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Greenhouse gas emission trends and projections in Europe 2008

Annex: Additional information on greenhouse gas emission trends and projections by sector and by Member State

European Environment Agency

Contents

A 1 Sectoral emission trends and projections in the EU

This annex presents sectoral emissions trends and projections in the EU, as reported by Member States. It also attempts to link these trends with existing or planned policies and measures (PAM) in the EU. Emissions are presented by main emitting source, according to the nomenclature established by the intergovernmental panel on climate change (IPCC) for the calculation of greenhouse gas emissions.

Reporting of indicators under the Monitoring Mechanism:

Besides historic and projected trends in sectoral greenhouse gas emissions, this annex also includes historic and projected trends indicators (and their respective numerators and denominators), as reported by Member States under the Monitoring Mechanism Decision (Commission Decision (166/2005/EC) implementing Decision 280/2004/EC). These indicators have been defined to measure the effects of policies and measures over time. Four categories of indicators are defined, three concerning past data and one relative to projected data:

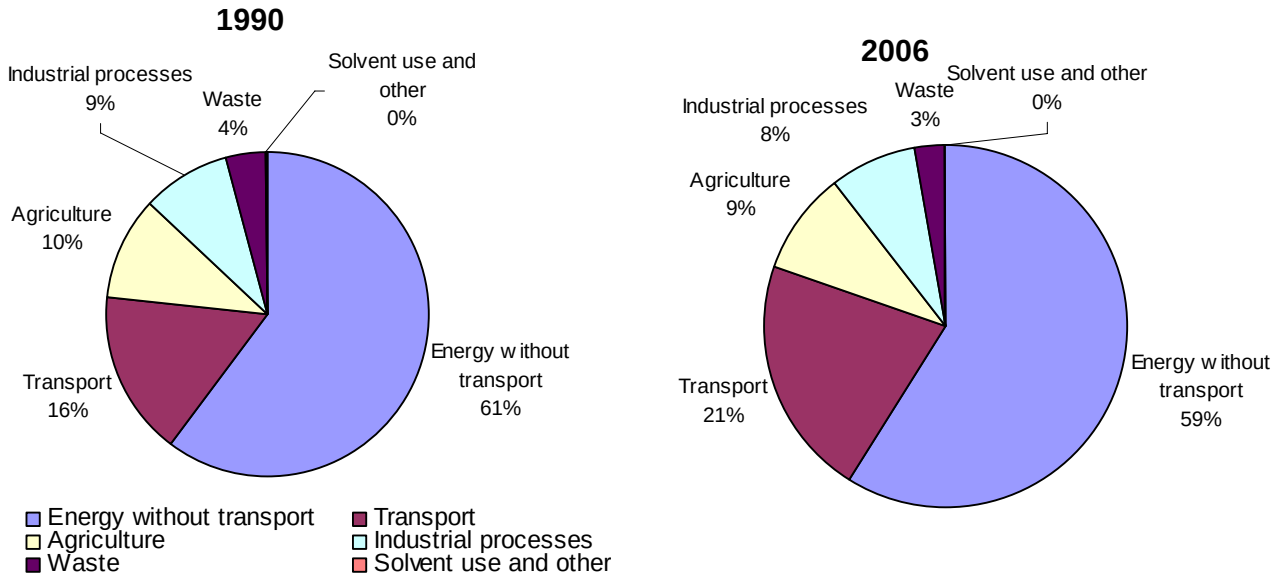
- 7 priority indicators, which must be reported by Member States every year,
- 6 additional priority indicators and 15 Supplementary Indicators, which Member States are encouraged to report every year,
- 10 indicators for projections for the years 2005, 2010, 2015 and 2020.

The past indicators shall cover data at least for the last inventory year (2006). However, the provision of the whole time series 1990–2006 allows a better assessment of the effectiveness of policies and measures. The comparability of these indicators between countries is limited by the fact that Member States use sometimes different bases for accounting of numerator and denominator.

A 1.1 Sector shares and main trends in the EU-15

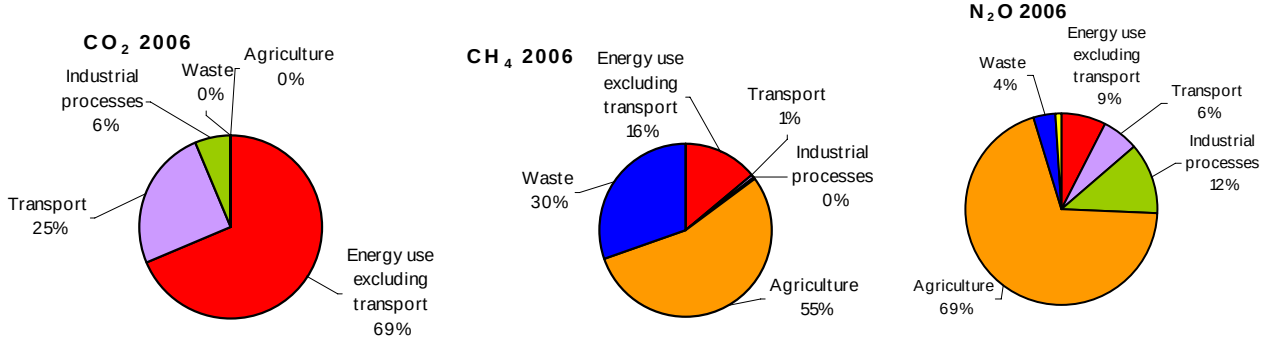
- Approximately 80 % of total greenhouse gas (GHG) emissions (4 151 million tonnes CO_2 equivalent (Mt CO_2-eq.) in 2006) in the EU-15 are due to the supply and use of energy (including fuel consumption from transport) (Fig. 1). CO_2 emissions from public electricity and heat production represent a quarter of all EU-15 GHG emissions, while CO_2 emissions from road transportation represent a fifth (Fig. 2).
- Agriculture is the main CH_4 and N_2O emitter and accounts for 9 % of total GHG emissions in 2006 (Figure 1 and Figure 2).
- Between 1990 and 2006, the GHG emissions that increased most in absolute value were CO_2 emissions from road transportation, CO_2 emissions from electricity and heat production and HFCs emissions from refrigeration and air conditioning equipment (Figure 3).
- Between 1990 and 2006, the GHG emissions that decreased most in absolute value were CH_4 emissions from land filling, CO_2 emissions from fuel combustion in manufacturing industries and construction and CO_2 emissions from the manufacture of solid fuels (e.g. charcoal) (Fig. 3).

Figure 1 Sector shares of total greenhouse gases in 1990 and 2006 in the EU-15



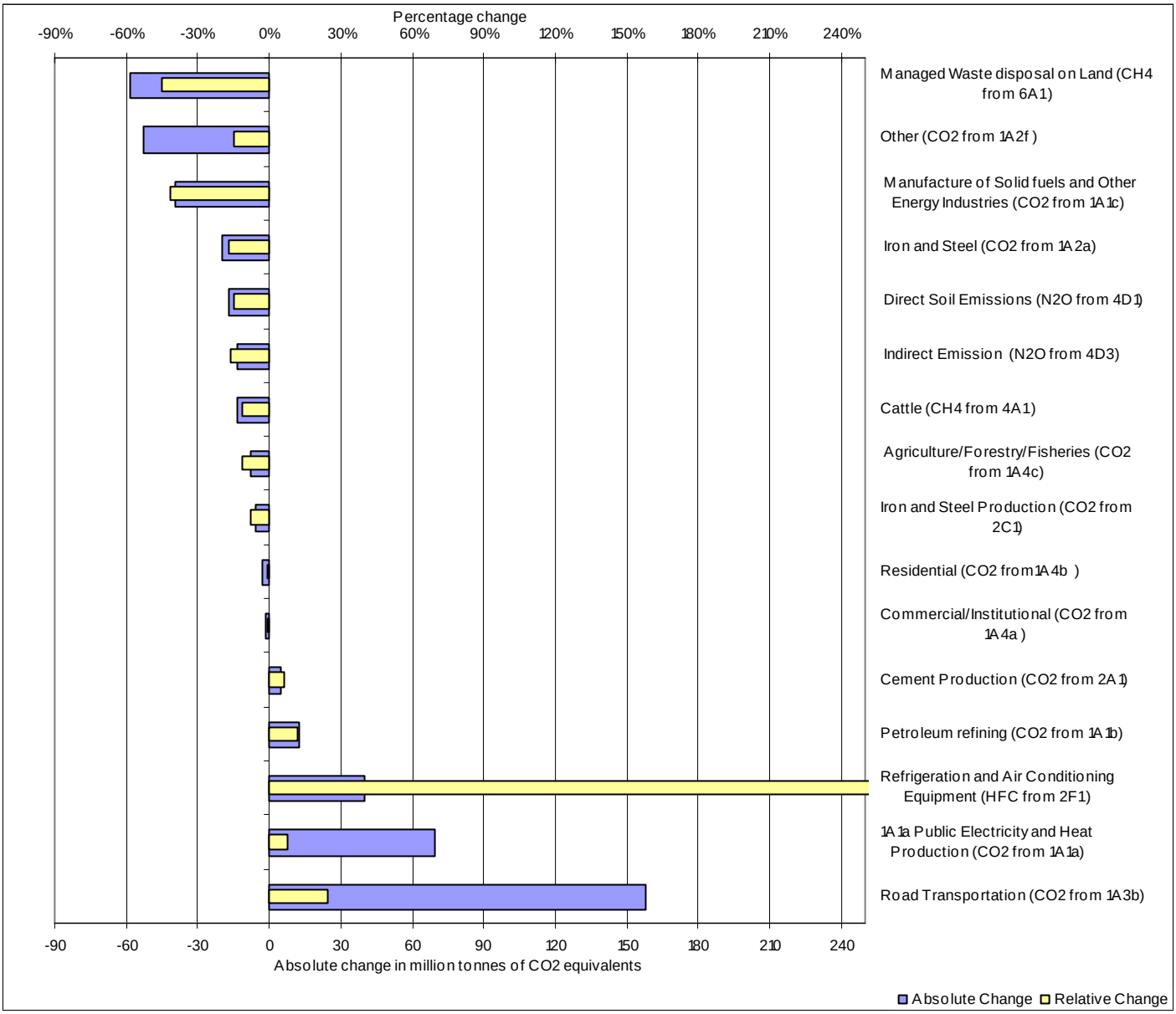
Source: EEA, 2008a.

