kraftwerk Scholven	Germany	11.80	1.2 %
Total top 10		**174.40**	**18.2 %**
Total sector		**960.65**	

Note: In the EPER, combustion installations are included if they have a capacity of more than 50 MW. The emissions of a facility are reported under its main activity and include energy and process-related emissions.

Source: *European pollutant emission register.*

Renewable energy developments compared with targets for 2010

The share of renewable energy (wind energy, solar energy, biomass and hydropower) in the EU's electricity consumption grew only slightly from 13.4 % to 13.6 % between 1990 and 2002 (Figure 7.10). This was achieved through an average annual growth in output of 2.3 % per year over the 1990–2002 period. In 2002, Austria and Sweden were by far the largest users of renewables for their national electricity production, with shares of about 66 % and 47 %, respectively, due to hydropower production.

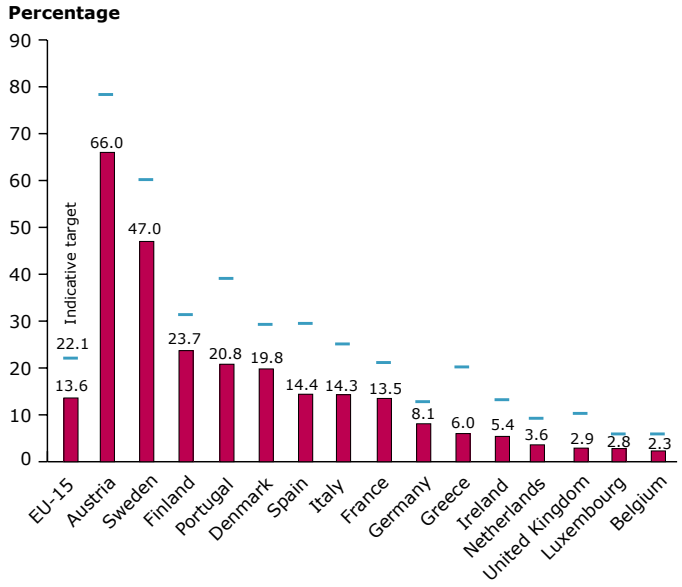
In 2002, the EU-15 experienced a significant drop in the share of electricity produced from renewables, as the share in 2001 was 15.2 % compared with 13.6 % in 2002. This decrease is due to a reduction in generation from large hydro, excluding pumped storage, which declined from 11.3 % in 2001 to 9.0 % in 2002. The share of electricity generation from all other renewable energy sources increased, but this improvement was still eclipsed by the decrease in the percentage contribution from large hydro generation.

Between 2001 and 2002, the share of renewables in gross electricity production increased most in Denmark, Luxembourg, Germany and Ireland. In absolute terms, electricity production by renewables grew most in the United Kingdom, Denmark and Germany, by between 1 and 9 TWh.

Renewable electricity was dominated by large hydropower, which had a 66 % share of output in 2002, followed by biomass/waste (13 %) and wind power (10 %). Large hydro is an established technology, but its capacity is not expected to increase substantially because of concerns about its impact on the environment through the loss of land and the resultant destruction of natural habitats and ecosystems.

For 2010, the EU has proposed indicative targets for Member States and agreed to an overall indicative target of 22.1 % for the EU

Figure 7.10 Targets for 2010 and share of electricity consumption met by renewable energy sources in 2002



Note: The data for Germany is provisional. National indicative targets shown 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. Concerning waste, only electricity generated from biodegradable industrial and municipal waste is considered renewable under the directive. However, the figures shown above also include electricity from non-biodegradable waste, since separate data are not available. They therefore overestimate the share of renewable electricity in gross electricity consumption by an amount equivalent to the electricity produced from non-biodegradable waste.

Source: Eurostat.

for the contribution of renewable energy sources to gross electricity consumption ([27]) (Figure 7.11).

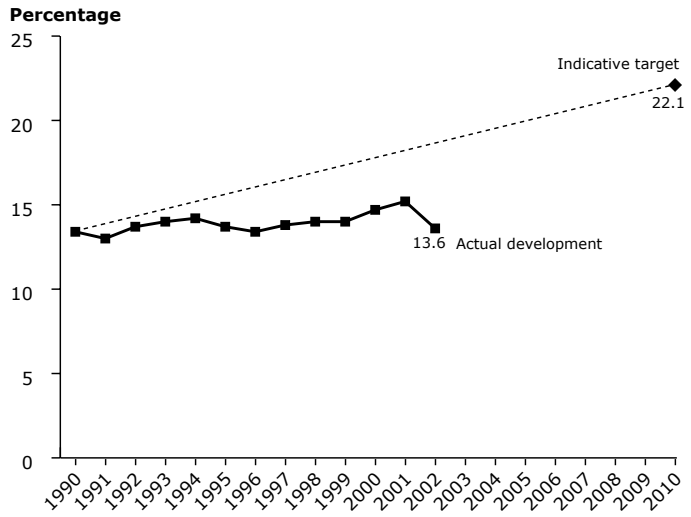
Growth in renewable electricity is expected to come from increases in wind energy, solar power, biomass and small hydro (EEA, 2002a). The target for 2010, therefore, is very ambitious because the current growth rate of wind, solar, bio and small hydro has to significantly increase between 2003 and 2010, assuming the share of large hydropower plants remains stable. Apart from hydropower, wind energy is playing a leading role in renewable energy sources. Overall, the current growth rate of renewable electricity generation will need to triple to attain the EU target.

Member States have implemented a number of policies and measures (EEA, 2002a) that are expected to lead to further increases in the share of renewables. For example, the rapid expansion of wind power (increasing by a factor of 46 in the EU during the period 1990–2002) was driven by Denmark, Germany and Spain, and was the result of support measures including 'feed-in' arrangements that guarantee a fixed favourable price for renewable electricity producers. Similarly, the rapid expansion of solar (photovoltaic) electricity was driven by Germany and Spain, mainly as a result of a combination of 'feed-in' arrangements and high subsidies.

Biomass/waste resources have also expanded rapidly (an increase of almost 200 % between 1990 and 2002) and have the added benefit that they can be used in high-efficiency combined heat and power plants. The largest absolute increases in the amount of electricity produced from biomass and waste during 1990–2002 were seen in Finland, Germany and the United Kingdom. The largest share of biomass is wood/waste

([27]) Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market, September 2001.

Figure 7.11 EU-15 trend in electricity consumption met by renewable energy sources and indicative target for 2010



Source: Eurostat.

(covering wood waste, straw and some other solid waste), besides biogas and industrial and municipal waste. In Austria, Finland and Sweden, countries with extensive forested areas, wood/waste accounts for over 90 % of biomass and waste production. In absolute values, the amount of electricity produced from wood/waste was highest in Finland, followed by Sweden. Both countries provided considerable research and development support and subsidies to the biomass power industry. In Sweden, the introduction of CO_2 and energy taxes from which biomass is exempted also helped the expansion of biomass power plants (EEA, 2003b).

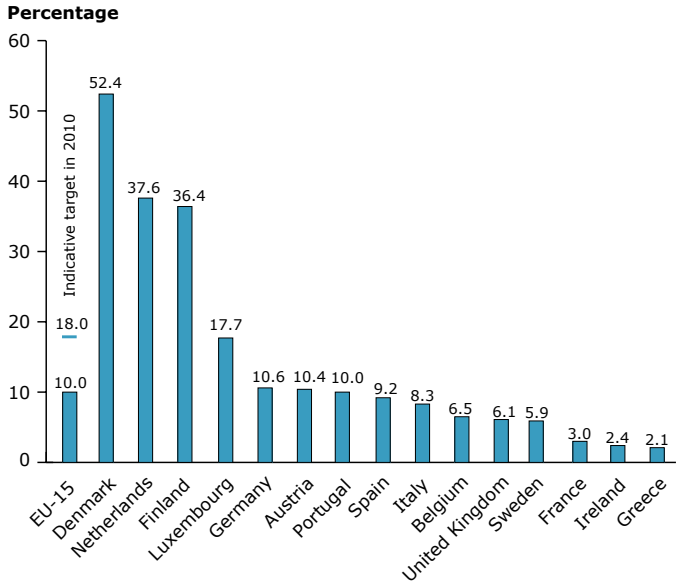
Combined heat and power developments compared with targets for 2010

Combined heat and power technology uses fossil fuels, biomass or waste to supply end-users with heat as well as electricity. In so doing, it avoids much of the waste heat losses associated with normal electricity production: CHP utilises over 85 % of the energy in the fuel rather than the average of about 35 to 45 % in current condensing power plants producing only electricity. CHP schemes are particularly effective for large, dense heat loads for long periods of the year, such as those provided by collective housing schemes in relatively cold climates (EEA, 2003b).

In the EU-15, CHP increased its share in electricity production to about 10 % in 2000 (Figure 7.12).

Growth was highest in Member States with programmes and targets providing incentives for that technology, such as Denmark, Finland, Italy, the Netherlands and Spain. High market penetration of CHP electricity in Denmark was achieved as a result of strong government policy support, providing tax incentives and subsidies. Government support was also an important factor in Austria and the Netherlands. In Finland, the introduction of liberalised energy markets stimulated investment in CHP. In recent years, however, many Member States have had problems with intensification of CHP use, in particular Germany, the Netherlands and the United Kingdom. In Germany, CHP capacity fell by 16 % between 1998 and 2000 due mainly to a decrease in electricity prices that resulted from the liberalisation of the electricity market in 1998 and an increase in gas prices on international energy markets. In 2000, Germany implemented a CHP-support

Figure 7.12 Target for 2010 for the EU-15 and share of gross electricity production from combined heat and power plants in 2000



Note: The data include combined heat and power production from public electricity and heat producers as well as from autoproducers (at specific industrial sites). Eurostat has adopted a new methodology to calculate the share of CHP in gross electricity production designed to better identify electricity production from combined heat and power. This revision has resulted in different (lower) figures for some countries. The 18 % indicative target for 2010 was set by the European Commission in 1997 on the basis of a previous methodology and may therefore not be directly comparable with the new methodology. The proposed directive on CHP (2002) is adopted but does not replace this indicative target, which is still valid.

Source: Eurostat.

law (KWK-Vorschaltgesetz) to improve the economic position of public CHP plants and, in 2002, a new CHP-support law to enforce the federal government's target to double CHP electricity production by 2010. This law allows CHP producers to put a surcharge on the price of power they feed into the public grid.

The EU has set an indicative target of doubling all electricity production from CHP between 1994 and 2010 (from 9 % to 18 %) (European Commission, 1997a). The current rate of increase is not sufficient to achieve the EU target of 18 % by 2010. The proposed directive on CHP (2002) is adopted but does not replace this indicative target, which is still valid.

The disappointing trends in CHP development are due to the following factors.

- Rising natural gas prices have reduced the cost competitiveness of CHP; gas is the preferred fuel for new 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.

In addition, aggressive pricing, due to large over-capacities in Europe, has been used by electricity utilities to protect their markets.

7.2.2 Energy use in manufacturing industries

Carbon dioxide emissions from fossil fuel combustion in manufacturing industries accounted for 14 % of total EU-15 greenhouse gas emissions in 2002. Between 1990 and 2002, CO_2 emissions from manufacturing industries declined by 11 %. Emission reductions had already been achieved in 1993, mainly due to efficiency improvements and structural

change in Germany after reunification and the relatively small economic growth in the EU-15 (Figure 7.13). Compared with 2001, emissions declined by 2 % in 2002 mainly from iron and steel production in Italy and the United Kingdom.

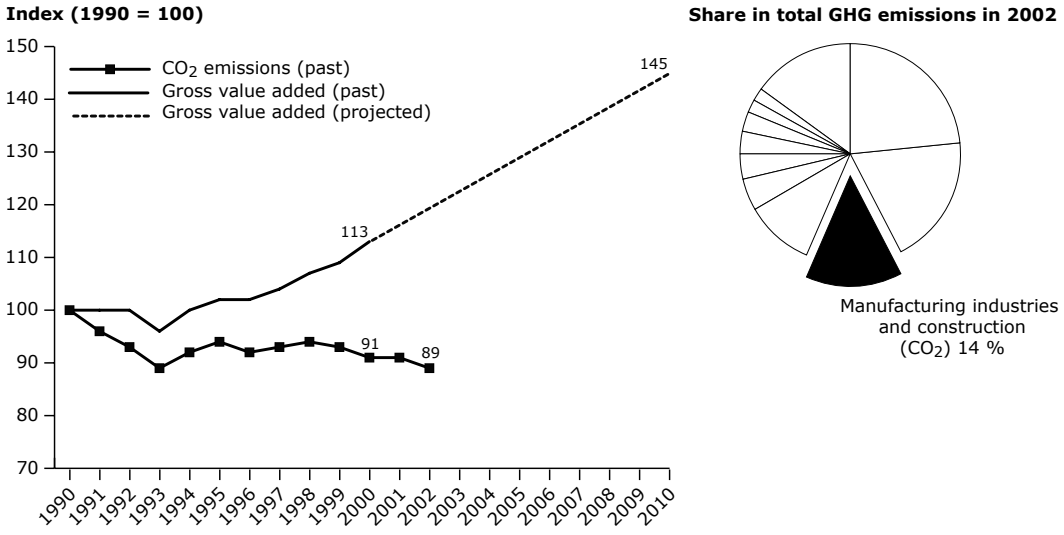
Between 1990 and 2000, industrial output — the main driving force for emissions from the industry sector — increased by 13 % in terms of gross value added and is projected to increase further to 45 % above the 1990 level by 2010 ([28]). Therefore, for the EU-15 as a whole, CO_2 emissions from manufacturing industries decoupled from gross value added.

Most Member States achieved decoupling of CO_2 emissions and gross value added in industry, except Spain (Figure 7.14). The decrease of Luxembourg's CO_2 emissions was mainly due to a sharp decline in coke consumption after the conversion of the steel industry to electric arc furnaces.

Figure 7.15 shows that CO_2 emissions decoupled slightly from fuel combustion in manufacturing industries and construction. This is due to a shift from solid fuels to gaseous fuels. The share of solid fuels in total fuel consumption decreased from 30 % in 1990 to 18 % in 2002, whereas the share of gaseous fuels increased from 34 % to 48 %. Figure 7.16 shows that all Member States except the Netherlands decoupled emissions to a certain extent from fuel combustion.

As several Member States did not provide a breakdown of CO_2 emissions related to fossil fuel combustion within manufacturing industries in their inventory submissions, Eurostat data are used in the following figures. In 2002, iron and steel production accounts for about 30 % of total CO_2 emissions from fossil fuel combustion in manufacturing industries, followed by the non-metallic minerals industry (17 %) and the chemical industry (15 %). Between 1990 and 2002, CO_2 emissions from fossil fuels decreased in all of the largest industrial branches except pulp and paper production. The chemical industry shows the largest emission decreases and the largest degree of decoupling.

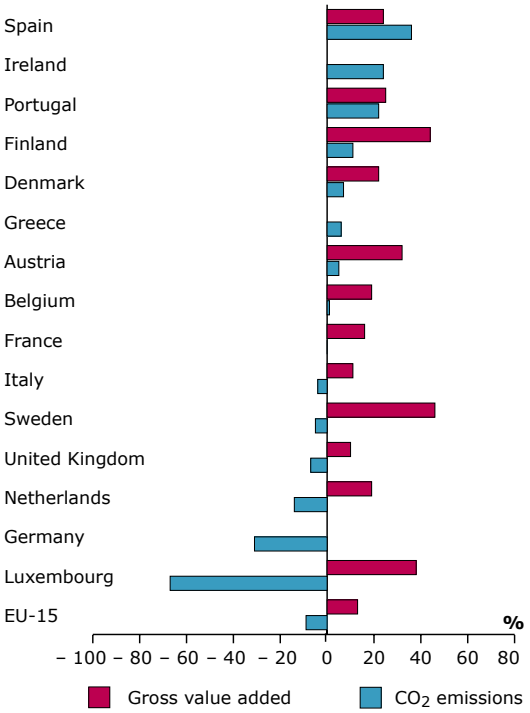
Figure 7.13 EU-15 CO_2 emissions from manufacturing industries and construction 1990–2002 compared with value added (past and projected) and share in total GHG emissions



Sources: EEA, 2004; European Commission, 2003c; Eurostat.

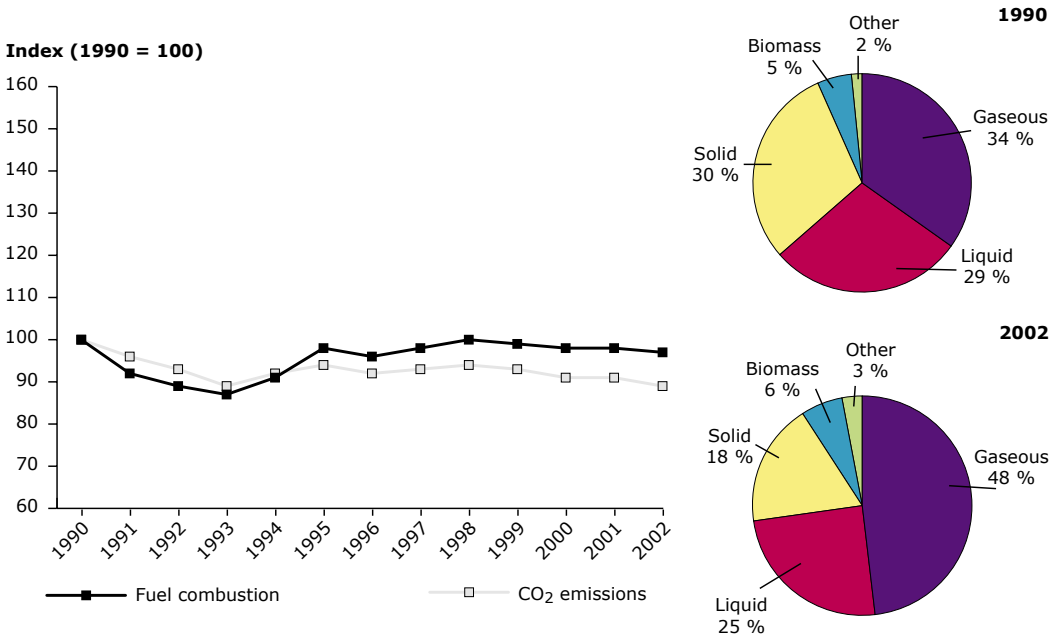
([28]) Information on gross value added and on physical ouput in this section is taken from Eurostat as compiled for the Eurostat energy-efficiency indicators. The compilation of these indicators has stopped recently; therefore some of these data are available up to 1999/2000 only. Sometimes, the data do not include all EU-15 Member States or are based on estimates. Therefore, the information may deviate from the information on projections which is taken from European Commission (2003c).