Figure 2 Sector shares of total CO_2, CH_4 and N_2O emissions in 2006



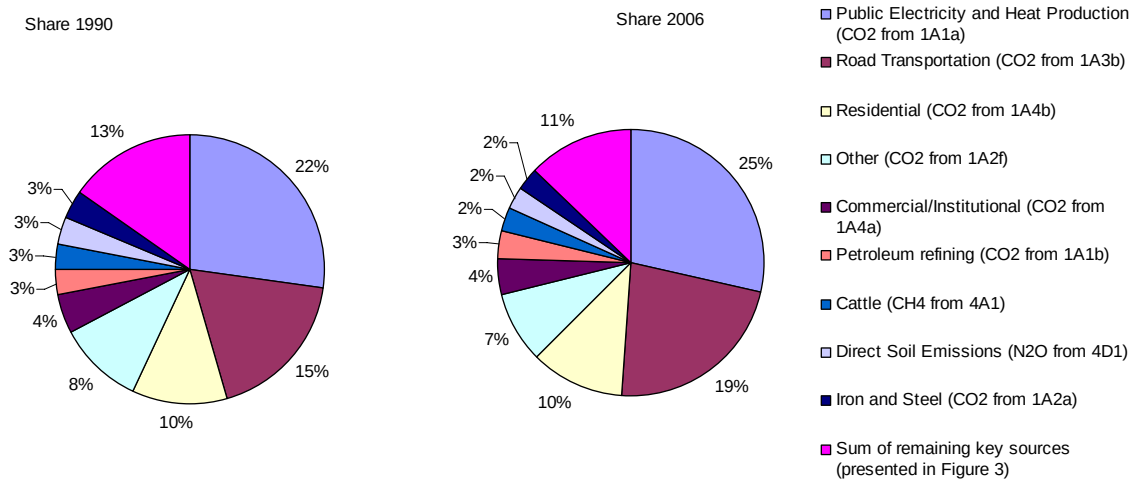
Source: EEA, 2008a

Figure 3 Changes in emissions from key sources in the EU-15 from 1990 to 2006



Note: The most important key sources of greenhouse gas emissions listed here account for 85 % of total emissions in 2006, excluding emissions and removals from LULUCF.
Source: EEA, 2008a

Figure 4 Contribution of key sources to total GHG emissions in 1990 and 2006



Source: EEA, 2008a

A 1.2 Energy supply (energy industries)

Definition (IPCC sector 1A1)*: emissions from fuels combusted by the fuel extraction or energy-producing industries.*

Key EU policies and measures

- Directive on the EU emission trading scheme (ETS) (2003)
- Directive on electricity production from renewable energy sources (2001)
- Cogeneration Directive (2004)
- Directive on energy taxation (2003)
- Directive on the energy performance of buildings (2002).

Trends

- Between 1990 and 2006, GHG emissions from energy industries increased by 4 % in the EU-15. They increased by 7 % between 2000 and 2006 in the EU-15.

Total GHG emission from 1A1	Share in 1990 total GHG	Share in 2006 total GHG	Change 1990–2006	Change 2000–2006
EU-15	27.4 %	29.0 %	3.7 %	7.4 %
EU-27	30.2 %	30.9 %	– 5.5 %	6.1 %

Projections targeting energy supply and use

- Belgium, Denmark, Germany, Sweden and the United Kingdom are the EU-15 Member States that project that with the existing measures in place, 2010 emissions from energy supply and use will be lower than in 1990. The other EU-15 Member States project increasing emissions compared to 1990. Austria project being below 1990 levels with the implementation of additional domestic measures.
- Except Slovenia all EU-12 Member States project decreases in GHG emissions from energy supply and use by 2010 compared to 1990 emissions, due to the reductions that took place in the 1990s.

In the following policies and measures concerning energy industries and energy use in residential and services buildings are described, as a strict disaggregation of energy relevant policies and measures to all subsectors is not feasible.

Projection savings from policies and measures targeting energy supply and use

- The greatest emission reductions by 2010 in the whole energy sector (energy supply and use, including transport), are projected to be provided by policies and measures targeting energy industries. These policies and measures concern renewable energy, combined heat and power (CHP), energy taxation and building standards.
- In addition, Member States expect the EU Emission Trading Scheme (ETS) to contribute an emission reduction of at least 123 Mt CO_2 in the EU-27 by 2010.

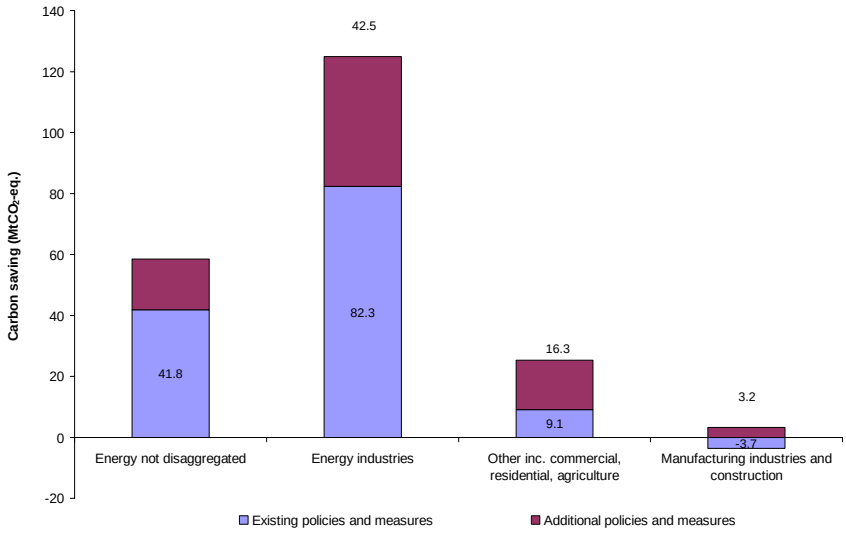
- Emission reduction potentials reported by Member States for energy policies have stayed relatively constant since 2006 for the EU-15, with a broadly similar split between 'existing' and 'planned' policies.

Figure 5 shows projected emission savings for the EU-15 in the energy supply and use sector, by sub-sector (except transport). Projected savings from policies and measures in 2010 are estimated by comparison with a hypothetical reference case in which no measures were implemented since the starting year chosen by Member States for their 'without measures' projections (see Annex 5.3 for further description of this method). Disaggregation by sub-sector was not available for the EU-12.

Of all polices and measures targeting the whole energy sector (energy supply, energy use, transport), those targeting the energy supply sector (energy industries) are projected to provide greatest emission reductions by 2010. They account for 64 % of all projected savings from existing measures in the energy sector (excluding transport) and 54 % of all projected savings from additional measures. Countries such as Germany, Italy and the United Kingdom report significant projected savings, in particular from policies and measures promoting renewable energy.

Policies and measures applied to the end use sectors of manufacturing industries and to commercial, residential and agriculture energy use also make significant contributions to 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. A range of economic instruments and voluntary agreements are intended to stimulate uptake of these options.

Figure 5 EU-15 projected greenhouse gas emission savings in energy supply and use excluding transport in 2010



Note: Projected savings from policies and measures in 2010 are estimated by comparison with a hypothetical reference case in which no measures were implemented since the starting year for the 'without measures' projection. See Annex 5.3 for further description of this method.

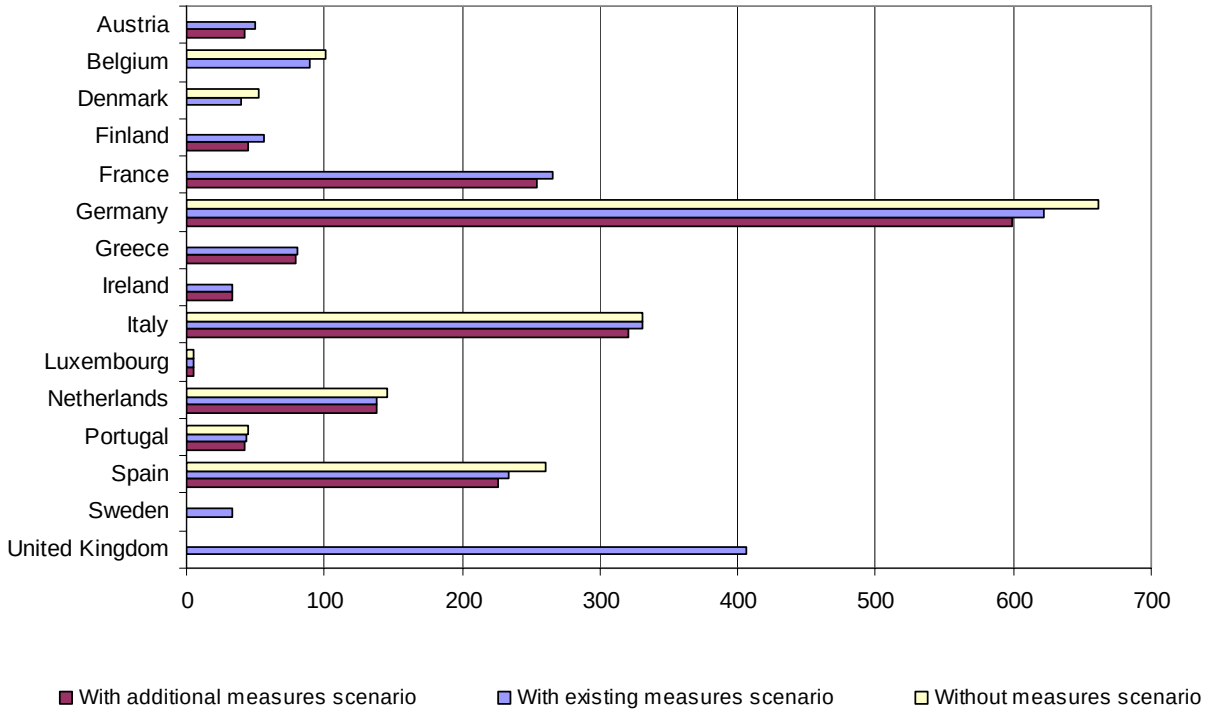
Projected emission reductions from policies are calculated from projection scenarios: the effect of 'existing' policies and measures is obtained by subtracting the 'with existing measures' projection from the 'without measures' projection and the effect of 'additional' policies and measures by subtracting the 'with additional measures' projection from the 'with existing measures' projection.