Figure 7.14 EU-15 Member States' CO_2 emissions from manufacturing industries and construction compared with gross value added (change 1990–2000)



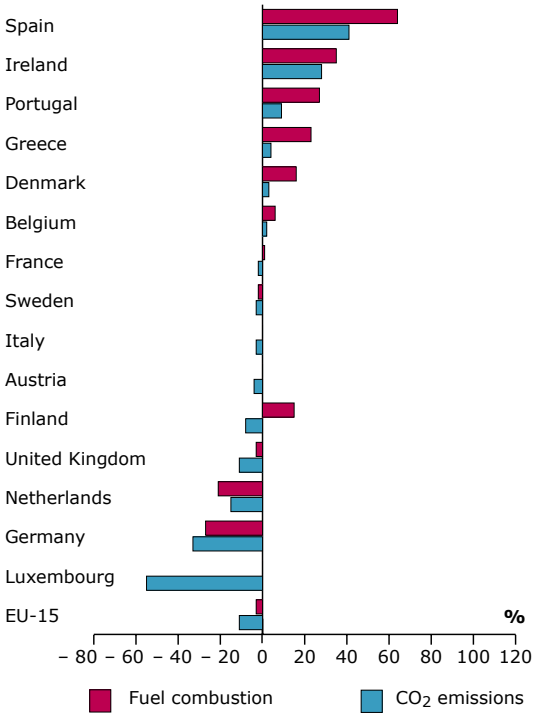
Source: EEA, 2004.

Figure 7.15 EU-15 CO_2 emissions from manufacturing industries and construction compared with fuel combustion and share of fuel use in manufacturing industries and construction 1990 and 2002



Source: EEA, 2004.

Figure 7.16 EU-15 CO_2 emissions from manufacturing industries and construction compared with fuel consumption (change 1990–2002)



Source: EEA, 2004.

Iron and steel production

Iron and steel production accounts for about 30 % of total CO_2 emissions from fossil fuel combustion in manufacturing industries. In 2002, emissions were 12 % below 1990 levels (Figure 7.17). Emissions decoupled from steel production, but less so from gross value added. Steel production is projected to be 11 % above 1990 levels in 2010 in the Primes baseline scenario (European Commission, 2003c), gross value added is projected to be 9 % below.

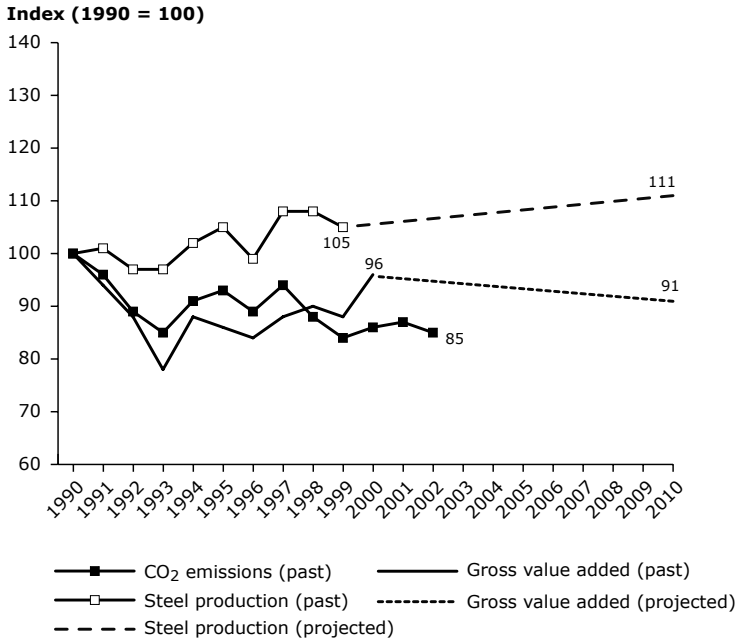
Table 7.2 includes CO_2 emissions of the largest metal-producing facilities in the EU-15 according to the European pollutant emission register (EPER). It shows that the 10 largest CO_2 emitters are responsible for over 51 % of total CO_2 emissions in metal production as reported under the EPER. A total of 104 metal-producing facilities have reported CO_2 data for 2001.

Non-metallic minerals production

The non-metallic minerals industry includes mainly cement, glass, lime and ceramics production and accounts for about 17 % of total CO_2 emissions from fossil fuel combustion in manufacturing industries. In 2002, emissions were 15 % below 1990 levels (Figure 7.18). Emissions decoupled from cement production and from gross value added. Cement production and gross value added are projected to be 11 % and 23 % respectively above 1990 levels in 2010 in the Primes baseline scenario (European Commission, 2003c).

Table 7.3 includes CO_2 emissions of the largest facilities producing non-metallic minerals in the EU-15 according to the European pollutant emission register (EPER). It shows that the 10 largest CO_2 emitters are responsible for about 14 % of total CO_2 emissions in non-metallic mineral production as reported under the EPER. A total of 279 facilities producing non-metallic minerals have reported CO_2 data for 2001.

Figure 7.17 EU-15 CO_2 emissions from iron and steel production (change 1990–2002) compared with steel production and gross value added



Sources: Eurostat; European Commission, 2003c.

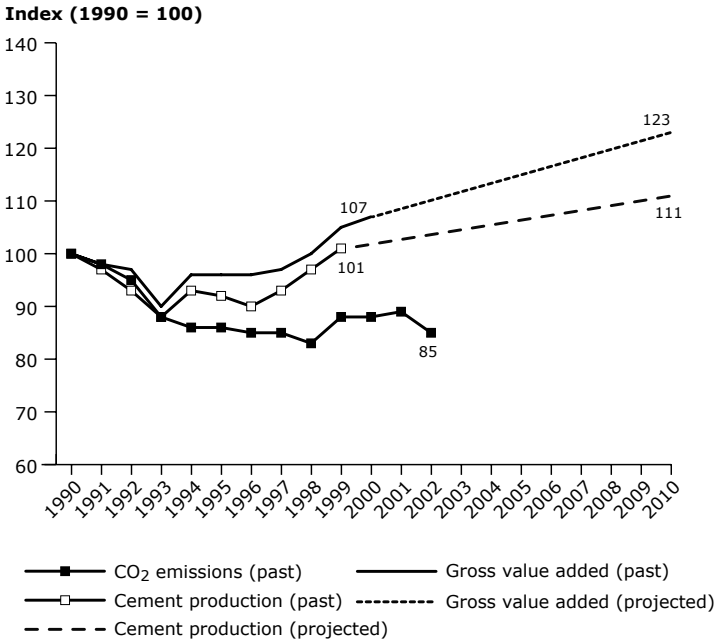
Table 7.2 CO_2 emissions of the 10 largest facilities in metal production in 2001

Facility	Country	Million tonnes	Share in total sector
Ilva SpA Stabilimento di Taranto	Italy	8.08	7.3 %
Corus UK Ltd	United Kingdom	6.78	6.1 %
voestalpine Stahl GmbH	Austria	6.72	6.1 %
Thyssen Krupp Stahl AG	Germany	5.78	5.2 %
Corus UK Ltd, Teesside works, Redcar, Cleveland	United Kingdom	5.69	5.2 %
Corus Staal BV	Netherlands	5.60	5.1 %
Thyssen Krupp Stahl AG Werk Schwelgern	Germany	5.41	4.9 %
Rautaruukki Oyj, Rautaruukki Steel, Terästehdas, Raahe	Finland	4.64	4.2 %
Aceralia Gijón	Spain	4.34	3.9 %
Salzgitter AG Werk Salzgitter	Germany	3.95	3.6 %
Total top 10		**56.99**	**51.6 %**
Total sector		**110.36**	

Note: In the EPER, metal production includes metal industry and metal ore roasting or sintering installations, and installations for the production of ferrous and non-ferrous metals with certain minimum production capacity limits. The emissions of a facility are reported under its main activity and include energy and process-related emissions.

Source: *European pollutant emission register.*

Figure 7.18 EU-15 CO_2 emissions from non-metallic minerals production (change 1990–2002) compared with cement production and gross value added



Sources: Eurostat; European Commission, 2003c.

Table 7.3 CO_2 emissions of the 10 largest facilities in non-metal minerals production in 2001

Facility	Country	Million tonnes	Share in total sector
Herakles GCCO, Volos	Greece	2.80	2.0 %
Aalborg Portland	Denmark	2.57	1.8 %
Rheinkalk GmbH & Co. KG	Germany	2.20	1.5 %
Cementos Portland	Spain	1.99	1.4 %
Titan Cement SA	Greece	1.99	1.4 %
Centro de Produção de Alhandra	Portugal	1.86	1.3 %
Centro de Produção de Souselas	Portugal	1.79	1.3 %
CCB SA	Belgium	1.68	1.2 %
Herakles GCCO, Chalkis Plant	Greece	1.61	1.1 %
Fabrica de Castillejo	Spain	1.58	1.1 %
Total top 10		**20.07**	**14.1 %**
Total sector		**142.01**	

Note: In the EPER, non-metallic mineral production includes production of cement clinker (capacity > 500 t/day), lime (capacity > 50 t/day), glass (capacity > 20 t/day), mineral substances (capacity > 20 t/day) or ceramic products (capacity > 75 t/day). The emissions of a facility are reported under its main activity and include energy and process-related emissions.

Source: *European pollutant emission register.*

Chemical industry

The chemical industry accounts for about 15 % of total CO_2 emissions from fossil fuel combustion in manufacturing industries. In 2002, emissions were 25 % below 1990 levels (Figure 7.19). Gross value added increased by 30 % in the 1990s and is projected to be 60 % above 1990 levels in 2010 in the Primes baseline scenario (European Commission, 2003c). The chemical industry shows the largest decoupling of the industries mentioned in this chapter.

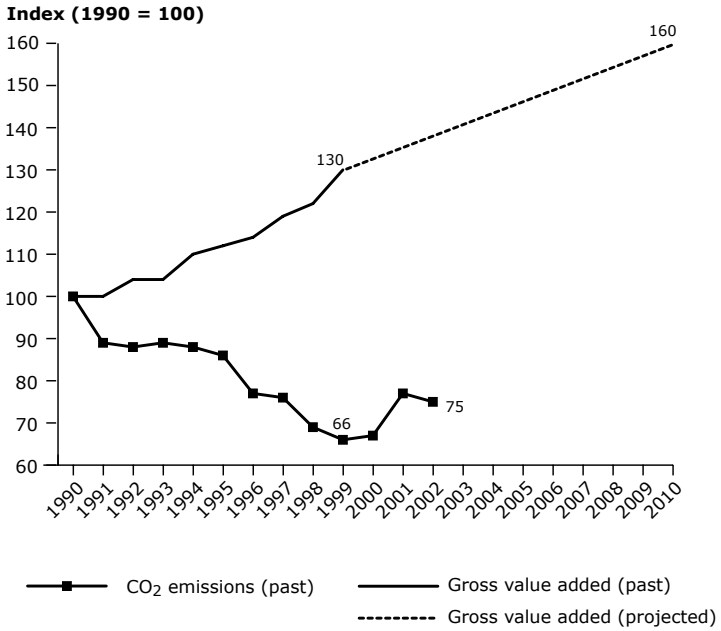
The chemical industry is a very heterogeneous branch consisting of, for example, the production of agrochemicals, petrochemicals, inorganic chemicals and pharmaceuticals. The most energy-intensive processes are the production of ammonia, which is the raw material for most fertilisers. Structural changes 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.

Table 7.4 includes CO_2 emissions of the largest chemicals producing facilities in the EU-15 according to the European pollutant emission register (EPER). It shows that the 10 largest CO_2 emitters are responsible for about 36.5 % of total CO_2 emissions in the chemical industry as reported under the EPER. A total of 152 chemical-producing facilities have reported CO_2 data for 2001.

Pulp and paper production

The pulp and paper industry accounts for about 6 % of total CO_2 emissions from fossil fuel combustion in manufacturing industries. In 2002, emissions were 3 % above 1990 levels (Figure 7.20). Emissions

Figure 7.19 EU-15 CO_2 emissions from the chemicals industry (change 1990–2002) compared with gross value added



Sources: Eurostat; European Commission, 2003c.

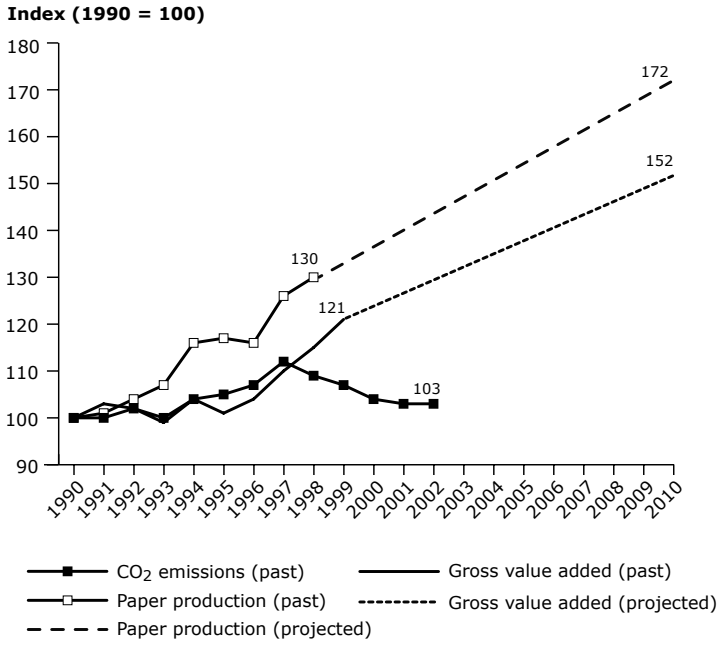
Table 7.4 CO_2 emissions of the 10 largest facilities in the chemical industry in 2001

Facility	Country	Million tonnes	Share in total sector
Unilever España SA — División Lever Fabergé	Spain	8.49	9.8 %
BASF AG	Germany	4.49	5.2 %
BP Köln GmbH	Germany	2.99	3.5 %
BASF Antwerpen nv	Belgium	2.70	3.1 %
Infracor GmbH	Germany	2.69	3.1 %
Hydro Agri Sluiskil BV	Netherlands	2.34	2.7 %
Simorep & Cie — SCS Michelin	France	2.33	2.7 %
BP Chembel NV	Belgium	1.85	2.1 %
Dow Benelux NV	Netherlands	1.81	2.1 %
Fa. Infra Serv Knapsack, Werk Knapsack und Hürth	Germany	1.74	2.0 %
Total top 10		**31.43**	**36.5 %**
Total sector		**86.20**	

Note: In the EPER, chemical industry includes basic organic chemicals, basic inorganic chemicals or fertilisers, biocides and explosives, and pharmaceutical products. The emissions of a facility are reported under its main activity and include energy and process-related emissions.

Source: *European pollutant emission register*.

Figure 7.20 EU-15 CO_2 emissions from pulp and paper production (change 1990–2002) compared with paper production and gross value added



Sources: Eurostat; European Commission, 2003c.

decoupled slightly from paper production and from gross value added since 1998 only. Paper production and gross value added are projected to be 72 % and 52 % respectively above 1990 levels in 2010 in the Primes baseline scenario (European Commission, 2003c).

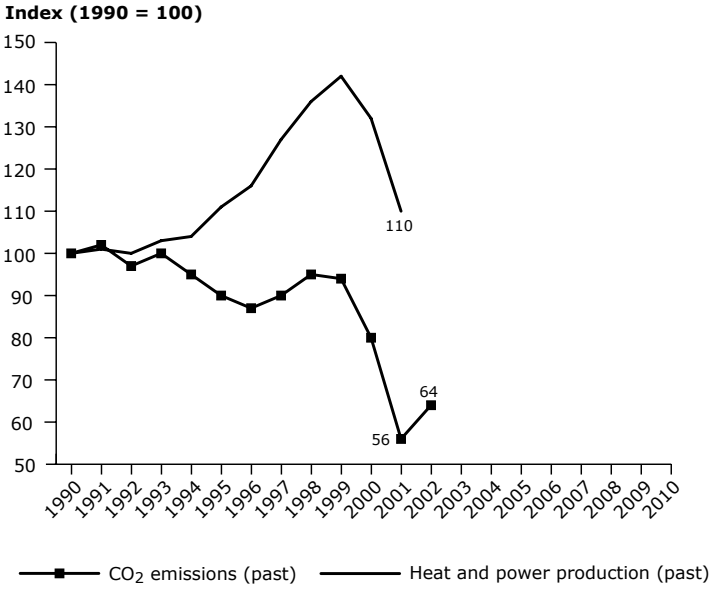
Table 7.5 includes CO_2 emissions of the largest pulp and paper producing facilities in the EU-15 according to the European pollutant emission register (EPER). It shows that the 10 largest CO_2 emitters are responsible for about 34 % of total CO_2 emissions in pulp and paper production as reported under the EPER. A total of 83 facilities for producing pulp and paper have reported CO_2 data for 2001.