Source: See Chapter 7 Sources of Information. Details on individual Member States can be found in Table 4 of the Country Profiles (Annex 8).

In addition, some Member States reported on the effects of the EU Emission Trading Scheme. According to their preliminary estimates, it will contribute to a 123 Mt CO_2 emissions reduction in the EU-27 in 2010, largely through actions in the energy and industrial sectors. A more comprehensive approach consists in estimating the emission reductions based on the annual emission caps for the period 2008–2012 compared to average verified emissions for 2005/2006. According to that method, the EU ETS would bring an overall reduction of 127 Mt CO_2 for the EU-27. (See Section 6.4 of the main report.)

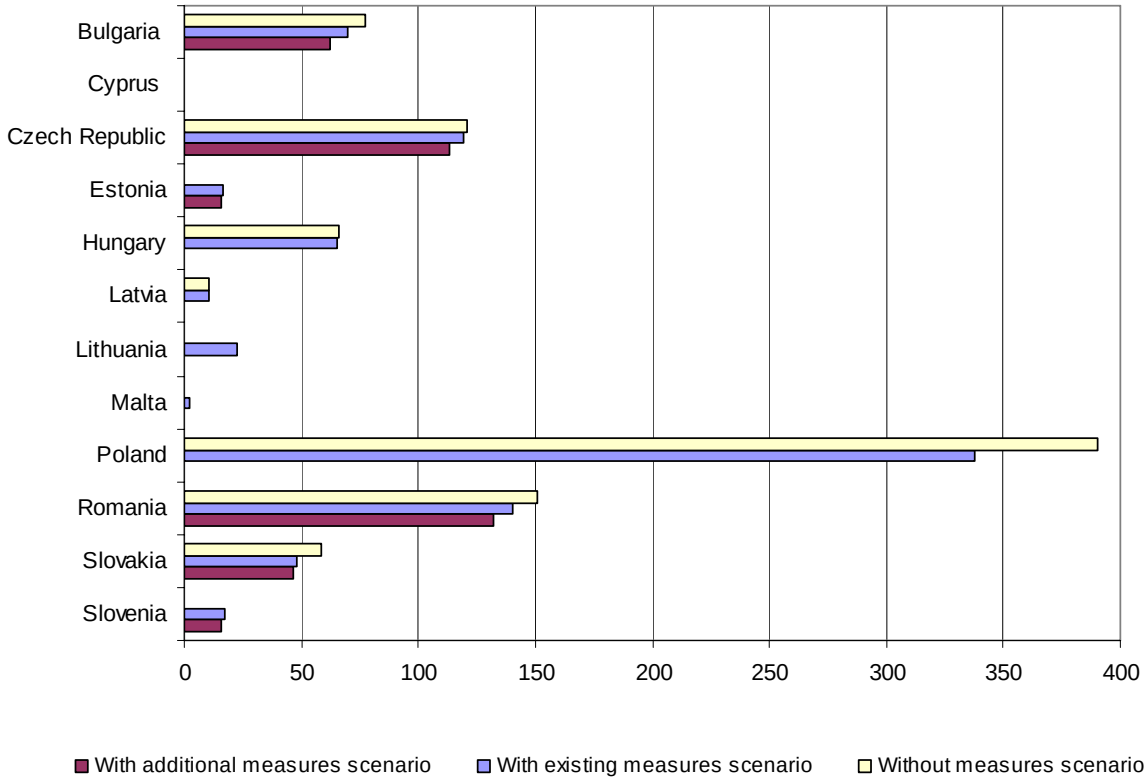
Figure 6 and Figure 7 display 2010 emission projections under 'with measures', 'with additional measures' (where one exists) and 'without measures' scenarios, as reported by Member States in their latest submissions. This illustrates the effect of PAMs implemented in the energy sector, including EU-wide and national actions. Where a 'without measures' scenario is not reported by Member States, it has been estimated through a bottom-up addition of Member State quantifications of the effect of energy-related PAMs. The most significant emission savings from existing PAMs targeting energy industries are projected in Germany, Poland and Spain. Additional measures are projected to deliver significant savings in Germany, France and Italy.

Figure 6 Projected effect of energy PAMs (excluding transport) to EU-15 projected emissions in 2010



Source: See Sources of Information (Chapter 7). Details on individual Member States can be found in Table 4 of the Country Profiles (Annex 8).

Figure 7 Projected contribution of energy PAMs (transport included) to EU-12 projected emissions in 2010



Source: See Sources of Information (Chapter 7). Details on individual Member States can be found in Table 4 of the Country Profiles (Annex 8).

Comparison between 2007 and 2008 projections

Limited comparisons can be made between the findings from reports submitted by Member States in 2008 and those submitted in 2007, as the methodology for calculating policy savings has changed between the 2007 and 2008 *Greenhouse gas emission trends and projections in Europe* reports, from a mix of top-down and bottom-up to solely top-down ([1]). The following points provide a comparison of projected savings (emission reductions) by energy sub-sector and by 'with measures' and 'with additional measures' scenarios in 2007 and 2008:

- For the EU-15, combined projected savings from 'with measures' and 'with additional measures' in the 'manufacturing industries and construction', 'other including commercial, residential, agriculture' and 'energy industries' sub sectors have decreased by 42 Mt, 79 Mt and 116 Mt respectively in 2008 compared to 2007, while projected savings which were not attributed to one of the sub-sectors have increased by 53 Mt.
- For the EU-15, reported emission reduction potentials for 2010 from energy policies have decreased by 327 Mt for existing measures and by 23 Mt for additional measures.

([1]) The top-down method involves calculating the difference between total projections in each scenario ('without measures' minus 'with existing measures', and 'with existing measures' minus 'with additional measures'), while bottom-up involves adding together the reported effect (emission reductions) of individual measures.

- Emissions savings from additional policies could be more comprehensively disaggregated by energy sub-sector in 2008 and it can be deduced that there has been little change in the split compared to 2007.
- For the whole EU, emission reduction potentials for 2010 from energy policies have decreased by 340 Mt.

A 1.2.1 CO_2 emissions from electricity and heat production

Definition (IPCC sector 1A1a)*: emissions from public electricity generation, public combined heat and power generation, and public heat plants. Public utilities are defined as those undertakings whose primary activity is to supply the public. They may be in public or private ownership. This category includes emissions from own on-site use of fuel but not emissions from autoproducers (undertakings which generate electricity/heat wholly or partly for their own use, as an activity which supports their primary activity).*

- In 2006, CO_2 emissions from public electricity and heat production in the EU-15 were 7 % higher than in 1990.
- A continuous decoupling between CO_2 emissions and electricity and heat production has been observed since 1990. It is mainly due to fuel switching (coal to gas) and efficiency improvements. However, there have been signs of further decoupling of emissions from production since 2003, as emissions have been relatively stable despite increasing electricity production and consumption.
- Electricity consumption and production are projected to keep strongly increasing.

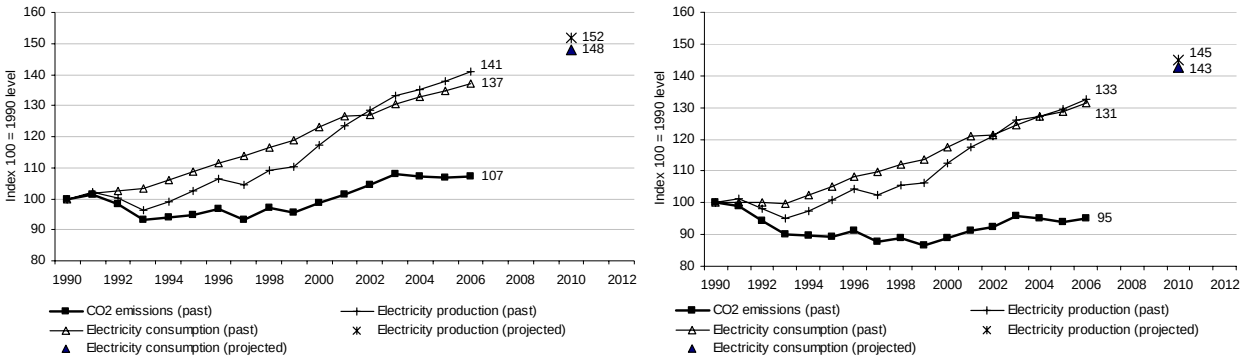
CO_2 emission from 1A1a	Share in 1990 total GHG	Share in 2006 total GHG	Change 1990–2006	Change 2000–2006
EU-15	22.4 %	24.5 %	7.3 %	8.8 %
EU-27	26.0 %	26.8 %	– 4.8 %	7.1 %

Between 1990 and 2006, electricity production increased in the EU-15 by 41 % (Figure 8) and the amount of fuel combusted increased by 23 % (Figure 9), while related emissions increased by only 7 %. These trends indicate the occurrence of efficiency improvements in electricity generation (less fuel needed for the same electricity output) and fuel switching (less CO_2 emissions for the same amount of fuel combusted).