Finally, Figure 7.21 shows that CO_2 emissions from fossil fuel consumption in autoproducer thermal power plants were 36 % below the 1990 level in 2002. After sharp declines in 2000 and 2001, emissions increased again in 2002. Overall output (power and heat production) was 10 % above 1990 levels in 2001. Therefore, CO_2 emissions decoupled from heat and power production.

Table 7.5 CO_2 emissions of the 10 largest facilities in pulp and paper production in 2001

Facility	Country	Million tonnes	Share in total sector
M-Real Sverige AB, Husums fabrik	Sweden	1.73	8.7 %
SCA Hygiene Products GmbH	Germany	0.96	4.8 %
Burgo Ardennes SA	Belgium	0.87	4.3 %
SCA Graphic Sundsvall AB, Östrands massafabrik	Sweden	0.81	4.1 %
Smurfit Munksjö Aspa Bruk AB	Sweden	0.46	2.3 %
Saica El Burgo (Fabricas Saica-2 y Saica-3)	Spain	0.46	2.3 %
Zanders Feinpapiere AG	Germany	0.42	2.1 %
Stora Enso	France	0.38	1.9 %
Sappi Austria Produktions-GmbH & Co. KG	Austria	0.37	1.9 %
Stablimento di Duino	Italy	0.36	1.8 %
Total top 10		**6.81**	**34.1 %**
Total sector		**19.97**	

Figure 7.21 EU-15 CO_2 emissions from autoproducers (change 1990–2002) compared with heat and power production



Source: Eurostat.

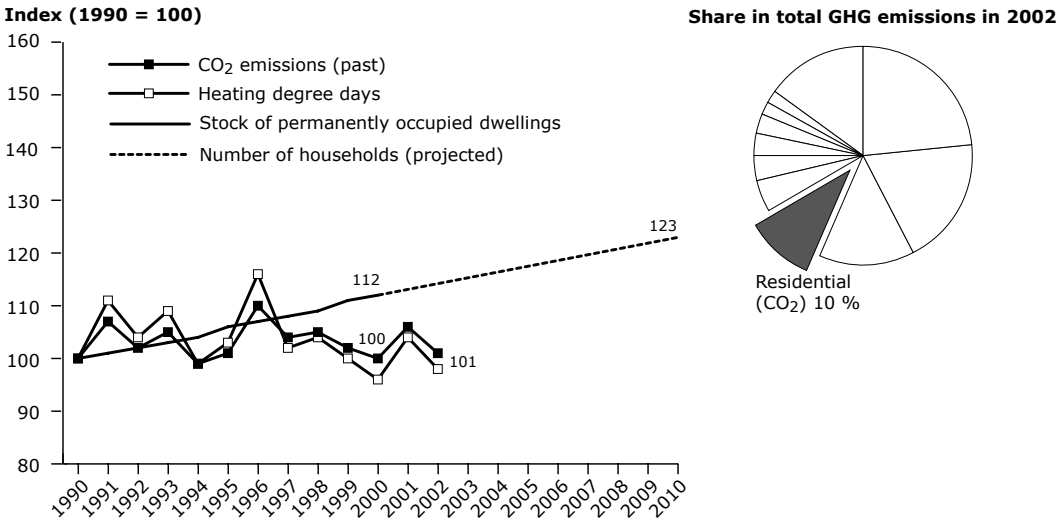
7.2.3 Energy use in households

Carbon dioxide emissions from fossil fuel use in households accounted for 10 % of total EU-15 greenhouse gas emissions in 2002. Between 1990 and 2002, CO_2 emissions from households fluctuated mainly in line with outdoor temperatures in the winter season. After the decline in 2002, because of warmer weather in most EU-15 Member States, emissions were almost at the 1990 level (Figure 7.22).

For households, CO_2 emissions are mainly influenced by the number and size of dwellings, building codes, the age distribution of the existing building stock, the fuel split for heating and warm water, and outdoor temperatures. For the EU, the number of dwellings increased by 12 % between 1990 and 2000 (no data for 2002) while CO_2 emissions from households remained more or less stable, with small fluctuations linked with outdoor temperatures (Figure 7.22). This decoupling may be an indication of energy efficiency improvements and fuel shifts of space heating. However, it should be noted that the high performance of some countries (e.g. the Nordic countries) is also influenced by a shift from household heating boilers to district heating plants (Figure 7.23). That shift in heating facilities reduces CO_2 emissions from households but slightly increases emissions from energy industries.

Figure 7.24 shows that CO_2 emissions decoupled slightly from fuel combustion in households. This is due to a shift from solid fuels to gaseous fuels. The share of solid fuels in total fuel consumption decreased from 11 % in 1990 to 2 % in 2002, whereas the share of gaseous fuels increased from 42 % to 55 %. Figure 7.25 shows that most Member States decoupled emissions to a certain extent from fuel combustion; exceptions are France, Greece, Portugal and Spain. A main reason for absolute reductions in fuel use in Denmark, Finland and Sweden is the increase of district heating. In Germany, efficiency improvements through thermal insulation of buildings and fuel switch in particular in eastern German households, solar thermal energy production and biomass district heating were largely responsible for CO_2 reductions from households.

Figure 7.22 EU-15 CO_2 emissions from households, compared with the number of permanently occupied dwellings and heating degree days and share of households in total GHG emissions

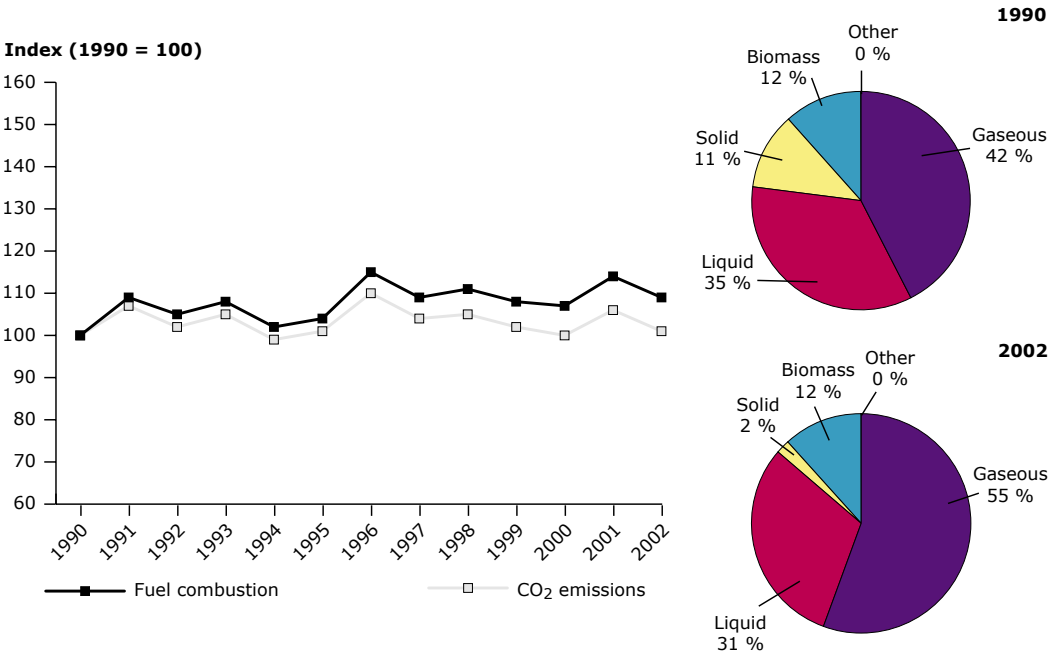


Sources: EEA, 2004; European Commission, 2003c; Eurostat.

Figure 7.23 EU-15 Member States' CO_2 emissions from households and number of dwellings (change 1990–2000)

Sources: EEA, 2004; Eurostat.

Figure 7.24 EU-15 CO_2 emissions from households compared with fuel combustion and share of fuel use in households 1990 and 2002



Source: EEA, 2004.

Figure 7.25 EU-15 CO_2 emissions from households compared with fuel consumption (change 1990–2002)

Source: EEA, 2004.

7.2.4 *Energy use in services*

Carbon dioxide emissions from fossil fuel use in services accounted for 4 % of total EU-15 greenhouse gas emissions in 2002. Between 1990 and 2002, CO_2 emissions from services fluctuated mainly in accordance with outdoor temperatures in the winter season. After the decline in 2002, due to warmer weather in most EU-15 Member States, emissions were slightly below 1990 levels (Figure 7.26). As in households, a fuel switch also took place in services: whereas the share of solid fuels in total fuel consumption decreased from 12 % in 1990 to 1 % in 2002 and the share of liquid fuels declined from 43 % to 32 %, the share of gaseous fuels increased from 43 % to 63 %. Emissions have decoupled from gross value added in services, which increased by about 30 % between 1990 and 2000, and are projected to increase further by 2010 to about 70 % above the 1990 level.

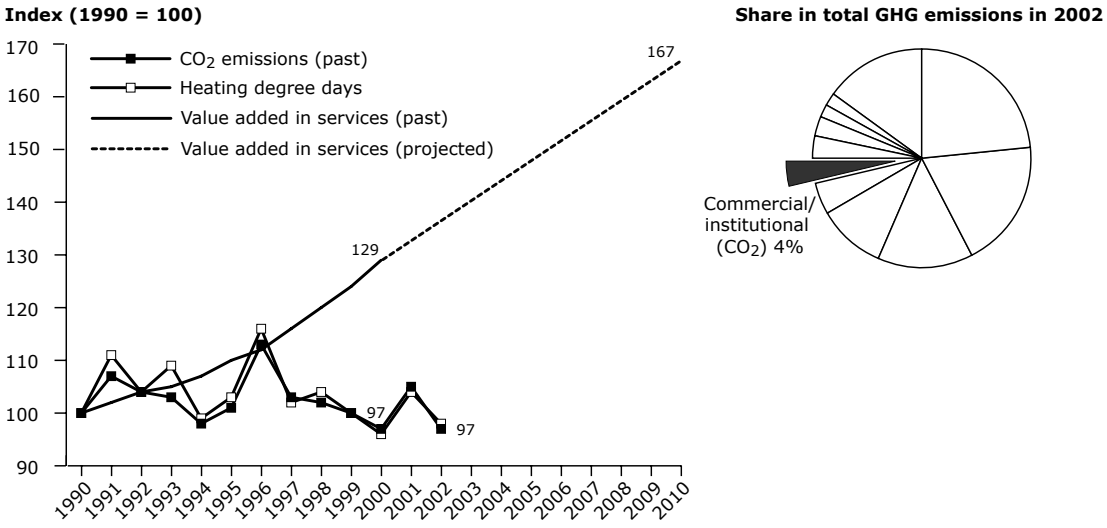
Denmark, Germany, Sweden and the United Kingdom decreased their emissions; all other Member States increased emissions from services (Figure 7.27). The reasons for the decreases might be similar to those mentioned above for households. However, the emission trends need to be interpreted with care, because Member States have difficulties in allocating emissions to this source because of weaknesses in the statistical basis.

7.2.5 *Energy supply by petroleum refining*

Petroleum refining accounts for 3 % of the EU-15 total greenhouse gas emissions and is a smaller part of the energy supply sector compared with electricity and heat production. This source includes all combustion activity supporting the refining of petroleum products; it does not include evaporative emissions.

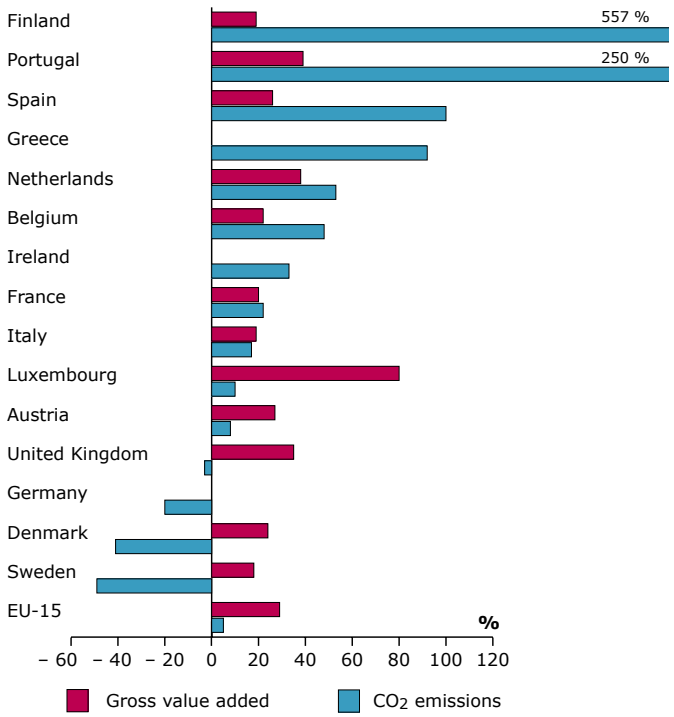
Between 1990 and 2002, CO_2 emissions from petroleum refining increased by 17 % in the EU-15 (Figure 7.28). After a sharp decline in 1991, emissions increased in almost every year up to 2002. In almost all Member States, CO_2 emissions from petroleum refining increased during the past decade, only the United Kingdom showed a decrease (Figure 7.29). Ireland, Greece and Italy had increases of more than 60 %. Italy has the largest crude oil refining capacity in the EU-15 and accounts for about 60 % of absolute emission increases between 1990 and 2002.

Figure 7.26 EU-15 CO_2 emissions from services, compared with gross value added and heating degree days and share of services in total GHG emissions



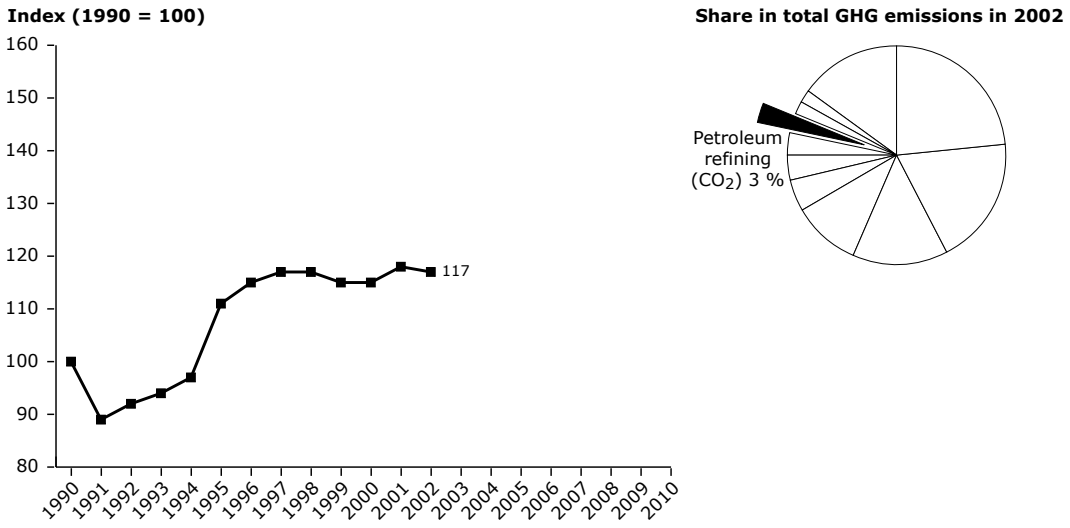
Sources: EEA, 2004; European Commission, 2003c; Eurostat.

Figure 7.27 EU-15 Member States' CO_2 emissions from services and gross value added (change 1990–2000)



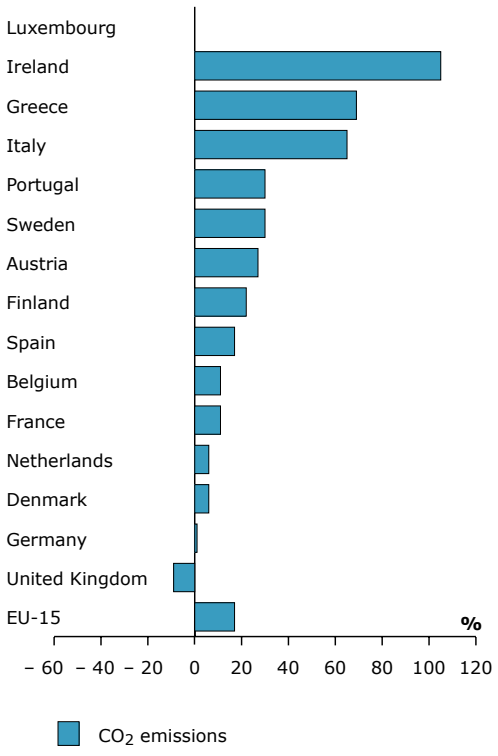
Sources: EEA, 2004; Eurostat.

Figure 7.28 EU-15 CO_2 emissions from petroleum refining and share in total GHG emissions in 2002



Source: EEA, 2004.

Figure 7.29 EU-15 Member States' CO_2 emissions from petroleum refining (change 1990–2002)



Source: EEA, 2004.

Table 7.6 includes CO_2 emissions of the largest mineral oil and gas refineries in the EU-15 according to the European pollutant emission register (EPER). It shows that the 10 largest CO_2 emitters are responsible for about 29 % of total CO_2 emissions of oil and gas refining as reported under the EPER. A total of 101 oil and gas refining facilities have reported CO_2 data for 2001.

Table 7.6 CO_2 emissions of the 10 largest facilities in mineral oil and gas refining in 2001

Facility	Country	Million tonnes	Share in total sector
Shell Nederland Raffinaderij BV	Netherlands	6.30	4.9 %
Saras Raffinerie Sarde SpA	Italy	5.99	4.6 %
PCK Raffinerie GmbH Schwedt	Germany	3.64	2.8 %
Raffineria di Gela SpA	Italy	3.61	2.8 %
FINA Raffinaderij Antwerpen NV	Belgium	3.23	2.5 %
Texaco Ltd	United Kingdom	2.98	2.3 %
ESSO RSAF	France	2.87	2.2 %
Repsol Petroleo	Spain	2.85	2.2 %
Shell UK Ltd	United Kingdom	2.80	2.2 %
Esso Petroleum Co. Ltd	United Kingdom	2.74	2.1 %
Total top 10		**37.01**	**28.6 %**
Total sector		**129.23**	

Note: The emissions of a facility are reported under its main activity and include energy and process-related emissions.

Source: *European pollutant emission register.*

7.3 Transport ([29])

Transport is the second largest sector of greenhouse gas emissions, accounting for 21 % of EU-15 emissions. Total GHG emissions from transport were 22 % above 1990 levels and are projected to further increase (Figure 7.30). Compared with 2001, emissions increased by 1 % in 2002; all Member States showed increases compared with the previous year, except Germany and the United Kingdom.

Transport causes CO_2 emissions through fossil fuel combustion in road transportation, national civil aviation, railways, national navigation and other transportation ([30]), with road transport being by far the largest source within transport (93 % in 2002). In 2002, CO_2 emissions from road transport had increased by 23 % compared with 1990, due to continuous increases in road transport volume (both passenger and freight). In particular, freight transport increased substantially between 1990 and 2000 (+ 40 %) and is projected to be 84 % above 1990 level in 2010 in the Primes baseline scenario (European Commission, 2003c).

Emissions of N_2O from transport account for only 0.6 % of total EU greenhouse gas emissions but are closely linked to the fuel consumption of petrol cars equipped

([29]) This sector includes domestic transport (or Sector 1.A.3 'Transport') but excludes international transport, according to UNFCCC guidelines for greenhouse gas inventories.

([30]) Note that, in accordance with UNFCCC guidelines, these emissions do not include CO_2 emissions from international aviation and navigation, which were 242 million tonnes in 2002 or 6 % of total EU-15 greenhouse gas emissions. Total EU-15 CO_2 emissions from international aviation and navigation grew by 44 % between 1990 and 2002.

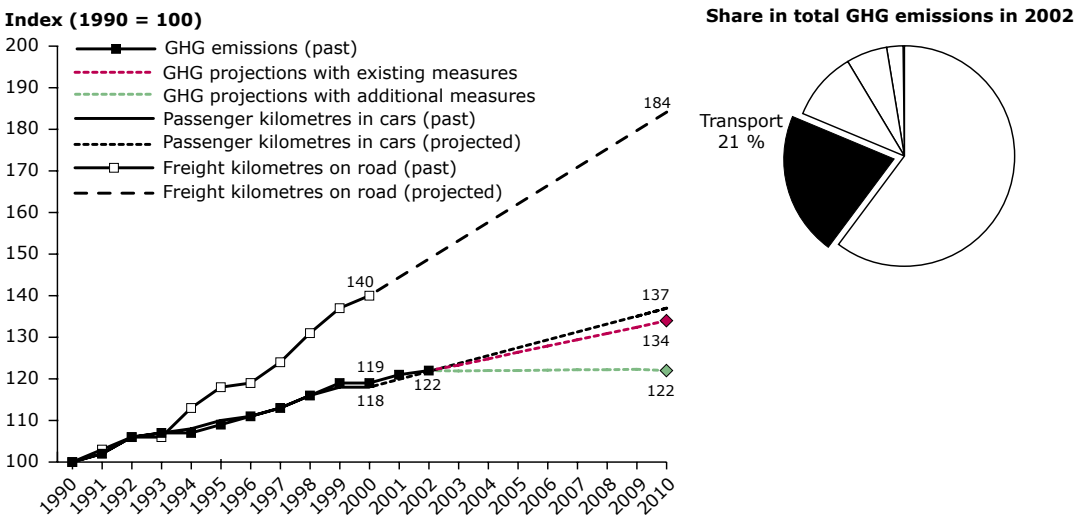
with catalysts. Nitrous oxide emissions are mostly formed during the warm-up phase. EU-15-wide N_2O emissions from transport increased sharply (119 %) between 1990 and 2002. However, more modern catalytic converters are emitting much less N_2O.

Emission projections provided in Figure 7.30 have to be interpreted with care because the sectoral projections of Germany, the largest emitter in the EU, are missing. Based on figures for the EU-14, aggregated total greenhouse gases from transport are projected to be 34 % above 1990 levels in 2010 when existing domestic measures are taken into account. Additional measures are projected to stabilise emissions at current levels. As with past transport emissions, by far the largest contribution is from road transport, although the exact contribution cannot be given due to lack of information on the shares of the various transport modes in the projections reported by Member States. Also emissions from international transport (especially aviation), which are excluded from these projections, are projected to increase substantially.

Figure 7.31 shows that, between 1990 and 2000, GHG emissions from transport increased in all Member States. Finland, Sweden and the United Kingdom limited their emission increases below 10 %. Luxembourg, Portugal and Spain registered emission increases of more than 40 %, Ireland more than doubled its GHG emissions from transport. The main reason for the large increase in Ireland is growth in road transport volumes. A second explanation is 'fuel tourism': passenger car fuels are bought in Ireland, where fuel prices are relatively low, but consumed outside Ireland (particularly in Northern Ireland). 'Fuel tourism' due to comparatively low fuel prices is also an important reason in other EU-15 Member States such as Austria and Luxembourg.

Explanations for the relatively small changes in emissions in Finland, Sweden and the United Kingdom may be high per capita GHG emissions from transport in 1990 and high and/or rapidly growing road fuel prices. For the cohesion countries (Greece, Ireland, Portugal and Spain), the opposite

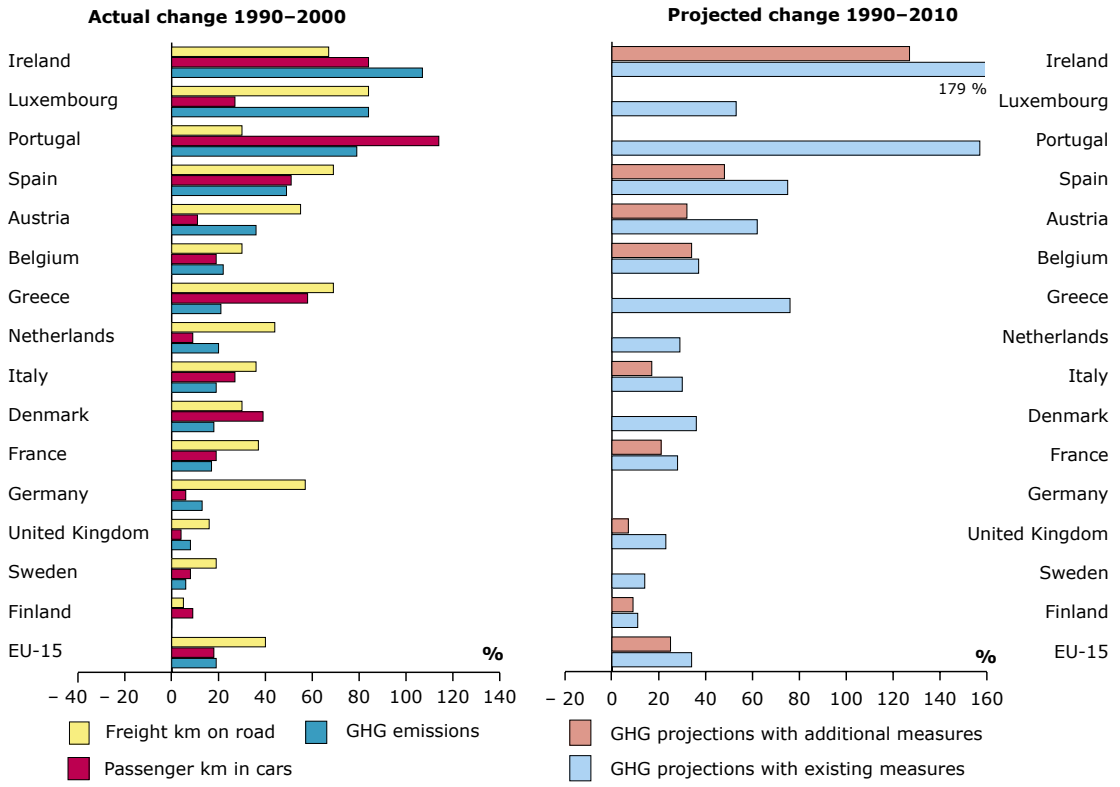
Figure 7.30 EU-15 past and projected greenhouse gas emissions from transport, passenger kilometres in cars and freight kilometres on road and share of the sector in total GHG emissions



Note: GHG projections for the EU-15 are calculated on the basis of projections reported by 14 Member States. The percentage change 2002–10 of the EU-14 is applied to the EU-15. Sectoral emission projections are missing for Germany.

Sources: EEA, 2004; European Commission, 2003c; Eurostat.

Figure 7.31 Actual and projected change in EU-15 GHG emissions from transport compared with passenger kilometres in cars and freight kilometres on road



Note: GHG projections for the EU-15 are calculated on the basis of projections reported by 14 Member States. The percentage change 2002–10 of the EU-14 is applied to the EU-15. Sectoral emission projections are missing for Germany.

Sources: EEA, 2004; Eurostat; information submitted under the EC GHG monitoring mechanism and in third national communications.

is true: low starting points in terms of per capita emissions and low road fuel prices. They have experienced strong growth in transport demand, particularly road, driven by economic growth, and have therefore also experienced large increases in GHG emissions.

In Germany, which is the largest emitter within the EU-15, GHG emissions from transport decreased for the third consecutive year. One reason for this might be the ecological tax reform in 1999 (see Section 6.4).

All reporting Member States project growing transport emissions, indicating that policies and measures are not sufficient. Ireland, Luxembourg, Portugal and Spain expect the strongest growth, with Ireland projecting that, compared with 1990, emissions will almost triple by 2010. Austria, Ireland, Italy, Spain and the United Kingdom expect that additional measures will significantly reduce the projected growth in transport emissions. For the other Member States, any additional measures are regarded as having less effect.

Key existing policies for road transport

Carbon dioxide emissions contribute substantially to the total greenhouse gas emissions from transport, and measures to reduce these emissions are therefore mportant.

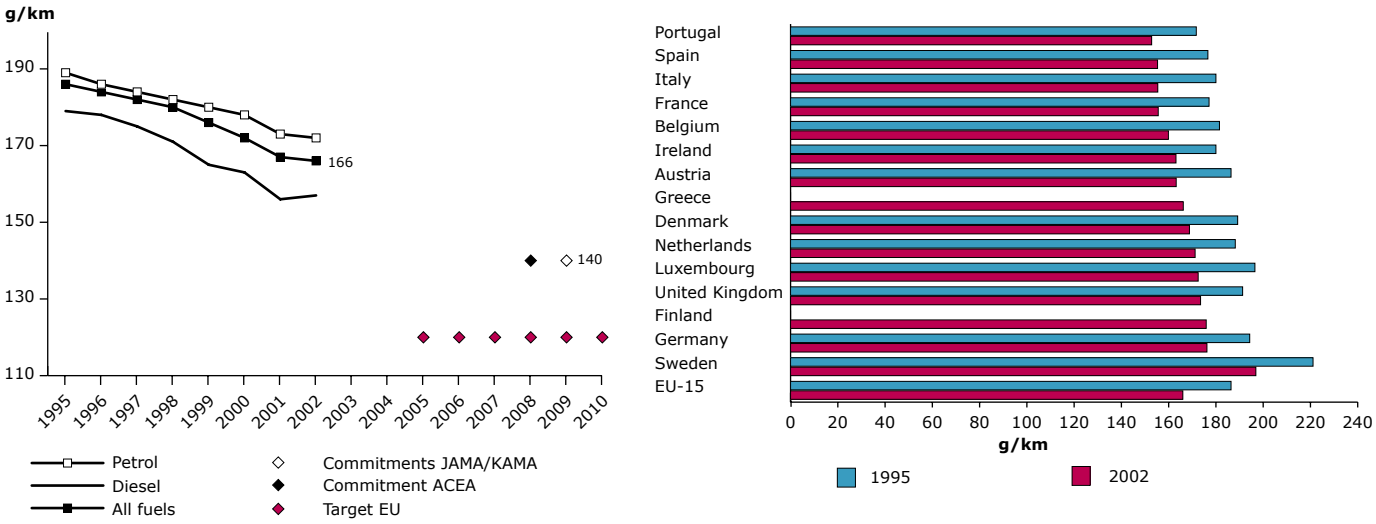
As far as passenger cars are concerned, the EU aims to reduce the average specific CO_2 emissions of new cars to 120 g CO_2/vehicle-km by 2005, and by 2010 at the latest. In order to meet these targets, voluntary agreements between the European Commission and the European, Japanese and Korean automobile

manufacturers' associations (ACEA, JAMA, KAMA ([31])) 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/vehicle-km for new passenger cars by 2008 (ACEA) and 2009 (JAMA/KAMA).

According to the fourth annual report on the effectiveness of the strategy to reduce CO_2 emissions from cars (European Commission, 2004b), all three associations reduced the average specific CO_2 emissions of their cars registered for the first time on the EU market (ACEA by about 1.2 %, JAMA by about 2.5 % and KAMA by about 1.8 %). Overall average specific CO_2 emissions from new cars were 166 g CO_2/vehicle-km in 2002. This was 0.6 % below the 2001 level and 10.8 % below 1995 levels (Figure 7.32). However, it has to be noted that the time series 1995–2002 is inconsistent because in 2002, for the first time, official EU CO_2 monitoring data are used for calculating the 2002 figures. Previous to this, the associations provided the underlying data. Thus, the 0.6 % change is very likely to underestimate the reduction in 2002 compared with 2001. In any case, in order to meet the EU's final target of 120 g CO_2/km, additional efforts are necessary. It should also be noted that the total number of passenger cars sold was 16 % above 1995 levels in 2002, thereby offsetting efficiency improvements.

One of the reasons for the specific emission reductions between 1995 and 2002 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 2002, 41 % of cars sold in the EU were diesel cars. The increased share of diesel cars raises

Figure 7.32 Average specific CO_2 emissions of new passenger cars per fuel type, and targets



Note: The time series 1995–2002 is slightly inconsistent because in 2002, for the first time, official EU CO_2 monitoring data are used for calculating the 2002 figures. Previous to this, the associations provided the underlying data. Thus, the 0.6 % change is very likely to underestimate the reduction in 2002 compared with 2001.

Source: European Commission, 2004b.

([31]) ACEA: European Automobile Manufacturers Association; JAMA: Japan Automobile Manufacturers Association; KAMA: Korea Automobile Manufacturers Association.

concerns, because this could result in higher emissions of particulates and nitrogen oxides and thus negatively affect air quality.

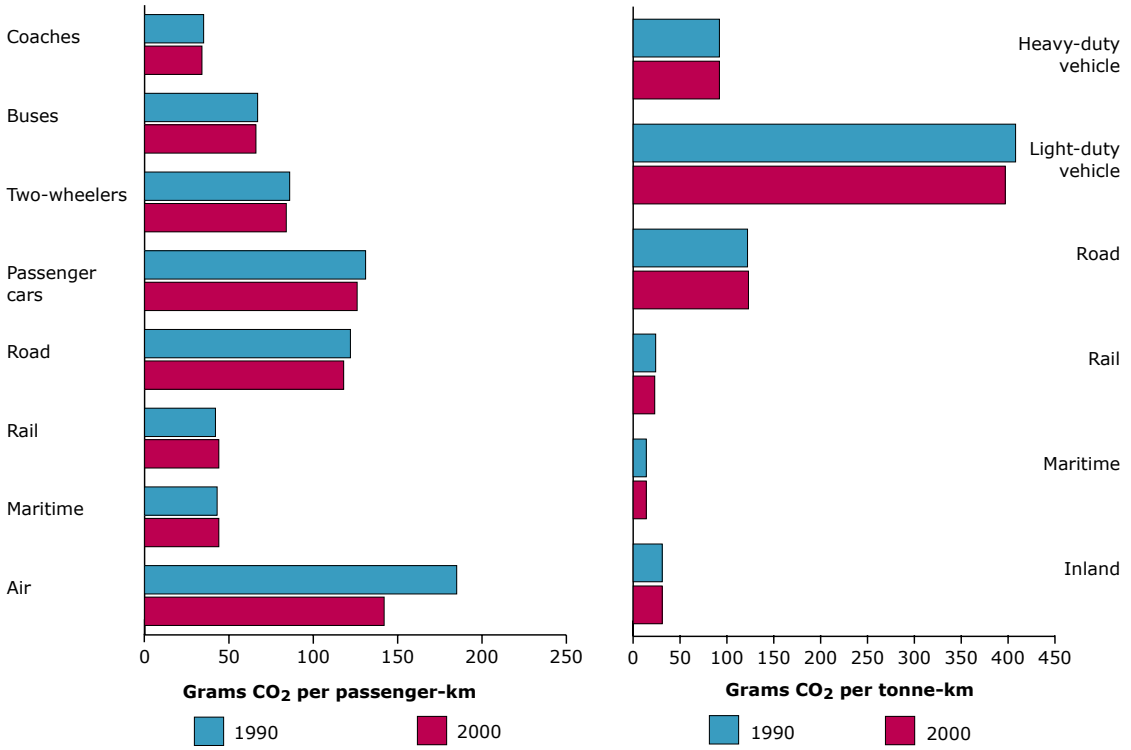
There are considerable differences in the specific fuel emissions of new cars in different Member States, ranging from 153 g CO_2/km in Portugal to 197 g CO_2/km in Sweden. For Sweden this is partly due to the very low share of new diesel cars.