After an increase in emissions between 1999 and 2003 due to higher electricity production from coal power plants (EEA, 2006a), emissions have remained stable since 2003, mainly due to marked improvements in fuel efficiency. The emission reductions due to the share of nuclear and renewable energy are of minor importance. The share of electricity production in nuclear power plants in total EU-15 electricity production even decreased between 1990 and 2006 from 33.4 % to 31.9 %. In the EU-15, the strong growth of electricity generation from biomass, natural gas fired power stations and wind turbines (401 %, 346 %, > 10 000 %, respectively, between 1990 and 2006) has resulted in minor emission reductions so far, as biomass and wind turbines only have a combined share of 5 % of total electricity generation in 2006. Furthermore, electricity generation from hydropower decreased by 17 % between 2001 and 2006.

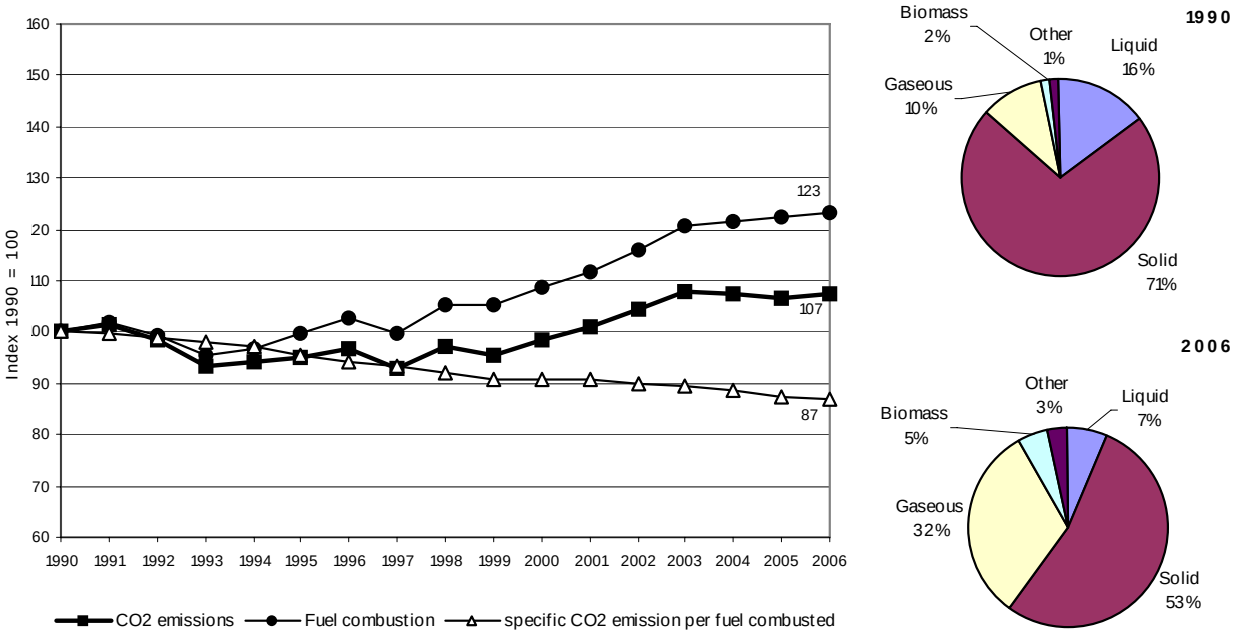
Electricity production and consumption are now strongly increasing while the resulting CO_2 emissions remain relatively stable (Figure 8). It is projected that electricity consumption and production will continue to increase (Figure 8).

Figure 8 CO_2 emissions from public electricity and heat production compared with electricity production and final electricity consumption, EU-15 and EU-27



Source: EEA, 2008a; Eurostat; PRIMES.

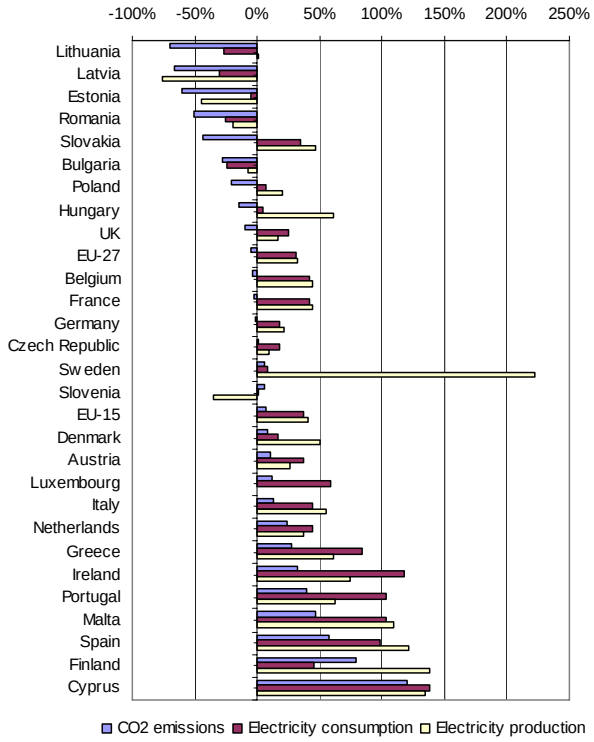
Figure 9 Comparison of CO_2 emission and fuel combustion, and change of share of fuel use between 1990 and 2006 for the EU-15



Source: EEA, 2008a;

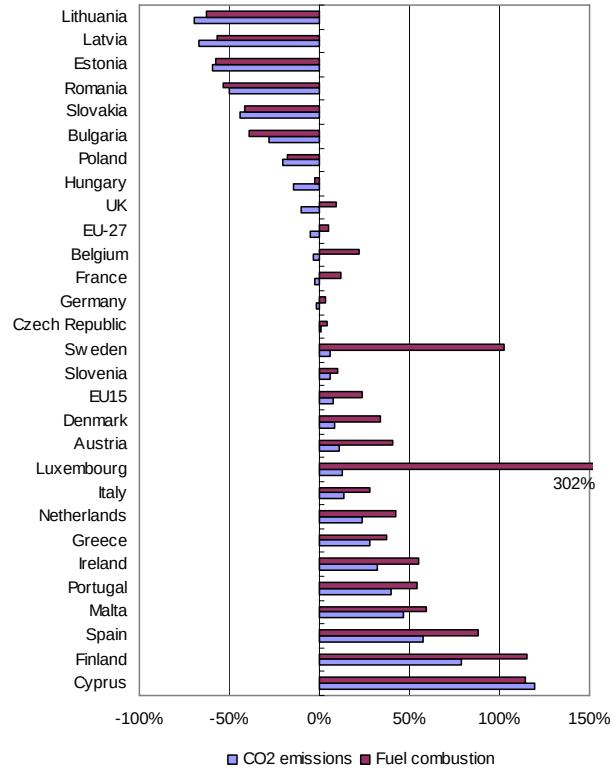
In eight EU-12 and four EU-15 Member States, CO_2 emissions decreased between 1990 and 2006. In eight of these twelve Member States, electricity production increased in the same time (Figure 10). Sweden has a remarkably low increase in CO_2 emissions despite a very high increase in electricity production. This is partly due to a remarkable increase in the share of biomass combustion in public electricity and heat production between 1990 and 2006 (from 13 % to 51 %).
Between 1990 and 2006 CO_2 emissions were decoupled from fuel combustion in thirteen EU-15 and four EU-12 Member States (Figure 11). Emissions even decreased in some cases while fuel combustion increased. In Luxembourg, a complete shift from coal to gas has occurred.

Figure 10 Change of electricity consumption and production (in thermal power plants) and CO_2 emissions from public electricity and heat production between 1990 and 2006



Source: EEA, 2008a; Eurostat.

Figure 11 Change of amount of fuel combustion and CO_2 emissions from public electricity and heat production between 1990 and 2006 in the EU-15



Source: EEA, 2008a.

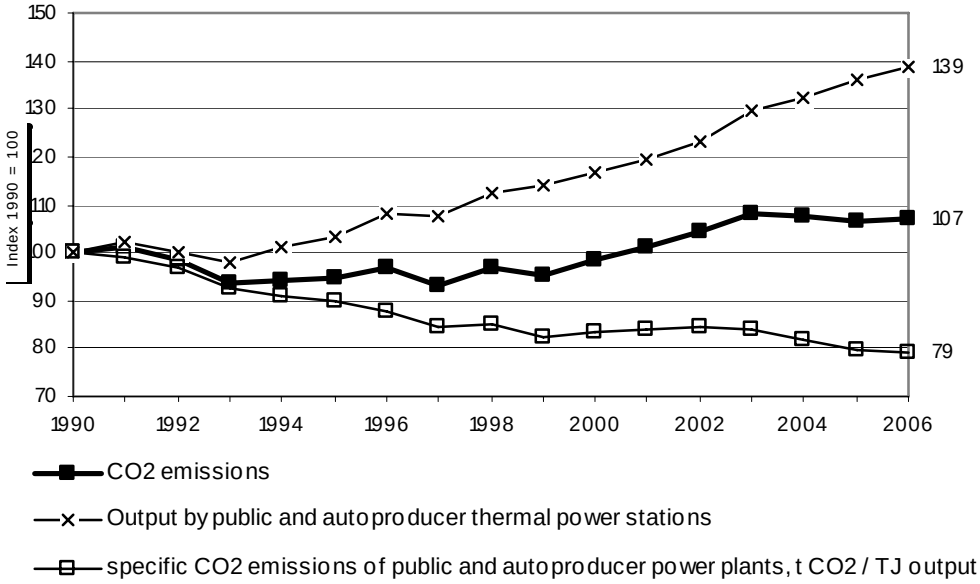
Emissions intensity from the energy transformation sector (Priority Indicator N°7 and projected Indicator N°7)

- Specific CO_2 emissions of public and autoproducer power plants have been decreasing since 1990.

To monitor the progress of policies and measures in the energy transformation sector, specific CO_2 emissions of public and autoproducer power plants are reported by Member States. This indicator is the ratio between CO_2 emissions from public and autoproducer thermal power stations ([2]), and the output ([3]) by these stations. Significant decoupling took place between 1994 and 1997 and between 2003 and 2006 (Figure 12).

Nine of the twelve Member States that reported both, the change in CO_2 emissions and the change in energy output between 1990 and 2006 showed a decoupling of these two parameters (Figure 13). The lowest CO_2 intensity was observed in Sweden (Figure 13).

Figure 12 CO_2 emissions from public and autoproducer (total and thermal) power stations compared with all products-output for the EU-15

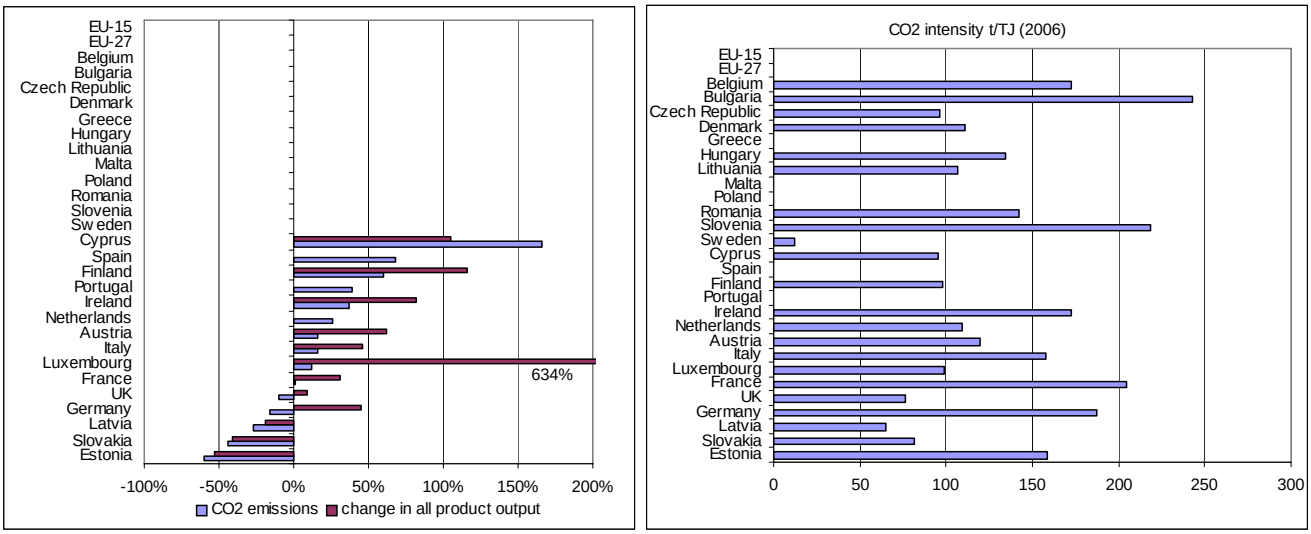


Source: EEA, 2008a; Eurostat.

([2]) CO_2 emissions from all fossil fuel combustion for gross electricity and heat production by public and autoproducer thermal power and combined heat and power plants. Emissions from heat only plants are not included.

([3]) Gross electricity produced and any heat sold to third parties (combined heat and power plants – CHP). Output from heat only plants is not included.

Figure 13 Specific CO_2 emissions of public and autoproducer power plants, t CO_2/TJ (change 1990–2006; absolute intensity) (Priority Indicator N°7)



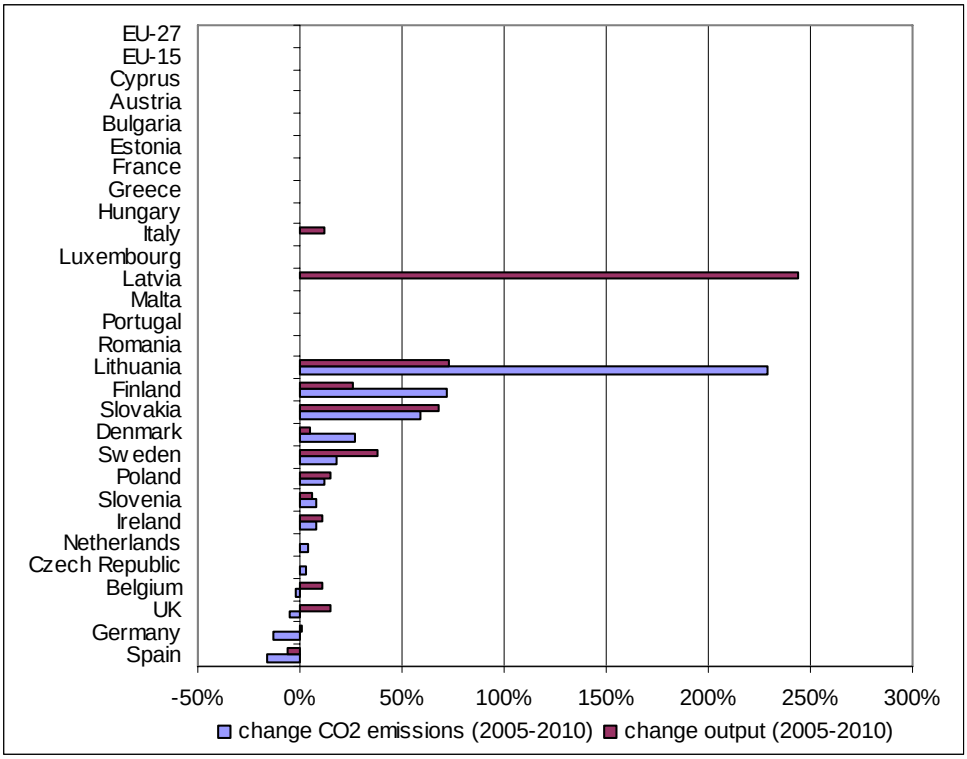
Note: Comparisons of absolute intensities are only of limited significance as data are not always consistent across countries and not all countries reported the whole time series.
Source: EEA, 2008a; Member States submissions.

The intensity values for 2006 are available for 22 Member States (Figure 13). Low intensities observed in northern Europe may be explained by:

- high shares of biomass combustion in public electricity and heat production (e.g. Sweden, Denmark, and Finland),
- high shares of CHP (Denmark, Finland, Latvia),
- high shares of gaseous fuels (e.g. Latvia, Lithuania, the United Kingdom).

Of the 14 Member States that provided projections for CO_2 emissions from public and autoproducer thermal power stations, only four (Belgium, Germany, Spain, the United Kingdom) project decreasing emissions between 2005 and 2010 (Figure 14).

Figure 14 Projected Change in CO_2 emissions from public and autoproducer thermal power stations and all products output between 2005 and 2010 (Projected Indicator N°7)



Note: Comparisons of absolute intensities are only of limited significance as data are not always consistent across countries.

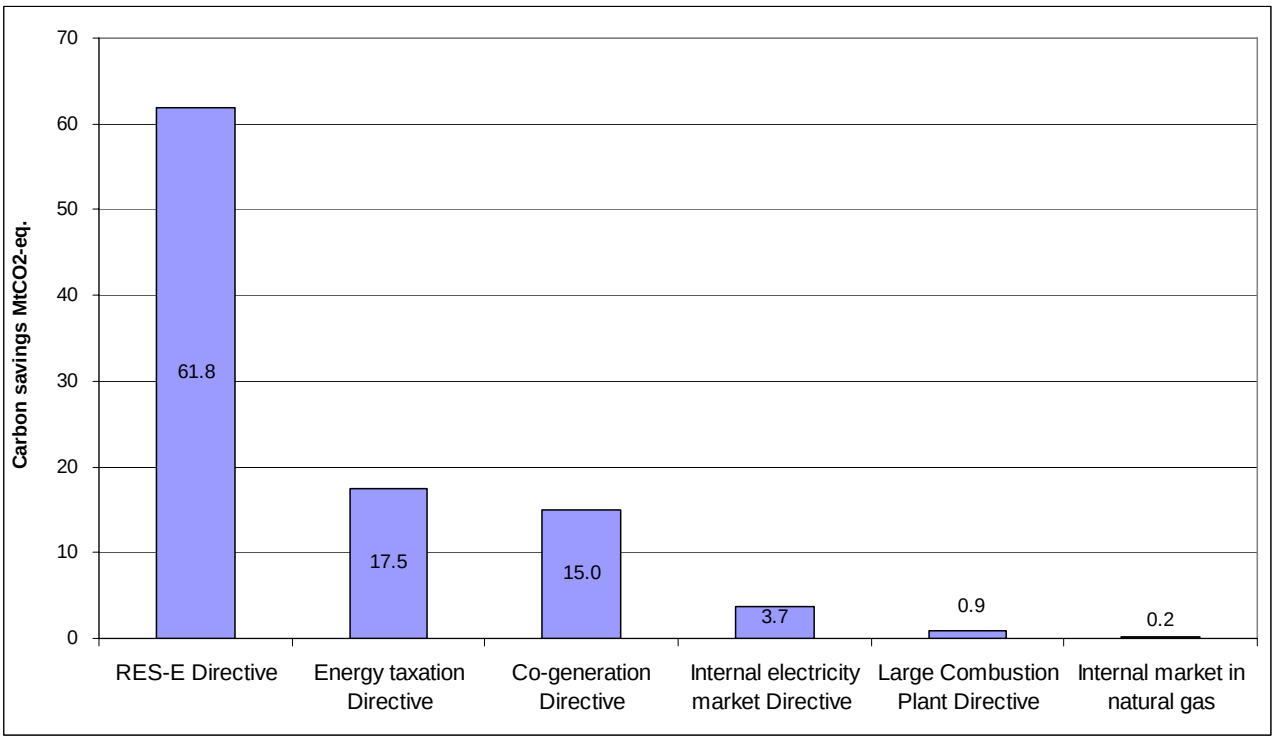
Source: Member States' submissions.