The estimated emission savings from the implementation of the ACEA agreement for the EU-15 as a whole is about 35 million tonnes of CO_2-equivalent, as assessed by Member States in their with existing and additional measures scenarios (see Figure 6.2).

The car-labelling directive (1999/94/EC) came into force in 2001 and the degree of implementation by Member States is currently being reviewed by the EC. The directive complements the ACEA agreement with important information on energy efficiency for car buyers, with the aim of increasing sales of more energy-efficient cars.

Currently road freight transport and other transport modes are not included in any EU strategy to reduce CO_2 emissions. Rail remains the most energy-efficient mode and there have been no improvements in the energy efficiency of rail diesel engines. Despite improvements during the 1990s, aviation is generally the least energy-efficient mode (Figure 7.33).

Figure 7.33 Specific CO_2 emissions per passenger-km and per mode of transport (left) and specific CO_2 emissions per tonne-km and per mode of transport (right) in the EU-15 1990/2000



Source: Eurostat.

7.4 Agriculture

Agriculture is the third largest sector of greenhouse gas emissions, accounting for 10 % of EU-15 greenhouse gas emissions. Agriculture's main emission sources are N_2O from soils and manure management and CH_4 from enteric fermentation and manure management. Total GHG emissions from agriculture were 9 % below 1990 levels in 2002 and are projected to further decrease by 2010 (Figure 7.34). The main reasons for declining agricultural emissions are decreasing cattle numbers and declining fertiliser and manure use. Agricultural emissions have decoupled from gross value added in agriculture.

Emission projections provided in Figure 7.34 have to be interpreted with care because the sectoral projections of large emitters like Germany and Spain are missing. Based on figures for the EU-12, aggregated total greenhouse gas emissions for the EU-15 are projected to be 13 % below 1990 levels in 2010 with existing domestic measures. Additional measures are not projected to provide substantial emission reductions.

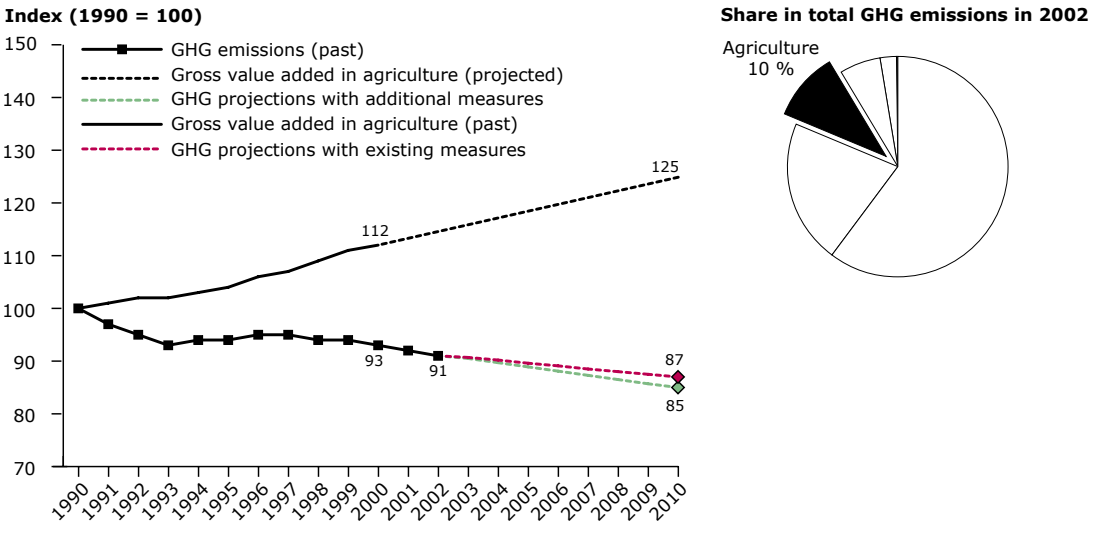
Figure 7.35 shows that between 1990 and 2000, GHG emissions from agriculture decreased in all Member States except Ireland and Spain. Gross value added increased in most Member States. For all Member States, total greenhouse gas emissions in agriculture are expected to decrease by 2010 from 1990 in both the existing measures and the additional measures projections. Belgium, Denmark, Finland and the Netherlands project significant decreases of more than 25 %. Unfortunately, Spain, with a high increase since 1990, did not report any agricultural emission projections.

Key policies and measures for agriculture

Decreases in fertiliser use and a reduction in the application of manure on land are likely to reduce N_2O emissions, while decreases in the number of cattle and increases in cattle productivity are likely to contribute to a decline in emissions of methane.

The drop in fertiliser use between 1990 and 2002 was achieved partly through the 1992 reform of the common agricultural policy (CAP), resulting in a shift from production-based support mechanisms to

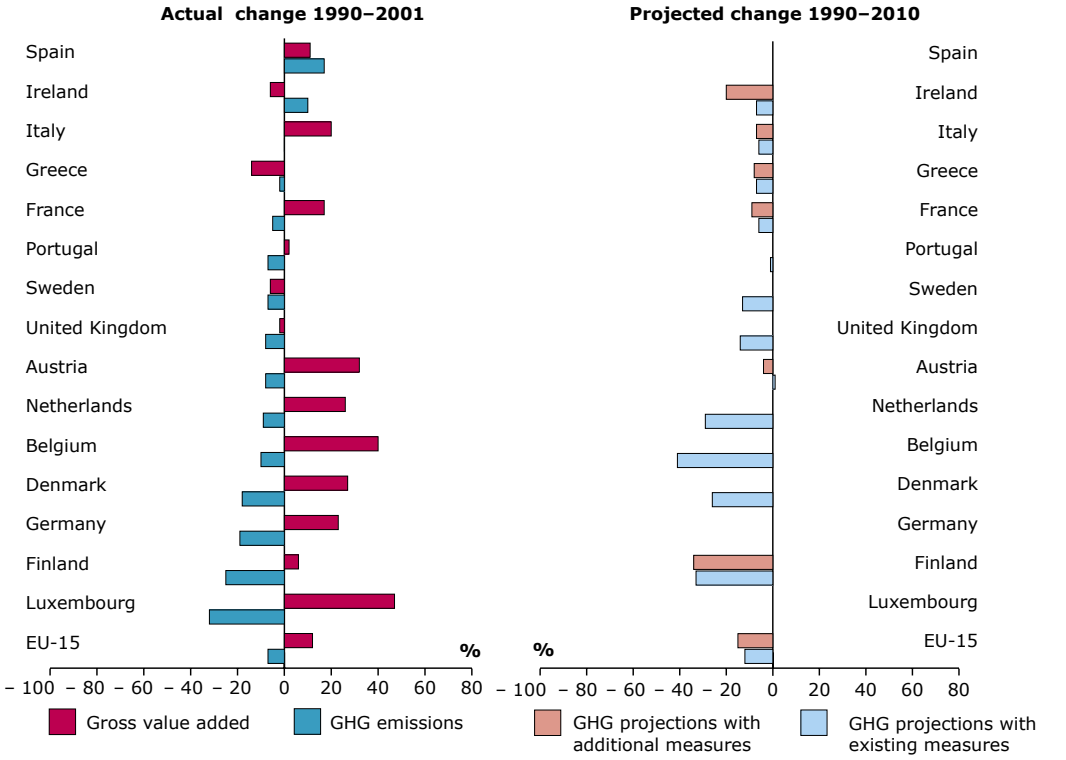
Figure 7.34 EU-15 past and projected greenhouse gas emissions from agriculture and gross value added and share of the sector in total GHG emissions



Note: GHG projections for the EU-15 are calculated on the basis of projections reported by 12 Member States. The percentage change 2002–10 of the EU-12 is applied to the EU-15. Sectoral emission projections are missing for Germany, Luxembourg and Spain.

Sources: EEA, 2004; European Commission, 2003c.

Figure 7.35 Actual and projected change in EU-15 GHG emissions from agriculture compared with gross value added



Note: GHG projections for the EU-15 are calculated on the basis of projections reported by 12 Member States. The percentage change 2002–10 of the EU-12 is applied to the EU-15. Sectoral emission projections are missing for Germany, Luxembourg and Spain.

Sources: EEA, 2004; Eurostat; information submitted under the EC GHG monitoring mechanism and in third national communications.

direct area payments in arable production. In addition, reduction in fertiliser use has also been achieved due to the implementation of EU directives such as the nitrate directive, and the agro-environment programmes supporting extensification measures. Promotion of good practice codes for the agricultural sector is a widespread measure for Member States to reduce N_2O and methane emissions.

7.4.1 Agricultural soils

Agricultural soils are the largest source of N_2O emissions in the EU-15, accounting for about 5 % of total EU greenhouse gas emissions in 2002. Emissions of N_2O from agricultural soils occur mainly from the application of mineral and organic nitrogen from fertilisers and animal manure.

Between 1990 and 2002, N_2O emissions from agricultural soils declined by 8 % in the EU. The main driving force of N_2O emissions from agricultural soils is the use of nitrogen fertiliser and manure, which was 12 % below 1990 levels in 2002 (Figure 7.36).

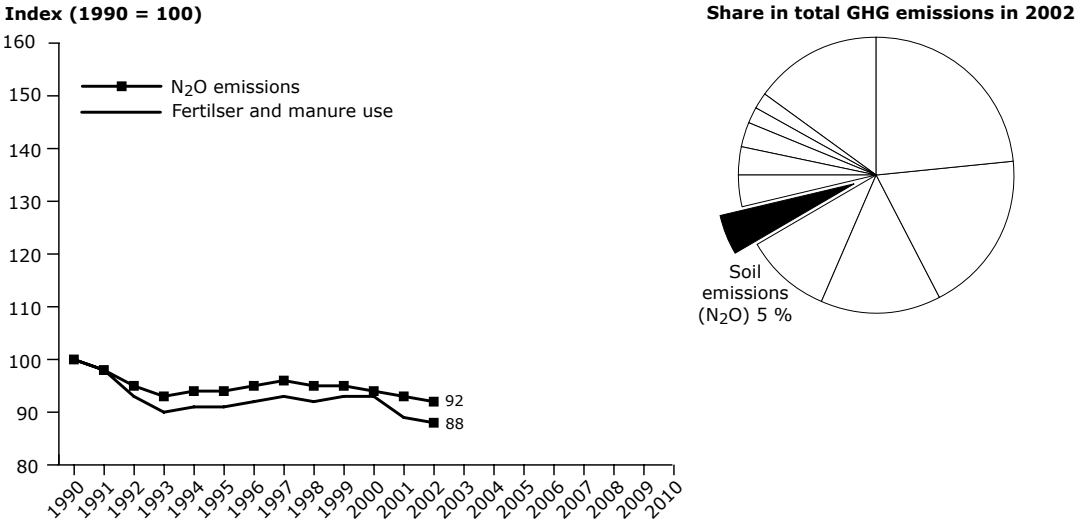
Nitrous oxide emissions from agricultural soils declined in most Member States; the largest reductions over the period 1990–2002 occurred in Denmark and Finland with reductions of more than 20 %. Ireland and Spain had small increases between 1990 and 2002. The decoupling of Dutch emissions from soils and fertiliser use is due to the phasing out of manure spreading on the land and the incorporation of manure into the soil; this is a measure to reduce ammonia emissions from manure but which has the negative side-effect of increasing N_2O emissions. The Greek emission trend is subject to an inconsistent time series, which has been removed in the latest Greek inventory (provided after the data deadline of this report).

7.4.2 *Enteric fermentation*

Enteric fermentation of animal feeds in the stomachs of cattle is the largest source of CH_4 emissions in the EU-15, accounting for 3 % of total greenhouse gas emissions in 2002. Between 1990 and 2002, CH_4 emissions from enteric fermentation declined by 9 % in the EU. The main driving force of CH_4 emissions from enteric fermentation is the number of cattle (Figure 7.38), which fell as a result of CAP reform.

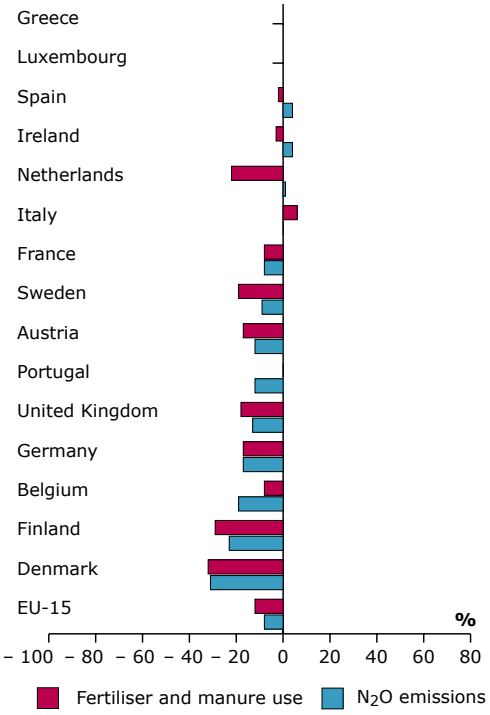
All Member States, except Greece, Ireland and Spain, reduced emissions from enteric fermentation. Emission decreases were largest for Germany and the Netherlands, with reductions of more than 20 % (Figure 7.39).

Figure 7.36 EU-15 N_2O emissions from agricultural soils, compared with nitrogen fertiliser and manure use, and share of the source in total EU-15 GHG emissions



Source: EEA, 2004.

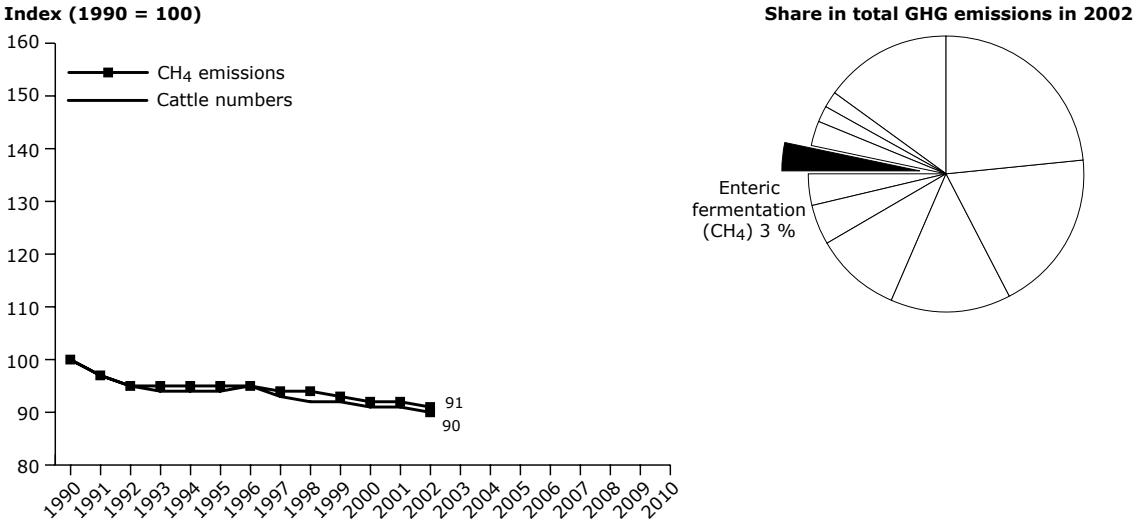
Figure 7.37 EU-15 Member States' N_2O emissions from agricultural soils and fertiliser and manure use (change 1990–2002)



Note: Information from Greece and Luxembourg has been excluded from this figure because no consistent time series were available before the data deadline of this report.

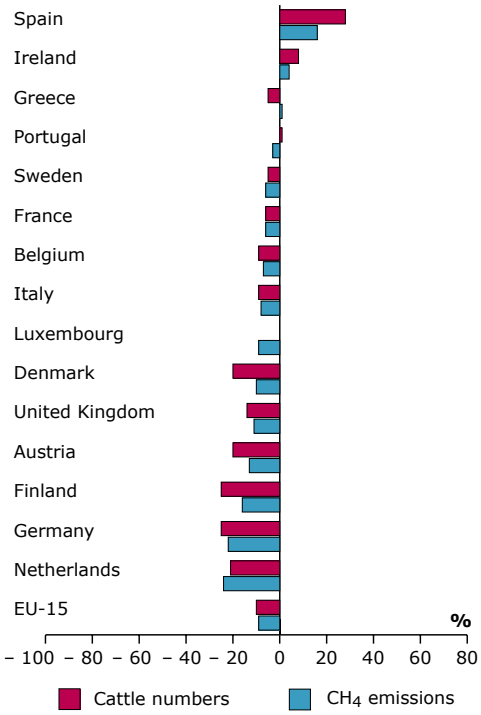
Source: EEA, 2004.

Figure 7.38 EU-15 CH_4 emissions from enteric fermentation, compared with the cattle numbers, and share of the source in total EU-15 GHG emissions



Source: EEA, 2004.

Figure 7.39 EU-15 Member States' CH_4 emissions from enteric fermentation and cattle numbers (change 1990–2002)



Source: EEA, 2004.