Projected savings from key policies and measures targeting energy industries

- The main GHG emission reductions in EU-27 energy industries are projected to be derived from policies and measures promoting renewable energy.
- Significant additional reductions are also expected from policies and measures on combined heat and power (cogeneration) and energy taxation.

Savings from renewable energy policies and measures play a major role, amounting for 62 Mt CO_2-eq. (50 Mt from existing measures and 12 Mt from planned additional measures). The CHP Directive (15 Mt) and the energy taxation Directive (17 Mt) are also expected to contribute significantly to reductions of EU-27 emissions in 2010, as illustrated in Figure 15 below. More information on policies related to renewable energy and CHP is provided in the next section. The directive on energy end-use efficiency and energy services is expected to create 1 % annual savings in the energy industries sector but is quantified by Member States to reduce EU-27 emissions by just over 3 Mt so far. The directive requires Member States to draw up national action plans to achieve 1 % yearly energy savings in the retail, supply and distribution of electricity, natural gas, urban heating, and other energy products including transport fuels.

Figure 15 EU-27 projected greenhouse gas emission savings from key CCPMs in the energy supply sector in 2010



Source: Database on Policies and Measures in Europe (www.oeko.de/service/pam/sector.php) as of 17 July 2008.

A 1.2.2 CO_2 emissions from petroleum refining

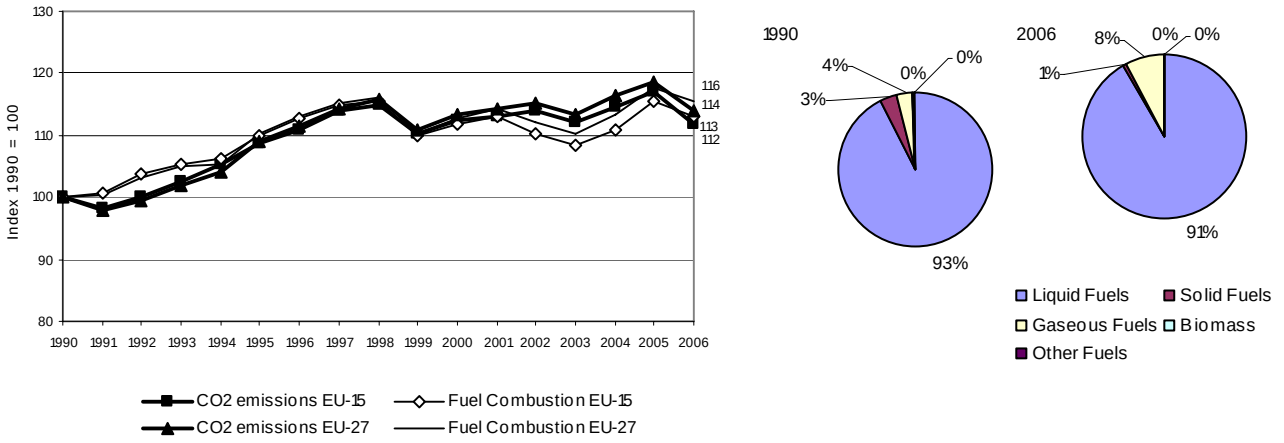
***Definition (IPCC sector 1A1b)**: emissions from all combustion activities supporting the refining of petroleum products. This category does not include evaporative emissions.*

- Between 1990 and 2006, CO_2 emissions from petroleum refining increased significantly, closely following the trend of fuel combustion in this sector (Fig. 16).
- No decoupling between emissions and activity has occurred since the fuel mix, still largely dominated by liquid fuels, did not change significantly (Fig. 16)
- Except in Bulgaria, Czech Republic, Hungary, the Netherlands, Slovenia and the United Kingdom, CO_2 emissions increased in all EU Member States.

CO_2 emission from 1A1b	Share in 1990 total GHG	Share in 2006 total GHG	Change 1990–2006	Change 2000–2006
EU-15	2.5 %	2.9 %	11.8 %	– 0.6 %
EU-27	2.1 %	2.5 %	13.9 %	0.5 %

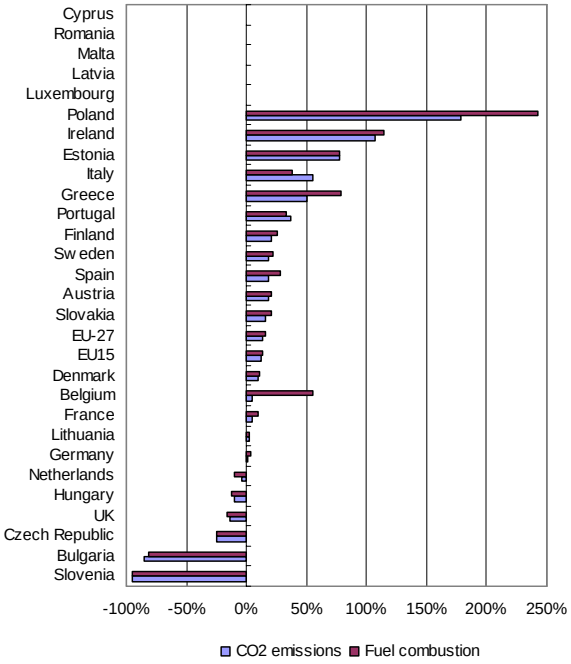
Between 2005 and 2006, fuel combustion and CO_2 emissions from petroleum refining decreased sharply. This decrease seems to be mainly caused by a decline in the overall consumption of oil products and a decline in local production coupled with increasing imports of oil products.

Figure 16 Trend of EU-15 CO_2 and EU-27 CO_2 emissions from petroleum refining and gross value and share of fuels in 1990 and 2006 for the EU-15



Source: EEA, 2008a.

Figure 17 Change of CO_2 emissions and fuel combustion from petroleum refining between 1990 and 2006 for EU-27 Member States



Note: Romania reports emissions under 'Public electricity and heat production'.
The following Member States reported that CO_2 emissions from petroleum refining were not occurring: Latvia, Luxembourg and Malta (1990 and 2006) and Cyprus (2006).

Source: EEA, 2008a.

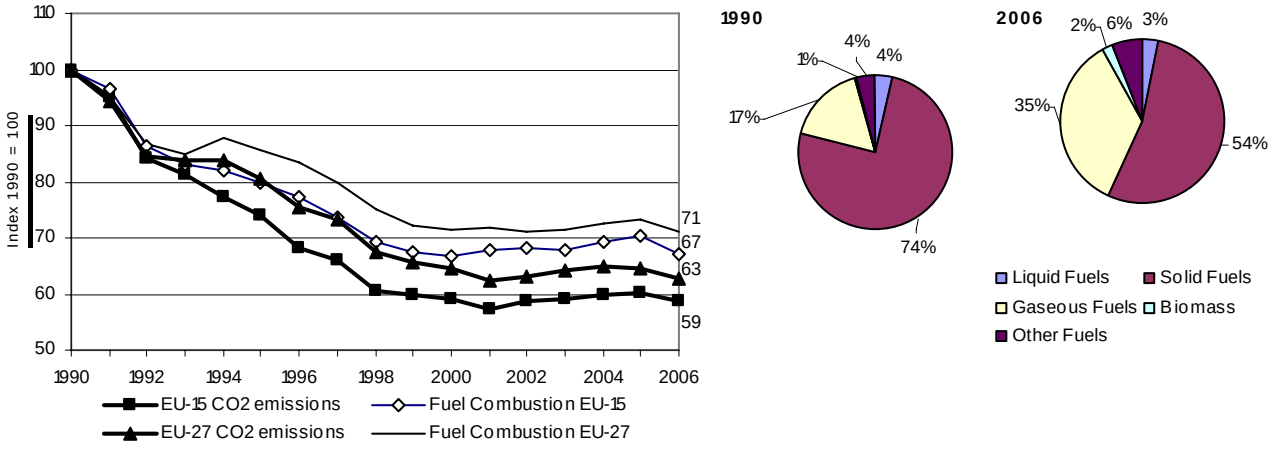
A 1.2.3 CO_2 emissions from the manufacture of solid fuels and other energy industries

***Definition (IPCC sector 1A1c)**: combustion emissions from fuel use during the manufacture of secondary and tertiary products from solid fuels including production of charcoal. This category includes emissions from own on-site fuel use.*

- Between 1990 and 2006, CO_2 emissions from the manufacture of solid fuels and other energy industries were significantly reduced, following the trend in fuel combustion in this sector (Figure 18).
- The decreasing trend in CO_2 emissions stopped in 2000. Emissions have been stable since, at a level 40 % below 1990 levels.
- Fuel switching from solid to gaseous fuels led to further reduction in CO_2 emissions (Figure 18).
- Ten EU-27 Member States show a decrease between 1990 and 2006, but emissions increased by more than 150 % in Denmark and the Slovak Republic (Figure 19).