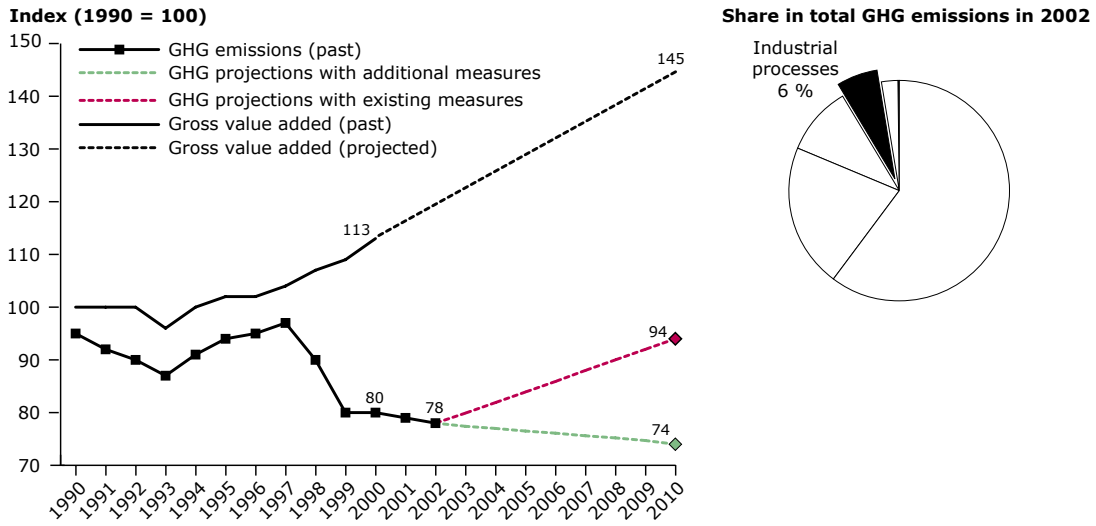
7.5 Industry (non-energy related) ([32])

Industrial processes (non-fuel combustion) contributed 6 % of total greenhouse gas emissions, in particular CO_2, HFC and N_2O, in the EU-15 in 2002. The main sources of industrial process emissions are CO_2 from mineral products (cement and lime production) and iron and steel production, HFCs from consumption of halocarbons (mainly in refrigeration, air conditioning, foam production and as aerosol propellants), and N_2O from the chemical industry (adipic and nitric acid production). Total GHG emissions from industrial processes for 2002 were 22 % below base-year levels (Figure 7.40); in 2002, the emissions decreased by 2 % compared with 2001.

Cement production dominated the trend of total GHG emissions from industrial processes until 1997. Factors for declining emissions in the early 1990s were low economic growth and cement imports from east European countries. Between 1997 and 1999, the trend was dominated by reduction measures in adipic acid production in Germany, France and the United Kingdom. In addition, between 1998 and 1999, large reductions were achieved in the United Kingdom due to reduction measures in HCFC production. Because of the reduction measures after 1997, emissions decoupled from gross value added in industry. The main reasons for the reductions in 2002, compared with 2001, were N_2O emission reduction from the chemical industries in France and the United Kingdom, CO_2 emission reduction from iron and steel in the United Kingdom and HFC reductions from HCFC production in Spain.

Emission projections provided in Figure 7.40 have to be interpreted with care because the sectoral projections of five Member States are missing (in particular from the largest emitter, Germany). Based on figures for the EU-10, aggregated greenhouse gas emissions for the EU are projected to be 6 % below base-year levels by 2010 based on existing domestic measures. With additional measures, emissions are projected to be 26 % below base-year levels.

Figure 7.40 EU-15 past and projected greenhouse gas emissions from industrial processes and gross value added and share of the sector in total GHG emissions



Note: For GHG emissions and projections, the base year is 100; for gross value added, 1990 is 100. GHG projections for the EU-15 are calculated on the basis of projections reported by 10 Member States. The percentage change 2002–10 for the EU-10 is applied to the EU-15. Sectoral emission projections are missing for Germany, Ireland, Luxembourg, the Netherlands and Spain.

Sources: EEA, 2004; European Commission, 2003c; Eurostat.

([32]) Sector 2 'Industrial processes', according to UNFCCC guidelines for greenhouse gas inventories.

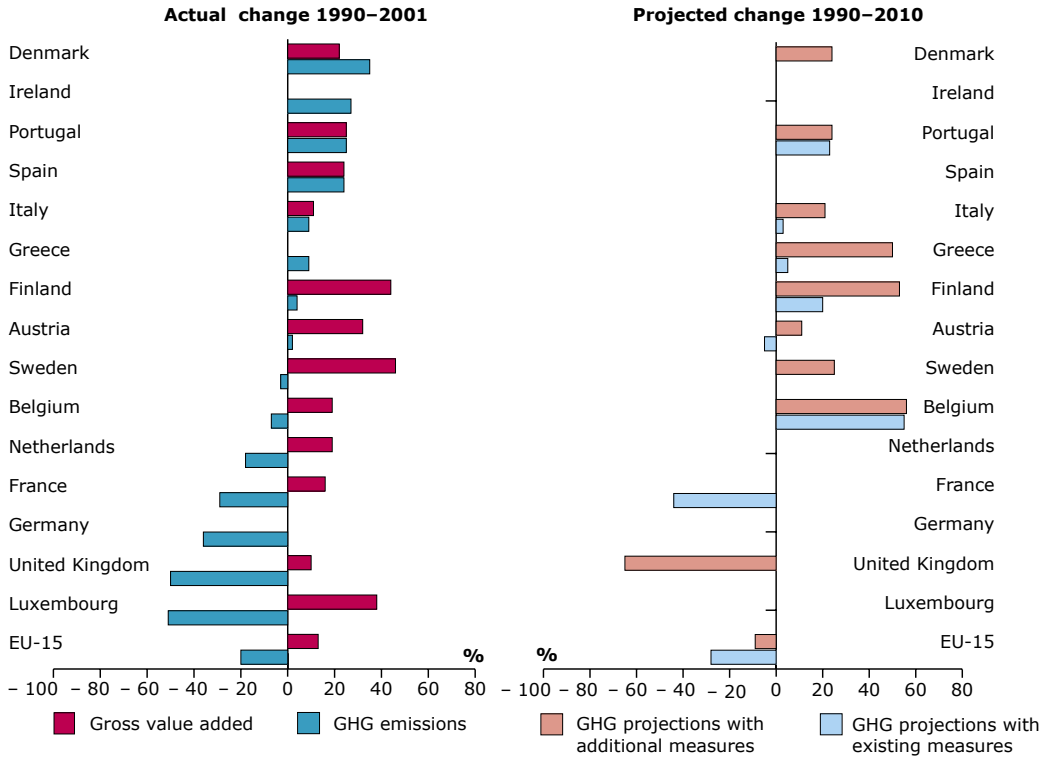
The projected reductions in N_2O emissions from adipic and nitric acid production offset substantial projected increases in HFC emissions, due to continuing replacement of chlorofluorocarbons which are being phased out to protect the ozone layer.

Figure 7.41 shows that between the base year and 2000, about half of the EU-15 Member States achieved emission reduction from industrial processes, particularly the large emitters: Germany, France and the United Kingdom. In most countries, gross value added from industry increased more rapidly than process-related emissions; the only exceptions are Denmark, Portugal and Spain. As regards 'with existing measures' projections, for most Member States, total greenhouse gas emissions from industrial processes are expected to increase by 2010 compared with the base year. Belgium, Finland and Greece in particular forecast strong growth. But Finland and Greece expect that additional measures will significantly reduce the projected growth in emissions. Only in the United Kingdom are emissions projected to decrease significantly, by 65 %, with existing domestic measures. This is due to improved abatement in the manufacture of adipic acid and other industries. With additional measures, France also projects large decreases (of 44 %). Unfortunately, Spain, with high increases in 2002 from base-year levels, did not report any projections of non-energy industrial emissions.

Key policies and measures for non-energy-related industrial processes

Policies and measures are mainly aimed at abatement measures in adipic and nitric acid production (to reduce N_2O emissions) and on alternatives (substitutes) for HFCs in refrigeration and air conditioning. Measures aimed at adipic acid production are mainly

Figure 7.41 Actual and projected change in EU-15 GHG emissions from industrial processes compared with gross value added



Note: GHG projections for the EU-15 are calculated on the basis of projections reported by 10 Member States. The percentage change 2002–10 of the EU-10 is applied to the EU-15. Sectoral emission projections are missing for Germany, Ireland, Luxembourg, the Netherlands and Spain.

Sources: EEA, 2004; Eurostat; information submitted under the EC GHG monitoring mechanism and in third national communications.

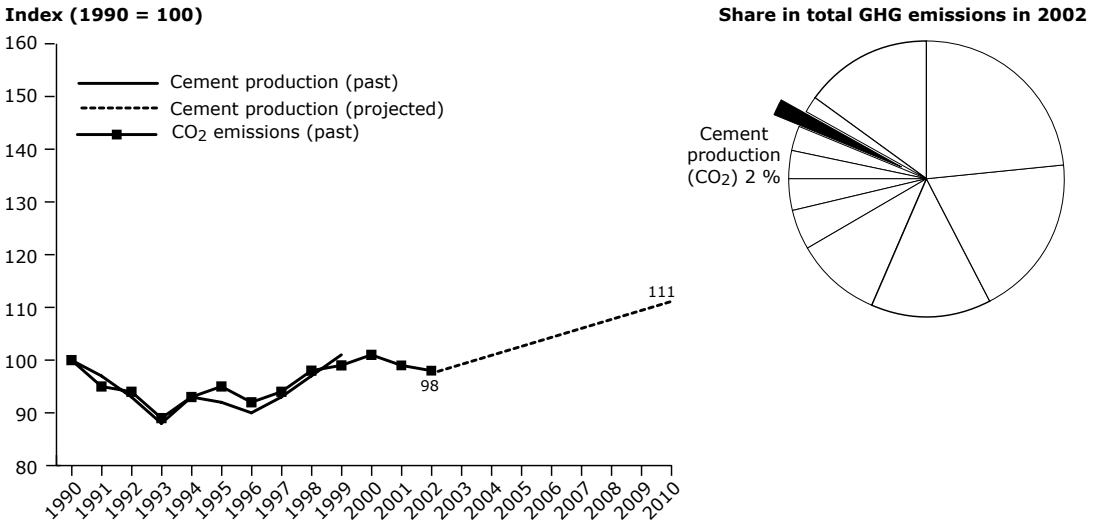
in the 'with existing measures' projections, but some countries report both existing and additional domestic measures for the other process emissions. However, about a third of EU-15 Member States did not report any policies and measures for these source categories. The reporting Member States expect some greenhouse gas savings in industrial processes to be achieved by regulatory policies and measures and through voluntary agreements.

7.5.1 Cement production

EU-15-wide CO_2 emissions from industrial processing of mineral products had a 2 % share of total EU-15 greenhouse gas emissions in 2002. In 2002, CO_2 emissions from mineral products were 1 % below 1990 levels in the EU (Figure 7.42). They declined in the early 1990s but have increased in recent years. Factors for declining emissions in the early 1990s were low economic growth and cement imports from east European countries. In 2000, cement production was about 5 % above 1990 levels; in the Primes baseline scenario (European Commission, 2003c), cement production is projected to rise to 11 % above 1990 levels by 2010.

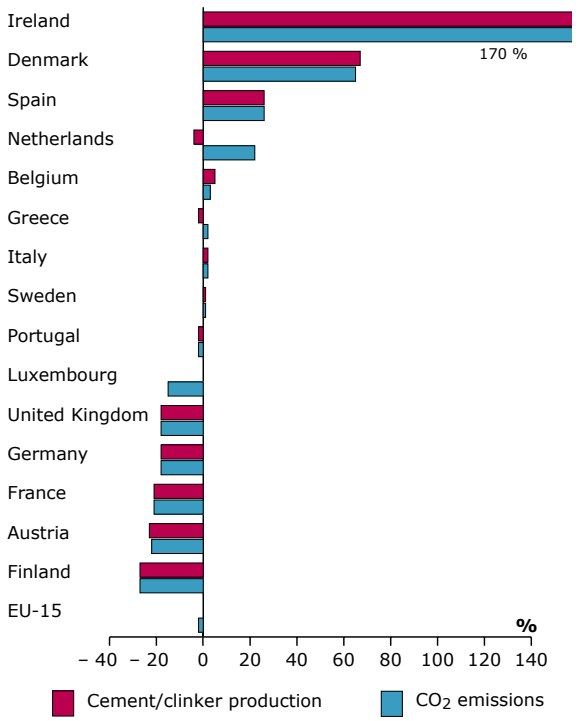
Figure 7.43 shows that in all Member States, except Greece and the Netherlands, CO_2 emissions changed in line with cement or clinker production. The reason for this is that process-related emissions are calculated on the basis of data on cement or clinker production and are directly linked to the carbon content of the activity data. Therefore, there is hardly any scope for decoupling CO_2 emissions from cement or clinker production.

Figure 7.42 EU-15 CO_2 emissions from cement production, compared with cement production, and share of the source in total EU-15 GHG emissions



Sources: EEA, 2004; European Commission, 2003c; Eurostat.

Figure 7.43 EU-15 Member States' CO_2 emissions from cement production and cement/clinker production (change 1990–2002)



Source: EEA, 2004.

7.5.2 Other sources

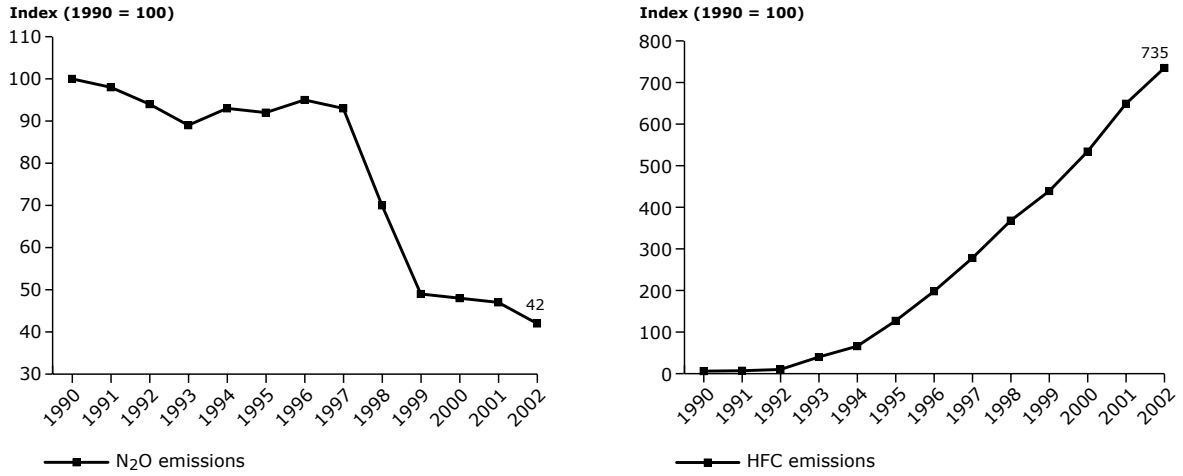
Other important sources of greenhouse gas emissions in the industrial processes sector, which in addition had large changes between 1990 and 2002, are the chemical industry (N_2O) and the consumption of halocarbons (HFC).

EU-15-wide N_2O emissions from the chemical industry had a 1.1 % share of total EU-15 greenhouse gas emissions in 2002. Most N_2O emissions from chemical industries occur in adipic and nitric acid production. In the EU, adipic acid is produced only in four countries (France, Germany, Italy and the United Kingdom), whereas nitric acid is produced more widely. Between 1990 and 2002, N_2O emissions from chemical industries dropped by 58 % in the EU-15 (Figure 7.44). In particular, the United Kingdom (– 90 %), Germany (– 70 %) and France (– 59 %) achieved large reductions, both in relative and absolute terms, primarily due to emission abatement measures in adipic acid production. Belgium, Italy and Portugal had increases in N_2O emissions from chemical industries.

HFC emissions from consumption of halocarbons and SF_6 currently account for 1.0 % of total EU-15 greenhouse gas emissions but have grown substantially. The main reason is the phasing out of ozone-depleting CFCs. HFCs are replacing CFCs mainly in refrigeration and air conditioning, and as aerosol propellants and blowing agents for the production of thermal insulation foams. Between the base year and 2002, EU-15 HFC emissions from consumption of halocarbons and SF_6 increased by a factor of seven (Figure 7.44). This was the highest increase in relative terms of all emission sources in the EU-15.

Table 7.7 lists the largest point source facilities of N_2O emissions in the EU-15 according to the European pollutant emission register (EPER). It shows that the 10 largest N_2O emitters are responsible for about 61 % of total N_2O emissions as reported under the EPER. A total of 405 facilities have reported N_2O data for 2001.

Figure 7.44 EU-15 Member States' N_2O emissions from the chemical industry (left) and HFC emissions from the consumption of halocarbons and SF_6 (right)



Source: EEA, 2004.

Table 7.7 N_2O emissions of the 10 largest facilities in 2001

Facility	Country	1 000 tonnes	Share in total sector
Radici Chimica SpA	Italy	25.70	18.3 %
Rhodia PI Chalampe	France	12.90	9.2 %
Hydro Agri Sluiskil BV	Netherlands	9.58	6.8 %
BASF Antwerpen NV	Belgium	9.51	6.8 %
DSM Limburg BV	Netherlands	8.69	6.2 %
BASF AG	Germany	6.64	4.7 %
Invista (UK) Ltd	United Kingdom	3.61	2.6 %
Kemira SA	Belgium	3.49	2.5 %
Terra Nitrogen (UK) Ltd, Severnside Fertilizer Works, Hallen, Bristol	United Kingdom	3.18	2.3 %
Terra Nitrogen (UK) Ltd, Severnside Fertilizer Works, Billingham, Cleveland	United Kingdom	3.02	2.1 %
Total top 10		**86.32**	**61.4 %**
Total N2O emissions		**140.66**	

Note: The emissions of a facility are reported under its main activity and include energy and process-related emissions.

Source: *European pollutant emission register*.