CO_2 emission from 1A1c	Share in 1990 total GHG	Share in 2006 total GHG	Change 1990–2006	Change 2000–2006
EU-15	2.3 %	1.4 %	– 41.2 %	– 0.8 %
EU-27	1.9 %	1.3 %	– 37.2 %	– 2.9 %

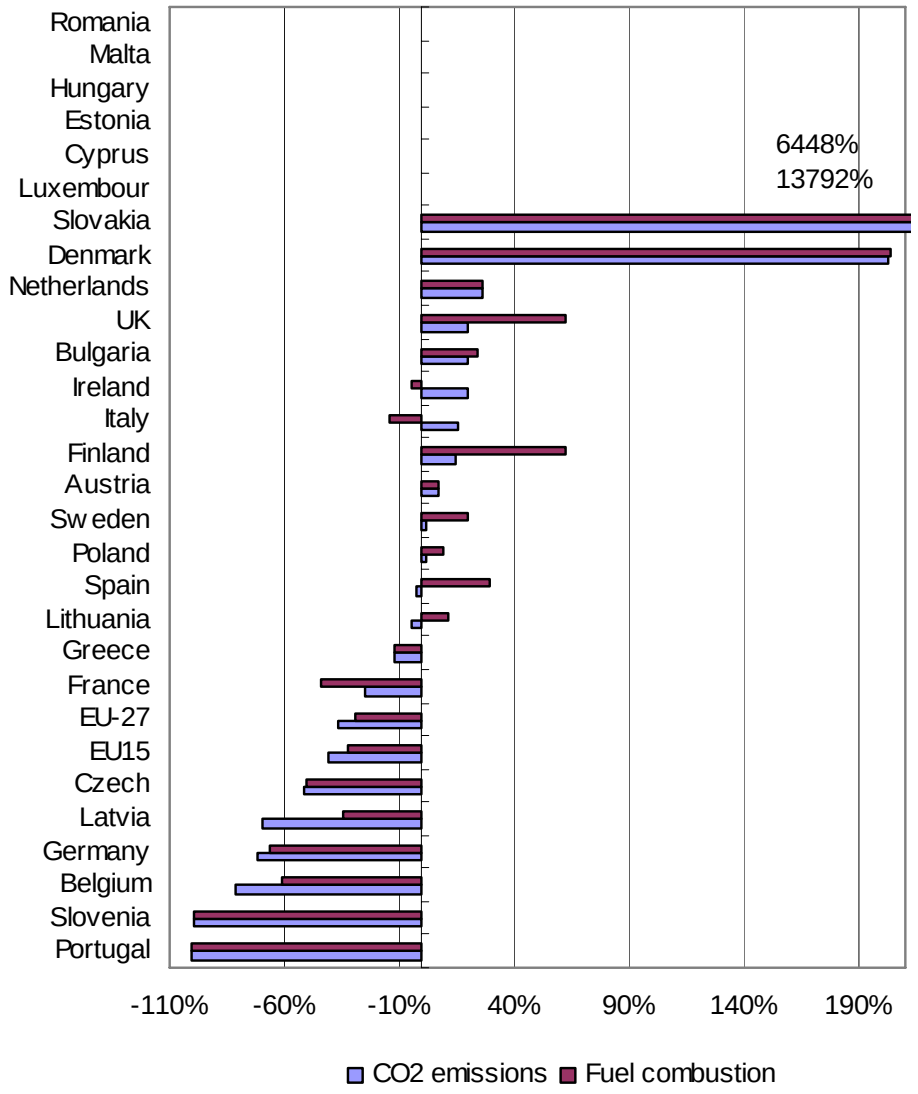
Figure 18 Trend of EU-15 CO_2 and EU-27 CO_2 emissions from manufacture of solid fuels and other energy industries and share of fuels in 1990 and 2006 for the EU-15



Source: EEA, 2008a.

Between 1993 and 1994 combustion of solid fuels increased only slightly while the increase in combustion of gaseous and liquid fuels was more pronounced which led to an increase in total fuel combustion in the EU-27 (Figure 18). In the following years, combustion of solid and liquid fuels decreased more than combustion of gaseous fuels increased in both the EU-15 and EU-27. This led to a decreasing trend in fuel combustion (Figure 18).

Figure 19 Change of CO_2 emissions and fuel combustion from manufacture of solid fuels between 1990 and 2006 for EU-27 Member States



Note: Romania reports emissions under 'Public electricity and heat production'; Hungary includes emissions under 'Chemical industry'.
The following Member States reported that CO_2 emissions from manufacture of solid fuels and other energy industries were not occurring: Cyprus, Estonia, Luxembourg and Malta (1990 and 2006) and Portugal (2006)

Source: EEA, 2008a.

A 1.3 Energy use (excluding transport)

A 1.3.1 CO_2 emissions from energy use in manufacturing industries and construction

Definition (IPCC sector 1A2)*: emissions from combustion of fuels in industry including combustion for the generation of electricity and heat. This category does not include emissions from the energy used for transport by industry, but include emissions arising from off-road and other mobile machinery in industry.*

Key EU policies and measures

- Cogeneration Directive (2004)

Trends

- Between 1990 and 2006, GHG emissions from energy use in manufacturing industries decreased by 12 %. They decreased by 2 % between 2000 and 2006.
- Energy intensity ([4]) in industry decreased by approximately 1.8 % per year over the period 1990–2004 (EEA, 2006b). 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.
- CO_2 emissions increased between 1990 and 2006 in only six EU-27 Member States (Figure 20).
- Data for gross value added in manufacturing industries were provided by only six EU-27 Member States. All these data show that CO_2 emissions were decoupled from gross value added.

CO_2 emission from 1A2	Share in 1990 total GHG	Share in 2006 total GHG	Change 1990–2006	Change 2000–2006
EU-15	14.4 %	12.9 %	– 12.2 %	– 2.2 %
EU-27	14.5 %	12.8 %	– 18.9 %	– 3.6 %

Policies and measures targeting energy use in manufacturing industries

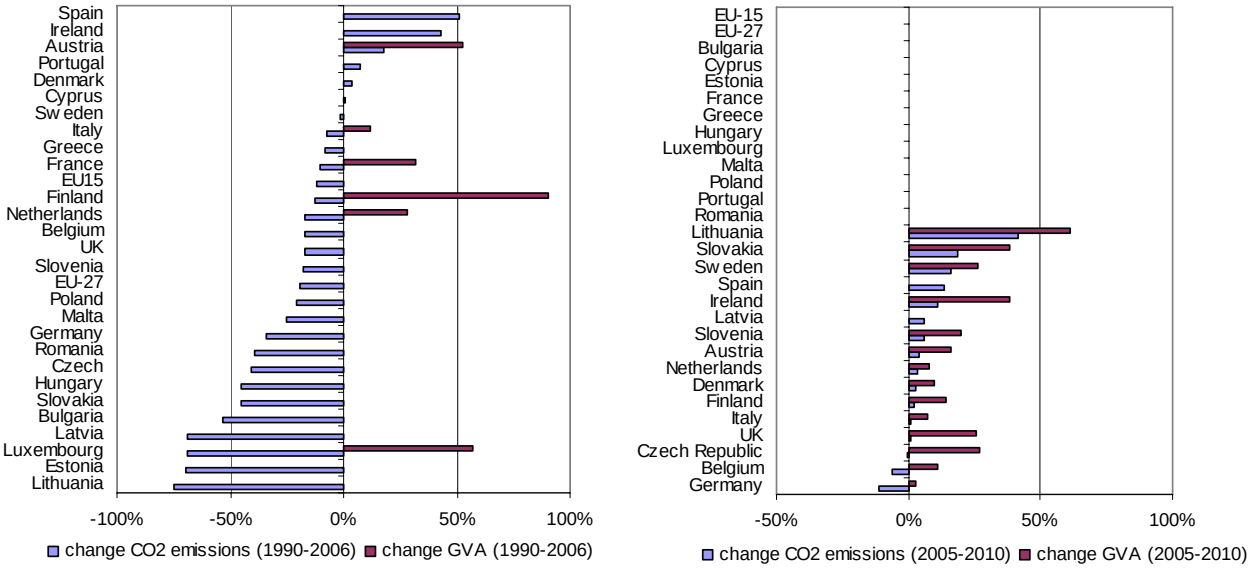
- Specific climate policies and measures contributed only partially to the decrease in energy intensity.
- The promotion of CHP in industry is expected to further reduce energy intensity.

Past reductions in CO_2 emissions from manufacturing industries were due to a decrease in energy intensity (ratio of energy use to value added) of industry by an average of 1.8 % per year over the period 1990–2004 (EEA, 2006b). 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

([4]) Energy intensity: ratio of energy use to value added.

improvement in energy intensity is projected to continue or to 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.

Figure 20 Change of CO_2 emissions from fossil fuel consumption in industry and gross values added of industry between 1990–2006 and 2005–2010 (Projected Indicator N°4)



Note: Comparisons of absolute intensities are only of limited significance as data are not always consistent across countries.

Source: EEA, 2008a, Eurostat, Member States' submissions

A 1.3.2 CO_2 emission from energy use and processes for iron and steel production

Definition (IPCC sector 1A2a)*: emissions from combustion of fuels in the iron and steel industry including combustion for the generation of electricity and heat.*

Definition (IPCC sector 2C1)*: by-product or fugitive greenhouse gas emissions from industrial processing of iron and steel products*

- EU-15 CO_2 emissions from iron and steel production decreased by 13 % between 1990 and 2006 and by 2 % between 2000 and 2006.
- This was mainly due the increasing share of electric processing in steel production, while the share of integrated steelworks has been decreasing.
- Emissions and gross value added have been decoupling since the late 1990s.

CO_2 emissions from iron and steel production are split between:

- process-related emissions, accounted for in the category Sector 2 'Industry',
- combustion-related emissions, accounted for in the category Sector 1 'Energy'.

As the boundary between energy and process related emissions is not uniformly interpreted in individual Member States, this chapter deals with both – combustion (1A2a) and process (2C1) related emissions.