7.6 Waste management

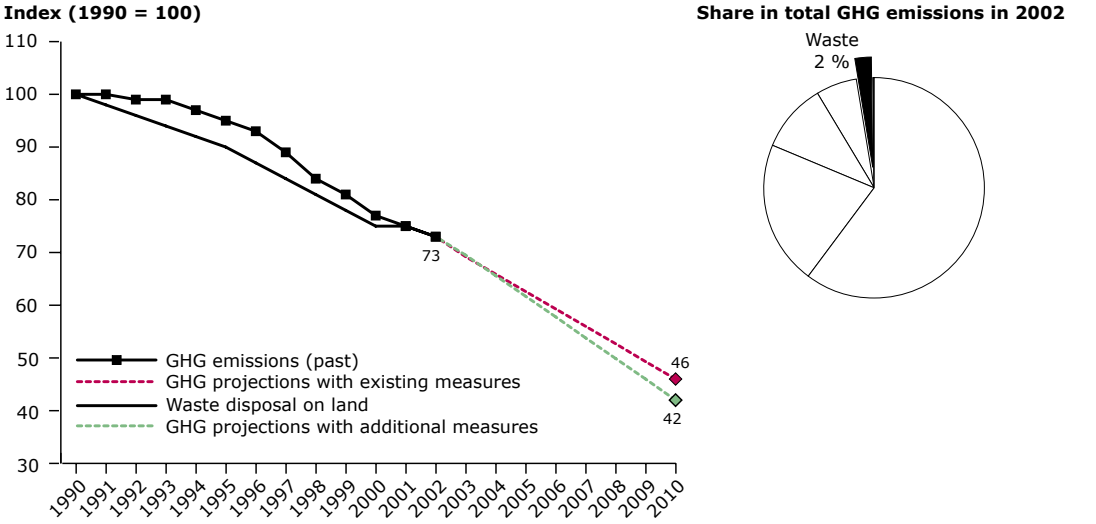
Waste management contributed 2 % of total greenhouse gas emissions in the EU-15 in 2002. Waste management causes mainly CH_4 from solid waste disposal in landfills (77 % of waste-related emissions). Smaller sources are waste water handling (CH_4, N_2O) and waste incineration (mainly CO_2) ([33]). Total GHG emissions from waste management were 27 % below 1990 levels and are projected to further decline by 2010 in the 'with existing measures' scenario (Figure 7.45). In 2002, the emissions decreased by 3 % compared with 2001.

Methane emissions from solid waste disposal on land dominate this sector. They result from the breakdown of biodegradable carbon compounds by anaerobic methanogenic bacteria in landfills. Between 1990 and 2002, EU-15 CH_4 emissions from landfills declined by 32 %. The main driving force of CH_4 emissions from solid waste disposal on land is the amount of biodegradable waste going to landfills and the amount of CH_4 recovered and utilised or flared. Total municipal waste disposal on land declined by 27 % between 1990 and 2002.

Emission projections provided in Figure 7.45 have to be interpreted with care because the sectoral projections of four Member States are missing (in particular from Spain and Germany, the largest emitters). Based on figures for the EU-11, aggregated greenhouse gas emissions from waste for the EU-15 are projected to be more than 50 % below 1990 levels by 2010 both in the 'with existing domestic measures' scenario and in the 'with additional domestic measures' projections.

Figure 7.46 shows that most EU-15 Member States reduced GHG emissions from waste management between 1990 and 2002; only Greece, Ireland, Portugal and Spain showed emission increases. Also most countries had decreasing amounts of solid waste disposal in landfills. In addition, Figure 7.46 shows that all Member States which report emission projections (also those with large increases between 1990 and 2002) expect emission decreases well below 1990 levels by 2010 (Greece projecting

Figure 7.45 EU-15 past and projected greenhouse gas emissions from waste management and waste disposal on land, and share of the sector in total GHG emissions

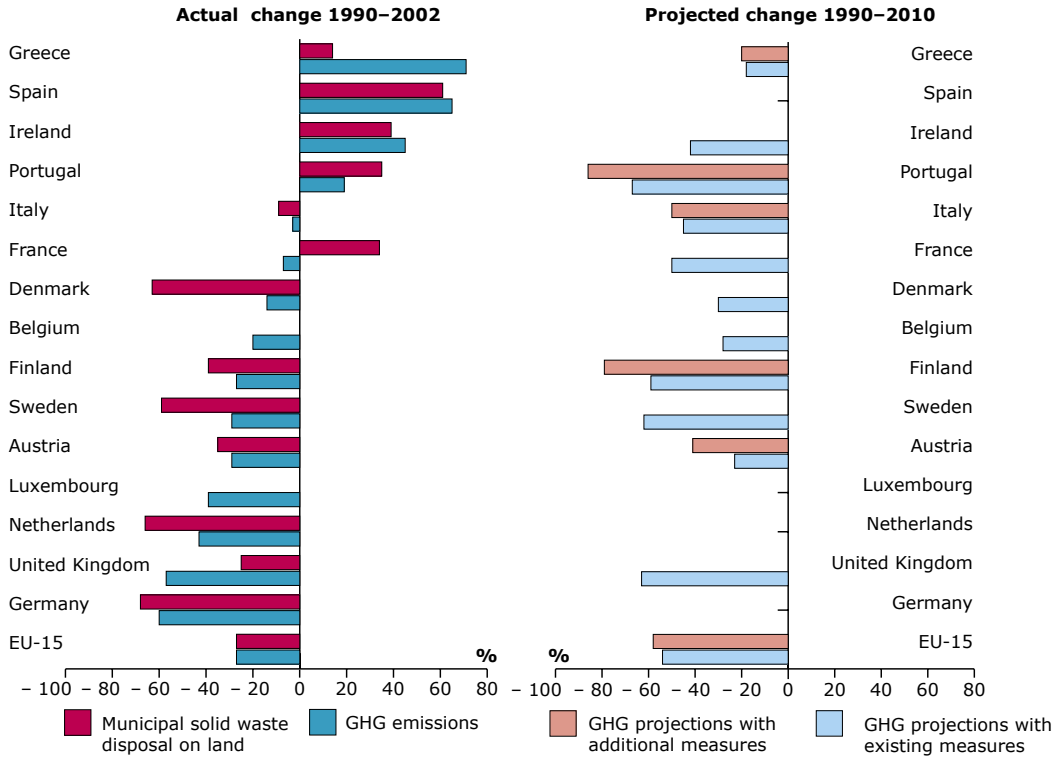


Note: GHG projections for the EU-15 are calculated on the basis of projections reported by 11 Member States. The percentage change 2002–10 of the EU-11 is applied to the EU-15. Sectoral emission projections are missing for Germany, Luxembourg, the Netherlands and Spain.

Source: EEA, 2004.

([33]) This sector does not include waste-to-energy facilities. Emissions from waste burnt for electricity and heat production are included in the energy sector.

Figure 7.46 Actual and projected change in EU-15 GHG emissions from waste management compared with waste disposal on land



Note: GHG projections for the EU-15 are calculated on the basis of projections reported by 11 Member States. The percentage change 2002–10 of the EU-11 is applied to the EU-15. Sectoral emission projections are missing for Germany, Luxembourg, the Netherlands and Spain.

Sources: EEA, 2004; Eurostat; information submitted under the EC GHG monitoring mechanism and in third national communications.

the lowest fall). The largest reductions are projected for Portugal, Sweden and the United Kingdom (with more than 60 % in the 'with existing measures' projections) and for Finland and Portugal (more than 75 % in the 'with additional measures' scenario). Unfortunately, Spain, with the second highest increase between 1990 and 2002, did not report emission projections for waste management.

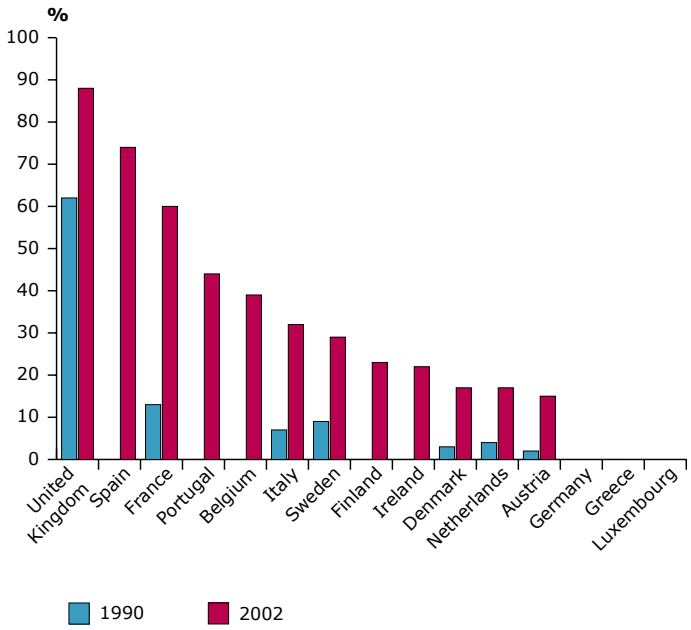
Key policies and measures for waste management (landfills)

The emission reductions from waste management were partly achieved due to the implementation of the landfill waste directive and similar legislation in Member States. The landfill waste directive is one of the EU's common and coordinated policies and measures, and was adopted in 1999. Member States are obliged to reduce the amount of untreated biodegradable waste disposed in landfills, and to install landfill gas recovery at all new sites. The 'with existing domestic measures' and 'with additional domestic measures' projections assume that the landfill directive will be implemented according to time schedules required.

The estimated emission savings from the implementation of the landfill directive for the EU-15 as a whole is about 53 million tonnes of CO_2-equivalent from the combination of 'with existing' and 'additional' measures under the directive, as assessed individually by Member States (see Figure 6.2). According to EU-15-wide estimates, domestic measures (both existing and additional) arising from the landfill directive account for reductions of about 40 million tonnes of CO_2-equivalent (European Commission, 2003b).

Figure 7.47 shows the shares of CH_4 recovery in total CH_4 emissions from solid waste disposal on land between 1990 and 2002. All Member States increased the share between 1990 and 2002 substantially. The highest share of CH_4 recovery is for the United Kingdom, with more than 85 %. For some Member States, no data are available.

Figure 7.47 Share of CH4 recovery in total CH4 emissions for EU-15 Member States 1990 and 2002



Source: EEA, 2004.

7.7 Comparison with EU-15-wide estimates

Because projections are not fully comparable between Member States, due to different underlying assumptions, it is useful to compare these with information from EU-15-wide projections. The comparison may help to improve both national and EU-15-wide projections and to achieve a more consistent view on the projected effects of Member States' policies and measures. This section compares the aggregated national projections for CO_2 emissions taking into account existing domestic measures with recent Community-wide emission projections for CO_2 emissions related to fuel combustion (European Commission, 2003c). The EU-15-wide projections were compiled using the Primes model.

Detailed analysis of the differences is, however, hampered by a lack of consistency between the coverage and disaggregation of the EU-15-wide projections and those from Member States. Most Member States did not provide projections of CO_2 emissions from fuel combustion separately, which the EU-15-wide projections cover. Carbon dioxide emissions from industrial processes are included in Member States' CO_2 emission projections, but not in the EU-15-wide projection. However, their share of total CO_2 emissions is quite small (4 % in 2002). Thus, total CO_2 emission projections aggregated from Member States are compared with EU-15-wide projections of CO_2 emissions from fossil fuel combustion.

The EU-15-wide projections for 2010 (Primes model) show a projected increase in energy-related CO_2 emissions of 4 % between 1990 and the year 2010, which corresponds with the aggregate national projections based on existing measures (Figure 7.48).

However, at the Member State level, there are considerable differences (Figure 7.49). In some cases, the EU-15-wide baseline projection shows a higher increase in emissions between 1990 and 2010 (Luxembourg, Portugal and Spain, particularly); in other cases, Member States' 'with existing measures' projections are higher than the EU-15-wide baseline projection (Belgium, Denmark and Finland, particularly). However, for most Member States with a large contribution to total EU emissions (France, Germany and the United Kingdom), the difference between the projections is relatively small, within

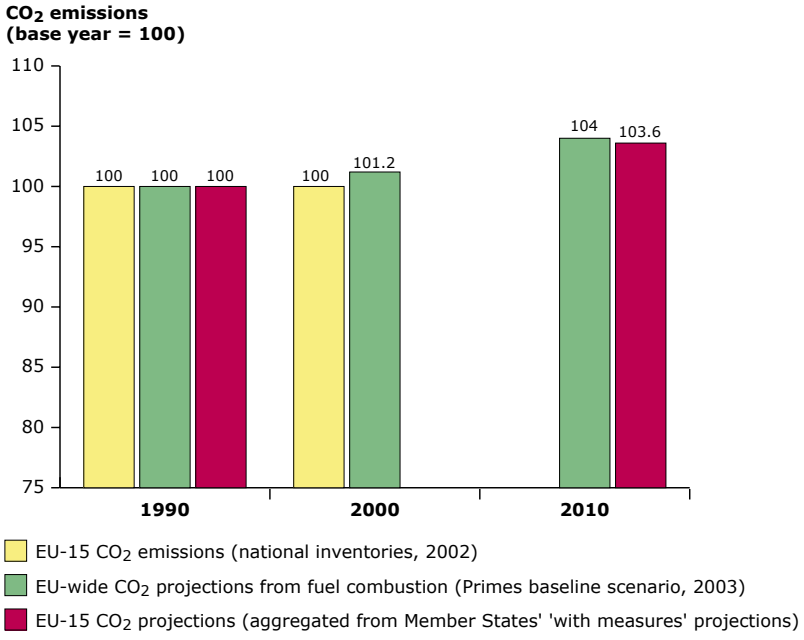
5 percentage points, which contributes to the relatively good agreement between the projections at EU level.

Changes with regard to last year's analysis

Austria, Belgium, Denmark, Greece, Ireland, Luxembourg, the Netherlands, Portugal and Sweden have provided updated GHG projections. Most Member States with updates reduced their 'with existing measures' projections for the year 2010 although only slightly (– 3 % compared with the prior projection or less). Only Belgium reduced the projection for the year 2010 more substantially, by 7 %. Sweden increased the GHG projection but only marginally, by 0.1 %, and, due to a higher base year reported this year, for agriculture the projected saving relative to the base year is greater than in the previous year. Luxembourg increased the projection for 2010 more significantly, by 3.4 %, but it still deviates substantially from projections provided by the EU-wide approach for Luxembourg (see below).

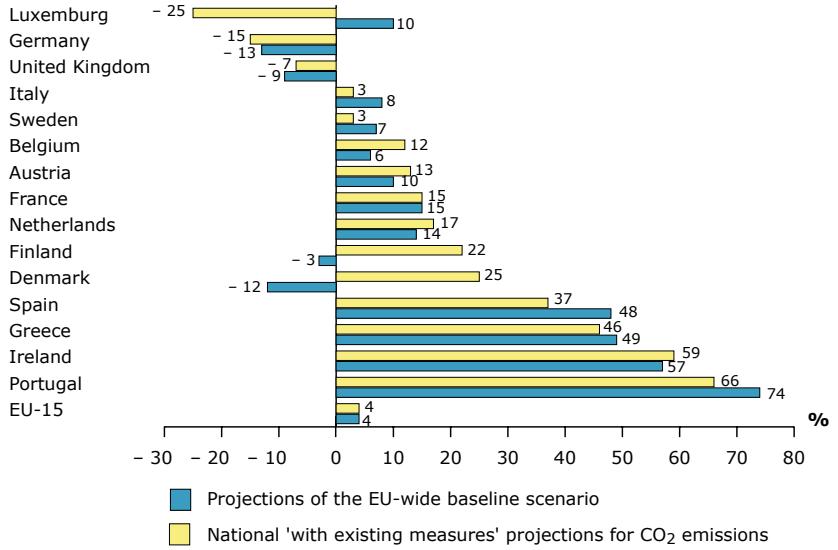
The aggregation of the updated 'with existing measures' projections results in an increase of 3.6 % for the EU-15, which is 0.5 percentage points below the 4.1 % increase calculated from the Member States' projections provided last year.

Figure 7.48 Comparison of the aggregated national 'with existing domestic measures' projections for CO_2 emissions with EU-15-wide projections (Primes model)



Sources: EEA, 2004; European Commission, 2003c.

Figure 7.49 Comparison by Member State of changes between 1990 and 2010 of national 'with existing measures' projections for CO_2 emissions with projections of the EU-15-wide baseline scenario (Primes model)



Note: Portugal did not provide a breakdown by gas in its new greenhouse gas projections included in its third national communication to the UNFCCC. Portugal's CO_2 emissions were therefore estimated with the share of CO_2 emissions in total greenhouse gas emissions provided in its second national communication.

Sources: EEA, 2004; European Commission, 2003c.

Reasons for differing projections

The comparison has revealed several differences between the EU-15-wide CO_2 baseline projection using the Primes model and the Member States' projections. These differences occur for a number of reasons.

- Differences in the database used: the Primes model is based on Eurostat energy balances for the year 2000; some of the Member States (e.g. Italy) use different databases, not fully compatible with the Eurostat data.

- Different definition of the sectors covered: an important example is the different approach for the consideration of emissions from bunker fuels used in international aviation. While Primes takes international bunker fuels into account, they are excluded from the national projections.

- Differences in emission factors: the Primes model applies emission factors for each Member State from Eurostat's default emission factor database. However, most Member States apply national emission factors, which are suited for national circumstances.

- Differences in the models applied: the Primes model is an econometric model driven by prices, which simulates economic decisions by representative sectors simultaneously. Some of the Member States use quite different model approaches. Germany, for example, applies a technological optimisation model which, in general, tends to show a lower projection result than an econometric model.

- Different assumptions applied in the models. These include:

  — coverage of policies by the projections, and different assumptions on the effectiveness of policies;

  — growth assumptions on driving forces of the models, like population, gross domestic product (GDP) and fuel prices;

  — assumptions on technological development.

8 Accounting of carbon sinks by EU Member States

In addition to reducing or limiting emissions of greenhouse gases, Member States can make use of CO_2 removals by land use change and forestry (LUCF) activities, or 'carbon sinks' under the Kyoto Protocol to achieve their UNFCCC and EU 'burden-sharing' targets. These carbon sinks include mandatory activities covered by Article 3.3 of the Protocol (afforestation, reforestation and deforestation) and voluntary activities under Article 3.4 (forest management, cropland management, grazing land management and revegetation). Further information on the use of carbon sinks under the Kyoto Protocol is given in Box 2.

Box 2 Carbon sinks under the Kyoto Protocol

The rules about how carbon sinks are accounted for under the Kyoto Protocol are described in Articles 3.3 and 3.4 and in the UNFCCC Marrakesh Agreements (2001).

Article 3.3 activities
Article 3.3 describes how net changes in greenhouse gas emissions by sources and removals by sinks resulting from certain land-use change and forestry activities are accounted for in meeting the Kyoto Protocol targets. These activities are defined as direct human-induced land-use change and forestry activities, limited to afforestation, reforestation and deforestation (ARD) since 1990.

Article 3.4 activities
Article 3.4 identifies additional human-induced activities related to changes in greenhouse gas emissions by sources and removals by sinks in the agricultural soils and other land-use change and forestry categories which a country may choose to use in order to meet its Kyoto Protocol target. In the Marrakesh Accords, activities under this article were defined as forest management, revegetation, cropland management and grazing land management. The extent to which parties can account for emissions and removals from these activities, for the first commitment period, is limited by a capping system.

Information from Member States on the use of carbon sinks

Nine Member States (Austria, Denmark, Ireland, Italy, the Netherlands, Portugal, Slovenia, Spain and the United Kingdom) provided estimates for their projected annual net carbon stock change under Article 3.3 during the commitment period (Table 8.1). Austria and Sweden expect additional emissions from ARD activities during the commitment period, whereas Denmark, Ireland, Italy, the Netherlands, Portugal, Slovenia, Spain and the United Kingdom estimate net sequestration effects from these activities. Belgium, Finland and Sweden have not yet quantified the expected effects from Article 3.3 activities. The net CO_2 removal from eight Member States that provided quantitative information on Article 3.3 activities amounts to about – 23 million tonnes of CO_2 per year (excluding data from Slovenia which does not form part of the EU-15 burden-sharing agreement for the first commitment period).

Table 8.1 Projected net carbon stock changes under Article 3.3 for the first commitment period

Member State	Net carbon stock change during 2008–12 (million tonnes of CO_2 per year)	Type of carbon pools included
Austria	+ 0.733	Not indicated
Belgium	Estimates not yet available	—
Denmark	– 0.282	Forest biomass
Finland	Estimates not yet available	—
Ireland	– 6.453	Not indicated
Italy	– 6.480	—
Netherlands	– 0.11	—
Portugal	– 1.393 to – 1.687	—
Spain	– 6.82	Not indicated, probably only above-ground biomass
Sweden	Probably small net debit	—
United Kingdom	– 2.2	Above-ground and below-ground biomass, litter and soil organic matter
EU-15 total (8 Member States)	– 23.016 to – 23.309	
Slovenia ([a])	– 0.04	Not indicated

Notes: Consistent with the reporting of emission inventories a negative sign '–' is used for removals and a positive sign '+' for emissions.

([a]) Slovenia is presented separately as it is not part of the EU-15 burden-sharing agreement for the first commitment period under the Kyoto Protocol and is therefore not considered in the sum of the EU-15 total.

Sources: Questionnaires submitted by Member States and third national communications.

Most of the countries have not yet taken a final decision with regard to accounting of Article 3.4 activities. Six countries (Austria, Italy, the Netherlands, Portugal, Slovenia and Spain) that provided information in the questionnaire have already decided to account for forest management under Article 3.4. Ireland indicated that it will not use Article 3.4 activities during the first commitment period. Denmark, Portugal, Slovenia, Sweden, Italy and the United Kingdom expect that carbon sequestration from forest management during the commitment period will exceed their maximum allowance for the accounting of forest management under Article 3.4 according to the Marrakesh Agreements (Table 8.2). If the very limited quantitative information provided for Article 3.4 activities so far is aggregated for five countries (excluding Slovenia), forest management activities will contribute with 4.6 million tonnes of CO_2 removals/year during the first commitment period to the EU target. No data is available so far regarding Member States' election and quantitative contribution of other activities under Article 3.4 (cropland management, grazing land management and revegetation). In its calculations of net emissions during the commitment period for its national allocation plan, Italy considered net removals from sinks with 10.8 million tonnes annually. This information corresponds with the information provided in the questionnaire and the third national communication of 6.48 million tonnes from Article 3.3 activities and 4.11 million tonnes from forest management under Article 3.4. However the assumed amount for forest management is much higher than Italy's threshold for accounting for forest management activities (by 3.66 million tonnes of CO_2) which would require renegotiating Italy's threshold for forest management activities.

Table 8.2 Potential projected net carbon stock changes from forest management under Article 3.4 for the Kyoto Protocol commitment period

Member State	Election of Article 3.4 activities	Net carbon stock change during 2008–12 (million tonnes of CO_2 per year)	Maximum allowance for forest management (million tonnes of CO_2 per year)	Carbon pools included
Austria	Forest management	No data provided	– 2.31	
Belgium	Not yet decided	No data provided	– 0.11	
Denmark	Not yet decided	– 0.22 to – 0.59	– 0.18	Not clearly indicated
Finland	Not yet decided	No data provided	– 0.59	
Ireland	No election	No data provided	– 0.18	
Italy	Forest management	– 4.11	– 0.66	Not clearly indicated
Netherlands	Forest management	Unclear whether the country-specific maximum threshold for forest management activities will be fully utilised	– 0.04	Not clearly indicated
Portugal	Forest management	– 1.58	– 0.81	Not clearly indicated
Spain	Forest management	– 0.81	– 2.46	Not clearly indicated, probably only above-ground biomass
Sweden	Not yet decided	Amount is likely to be larger than maximum allowance	– 2.13	Not clearly indicated
United Kingdom	Not yet decided	– 7.33	– 1.36	Above-ground and below-ground biomass, litter and soil organic matter
EU-15 total (5 Member States that have already decided to elect forest management)		– 4.63 million tones CO_2 per year (maximum allowance used in total estimate for those countries where net carbon stock change exceeds the maximum allowance from forest management)		
Slovenia ([a])	Forest management	– 3.813	– 1.32	Not clearly indicated

Notes: Consistent with the reporting of emission inventories a negative sign '–' is used for removals and a positive sign '+' for emissions.

([a]) Slovenia is presented separately as it is not part of the EU-15 burden-sharing agreement for the first commitment period under the Kyoto Protocol and is therefore not considered in the sum of the EU-15 total.

Sources: Questionnaires submitted by Member States and third national communications.

Use of sinks for achieving the EU's Kyoto target

The preliminary and incomplete information from Member States presented in this chapter shows that, so far, a total net sequestration of about 23 million tonnes of CO_2 per year of the commitment period from afforestation and reforestation activities under Article 3.3 of the Kyoto Protocol has been identified, with a further sequestration of 5 million tonnes of CO_2 per year from forest management under Article 3.4. These figures are modest when compared with the EU-15 Kyoto commitment (almost 8 % of the total of 339 million tonnes of CO_2-equivalent to be reduced by the EU in total or 0.7 percentage points of the EU-15 Kyoto target of – 8 %). The European climate change programme estimates that potentially 93 million to 103 million tonnes of CO_2 (equivalent to about 30 % of the EU reduction) could be sequestered in the agriculture and forestry sector (European Commission, 2003b). However, it has to be taken into account that many Member States have neither taken final decisions as to whether they will account for forest management, cropland management, grazing land management or revegetation under Article 3.4, nor estimated potential quantitative contributions to their targets from these activities.

9 The reporting scheme

9.1 State of current reporting

9.1.1 Greenhouse gas inventories of EU-15 Member States

For the preparation of this report, EU-15 greenhouse gas inventories as compiled under the EU monitoring mechanism and submitted by the European Commission to the UNFCCC (May 2004) have been used (EEA, 2004).

All Member States reported data for 2002. Data availability has improved over previous years. Gaps still exist for Greece (SF_6 for 1990–2002), Ireland (HFCs, PFCs, SF_6 for 1990–94) and Luxembourg (CO_2, CH_4, N_2O for 1991–93; HFCs, PFCs, SF_6 for 1990–97, 1999). A data gap-filling procedure was applied for Luxembourg (CO_2, CH_4, N_2O for 1991–93 and fluorinated gases for 1990–97, 1999) and Ireland (fluorinated gases for 1990–94). Data on CO_2, CH_4 and N_2O emissions used in this report do not include emissions and removals from land-use change and forestry. Comprehensive methods for estimating changes of carbon pools (sinks) under the Protocol have been developed by IPCC and will be mandatory for reporting in 2005.

Some of the indicators presented in the report contain sectoral driving force data. The main data sources are:

- data supplied by Member States under the monitoring mechanism in the common reporting format (CRF) tables;
- data from Eurostat (NewCronos database);
- data from Primes (base line scenario) as published in European Commission (2003c).

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

9.1.2 Greenhouse gas inventories of new EU Member States

The reporting under the monitoring mechanism has not been obligatory for the new Member States before accession. However, the new Member States are required to report GHG emissions under the UNFCCC, as they are Annex I parties to the UNFCCC ([34]) and all of them have ratified the Kyoto Protocol.

The completeness of the datasets reported under the UNFCCC and Council Decision No 280/2004/EC differs among the parties. The timeliness, completeness and consistency of reports of GHG emissions in 2004 improved compared with the previous year; however, there are still areas for improvement.

- Emissions are not available for all gases and years from 1990 to 2002: no complete time series are available for the Czech Republic, Lithuania, Malta and Poland; several new Member States have difficulties in reporting all fluorinated gas emissions (time series and/or base year); no data are available at all for Cyprus.
- Sector emissions are not reported consistently; estimation methods are not consistently applied for the whole period.

Gap filling has been applied for the Czech Republic, Lithuania, Malta and Poland in order to obtain more consistent time series for the aggregate estimates of the new Member States and of the EU-25 (Table 9.1). Gaps were only filled if emission data was

([34]) Malta and Cyprus are new Member States which are not Annex I countries to the UNFCCC.

Table 9.1 Gaps and gap filling approaches for the new EU Member States

Country	Years	Gas	Sectors	Approach
Czech Republic	1991, 1993, 1995	All	All	Interpolation
Czech Republic	1990–94	HFC, PFC, SF_6	Industrial processes	1995 values copied
Hungary	1992–97	HFC	Industrial processes	1998 values copied
Hungary	1991–97	PFC, SF_6	Industrial processes	Interpolation
Lithuania	1991–97, 1999–2001	All	All	Interpolation
Malta	2001–02	All	All	2000 values copied
Poland	2002	All	All	2001 values copied
Poland	1990–94	HFC, PFC, SF_6	Industrial processes	1995 values copied

available for some years between 1990 and 2002. If no value was available for any of these years, no gap filling was applied. Two approaches for gap filling were used:

- if estimates were missing from the outsides of the datasets, i.e. beginning or end of time series information, the nearest reported emission value was copied to the blank years;

- if estimates were missing from within a dataset, linear interpolation between the two reported values was applied.

9.1.3 Projections and policies and measures (EU-15 Member States)

The quality of reporting for Member States was of variable quality in 2004 in terms of the level of detail provided. Denmark, Ireland and Portugal provided third national communications in 2003. In summary, the following information was reported by the EU-15 Member States in 2004 (Table 9.2).

- Nine Member States reported new or revised projections.

- Nine Member States reported new or updated policies and measures.

- Three third national communications became available.

- Three new climate change strategies were reported.

The number of Member States submitting new reports or updates to existing projections and policies has increased. However, the quality of reporting has not significantly improved and in some cases the level of quantification is lower than in 2003. Member States often submit national communications as their report under the monitoring mechanism in the years when these are produced. The national communications are usually of a high standard, but more needs to be done by Member States to improve the availability and quality of reports to the monitoring mechanism in years when no national communication is provided. Consistency between the national communication and subsequent monitoring mechanism submissions should also be maintained.

9.1.4 Projections and policies and measures (new Member States)

Up until accession in 2004, the new Member States have not been obliged to report under the monitoring mechanism, thus the standard of reporting is lower than for the EU-15. The assessment is based on the third national communications published by the new Member States, though no new national communications became available in 2004; the draft third national communication

for Slovenia was made available. Poland and Slovenia reported new policies and measures and the Czech Republic and Slovenia reported new projections (Table 9.3). Lithuania provided new projections in their report commissioned in preparation for the third national communication.

There was some improvement in the reporting of policies and measures. The low number of new submissions limited the amount of improvement in the reporting by new Member States. The reporting of policies and measures for most of the new Member States gives a reasonable level of detail, including, in many cases, quantitative

Table 9.2 Reporting of new information in 2004 for EU-15 Member States

	New projections reported in 2004?	New policies and measures reported in 2004?
Austria	yes	yes
Belgium	yes	no
Denmark	yes	yes
Finland	no	yes
France	no	no
Germany	no	no
Greece	yes	yes
Ireland	yes	yes
Italy	no	no
Luxembourg	no	no
Netherlands	yes	yes
Portugal	yes	yes
Spain	yes	yes
Sweden	yes	yes
United Kingdom	no	no

Table 9.3 Reporting of new information in 2004 for new EU Member States

	New projections reported in 2004?	New policies and measures reported in 2004?
Cyprus ([a])	no	no
Czech Republic	yes	no
Estonia	no	no
Hungary	no	no
Latvia	no	no
Lithuania ([b])	yes	no
Malta ([a])	no	no
Poland	no	yes
Slovenia	yes	yes
Slovakia	no	no

Note:

([a]) Cyprus and Malta have not published national communications.

([b]) Lithuania submitted a report in preparation for its third national communication. Projections are taken from this report; however, policies and measures are not updated due to the late submission of this information.

information on emission reductions. 'With measures' and 'with additional measures' projections are generally provided, though the labelling of projections could be clearer.

Key areas for the new Member States to address for reporting under next year's monitoring mechanism are:

- clarity of reporting on the projections in terms of which projections are 'with measures' and which are 'with additional measures';
- tabulation of projections by gas and by sector;
- more extensive quantification of emission savings from policies and measures.

9.2 Improvements in the greenhouse gas monitoring mechanism

To help Member States report to a clear and consistent standard, the guidelines for the monitoring mechanism have been revised and improved. New implementing provisions were adopted under the EU monitoring mechanism by end of 2004 for reporting from 2005 onwards. The new legal basis for reporting is Council Decision No 280/2004/EC concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol. New or improved requirements in the decision include:

- new reporting requirements for Kyoto mechanisms;
- strengthened provisions on projections of greenhouse gas emissions, with guidance on how to provide more comprehensive and detailed projection data;
- inclusion of indicators to monitor and evaluate progress with policies and measures over time;
- guidance on Member States' reporting to the Commission on 'demonstrable progress', with new comprehensive projections, for the deadline of 15 March 2005.

In the new legislation, provision is also made for a review of progress at EU level and, if necessary, to propose suitable measures to ensure achievement of the EU target.

Member States are required to report on the demonstration of progress achieved by 2005, covering the elements provided in UNFCCC Decision 22/CP.7 on guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol. A workshop was held in October 2004 in order to help Member States improve the reporting of their projections, with a view to meeting the deadline for Member States to report on demonstrable progress under the Kyoto Protocol.

It is expected that use of the new implementing provisions from 2005 onwards will help to improve the quality of reporting on projections and on policies and measures.

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Glossary

ACEA	European Automobile Manufacturers Association (EU-wide agreement with ACEA and similarly also with Japanese (JAMA) and Korean (KAMA) automobile manufacturing industries)
ARD	afforestation, reforestation and deforestation
CCPMs	common and coordinated policies and measures at EU level
CDM	clean development mechanism as defined in the Kyoto Protocol, Article 12, meaning projects on the reduction of GHG emissions between industrialised countries and developing countries
CER	certified emission reduction unit caused by a CDM project
CFCs	chlorofluorocarbons
CHP	combined heat and power
CH_4	methane
CLRTAP	Convention on Long-range Transboundary Air Pollution
CO_2	carbon dioxide
COP	Conference of the Parties
CRF	common reporting format
DTI	distance-to-target indicator
ECCP	European climate change programme
EEA	European Environment Agency
ERU	emission reduction unit caused by JI projects
ETC/ACC	European Topic Centre on Air and Climate Change
GDP	gross domestic product
GHG	greenhouse gases
HCFC	hydrochlorofluorocarbon
HFC	hydrofluorocarbon
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change

IPPC	integrated pollution prevention and control
JAMA	Japanese Automobile Manufacturers Association
JI	Joint implementation as defined in the Kyoto Protocol, Article 6, meaning projects on the reduction of GHG emissions between industrialised countries and countries in transition
KAMA	Korean Automobile Manufacturers Association
KP	Kyoto Protocol
LUCF	land-use change and forestry
monitoring mechanism	Council Decision No 280/2004/EC concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol
MS	Member States
Mt	Mega (million) tonnes
NAP	national action plan
N_2O	nitrous oxide
PFCs	perfluorocarbons
RES	renewable energy sources
SF_6	sulphur hexafluoride
UNECE/EMEP	United Nations Economic Commission for Europe/Cooperative Programme for Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe
UNFCCC	United Nations Framework Convention on Climate Change

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