CO_2 emissions	Share in 1990 total GHG	Share in 2006 total GHG	Change 1990–2006	Change 2000–2006
2C1 (process)				
EU-15	1.7 %	1.6 %	– 8.1 %	2.2 %
EU-27	1.9 %	1.7 %	– 15.1 %	6.1 %
1A2a (combustion)				
EU-15	2.8 %	2.4 %	– 16.6 %	– 5.0 %
EU-27	2.7 %	2.4 %	– 18.9 %	– 4.4 %
Total iron and steel industry				
EU-15	4.5 %	3.9 %	– 13.3 %	– 2.2 %
EU-27	4.6 %	4.1 %	– 17.3 %	– 0.2 %

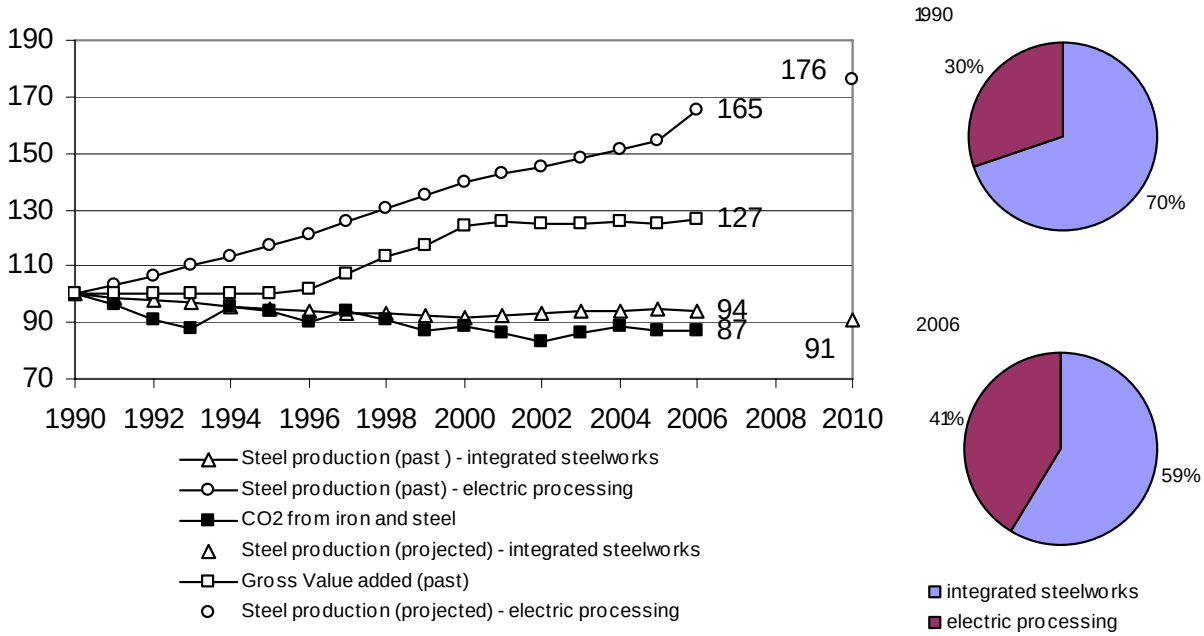
In 2006, energy-related CO_2 emissions and process-related CO_2 emissions contribute each 2 % to total EU-15 GHG emissions. Emissions depend partly on the method of processing (integrated steelworks or electric processing), whereby electric processing causes less direct emissions in the specific category. Emissions also depend on the fuels used for combustion. In 1990 73.5 % of the fuels used for combustion in iron and steel production were solid fuels. In 2006 the share of solid fuels decreased 66.95 %. In the same time the share of gaseous fuels increased (18.4 % in 1990 and 26.3 % in 2006). This switch from solid to gaseous fuels contributes to the reduction of energy-related CO_2 emissions in iron and steel production.

Since 2001, CO_2 emissions from iron and steel have been relatively stable while:

- steel production from electric processing has been steadily increasing;
- steel production from integrated steelworks has been stable.

This indicates a decoupling between steel production from electric processing and related CO_2 emissions, due to efficiency improvements in the steel production process and in electricity generation by the steel industry.

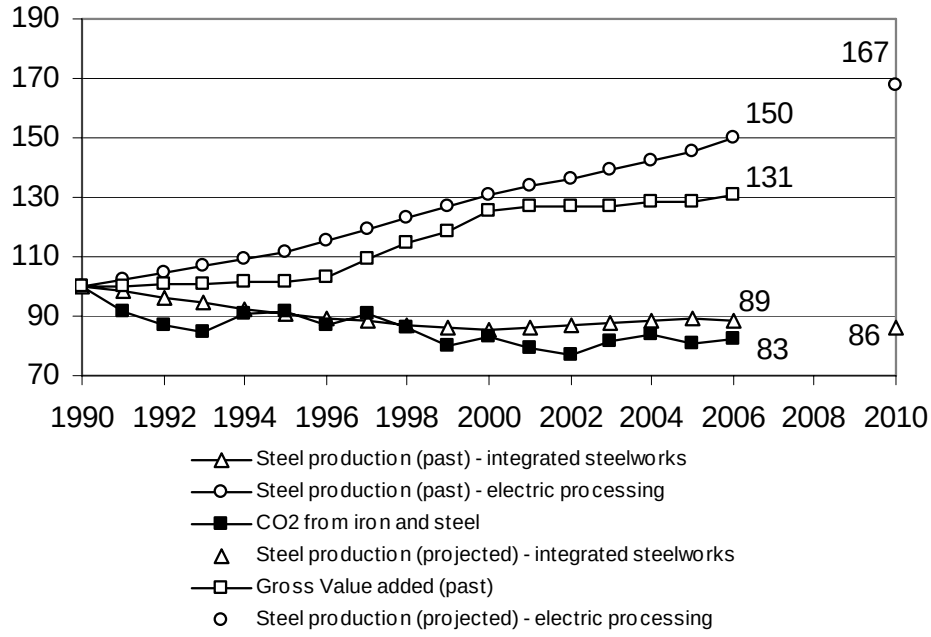
Figure 21 Trend of CO_2 emissions, steel production and gross value added for EU-15 Member States and share of fuels in 1990 and 2006



Source: EEA, 2008a, PRIMES, Eurostat

The emission trend in the EU-27 is similar to the EU-15 and shows decreasing CO_2 emissions while gross value added and electric processing of steel is increasing.

Figure 22 Trend of CO_2 emissions, steel production and gross value added EU-27 Member States



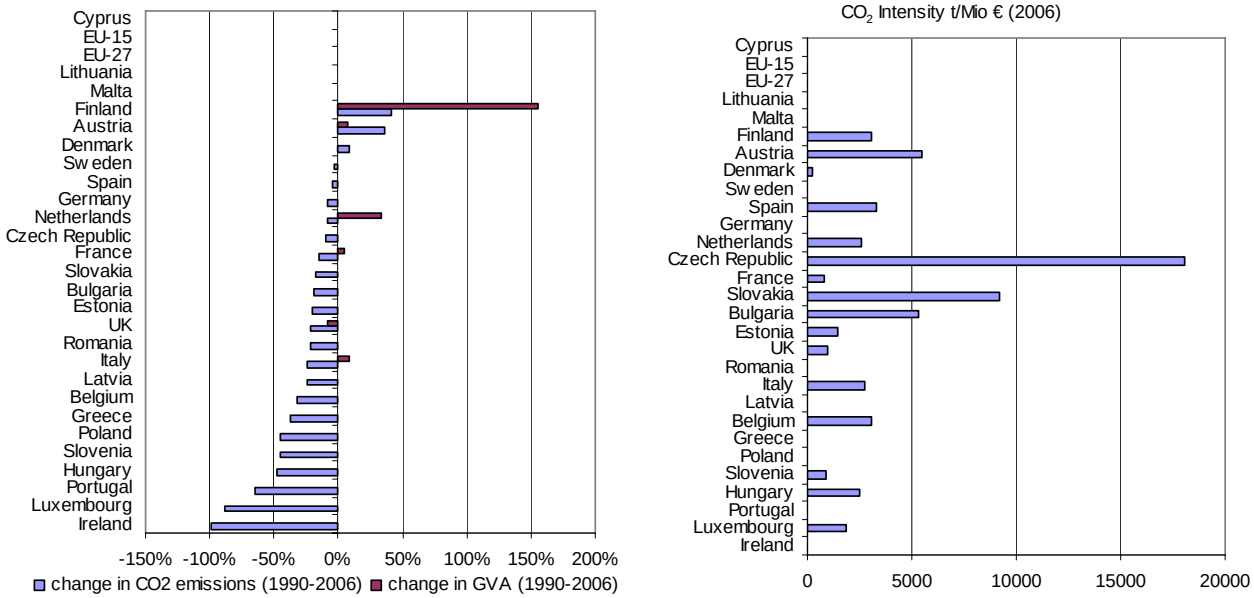
Source: EEA, 2008a, PRIMES, Eurostat

Total CO_2 intensity and specific CO_2 emissions in the iron and steel industry (additional priority indicators 2 and 5)

- In 21 of the 24 Member States for which data are available, CO_2 emissions in the iron and steel industry decreased between 1990 and 2006.
- Approximately half of the Member States reported sufficient data allowing indicators assessment.

Seventeen Member States reported both nominator and denominator in 2006 for the calculation of CO_2 intensity in the steel industry ([5]) (Figure 23). In 13 countries, the resulting intensity is below 5 000 t CO_2 per EUR million of gross value added (Figure 23). For some countries (e.g. Denmark and Slovenia), the denominator may include more activities than for other countries, because no disaggregated information is available.

Figure 23 CO_2 intensity - iron and steel industry per gross value added, t/EUR million (change 1990–2006; absolute intensity) (Additional Priority Indicator N°2)



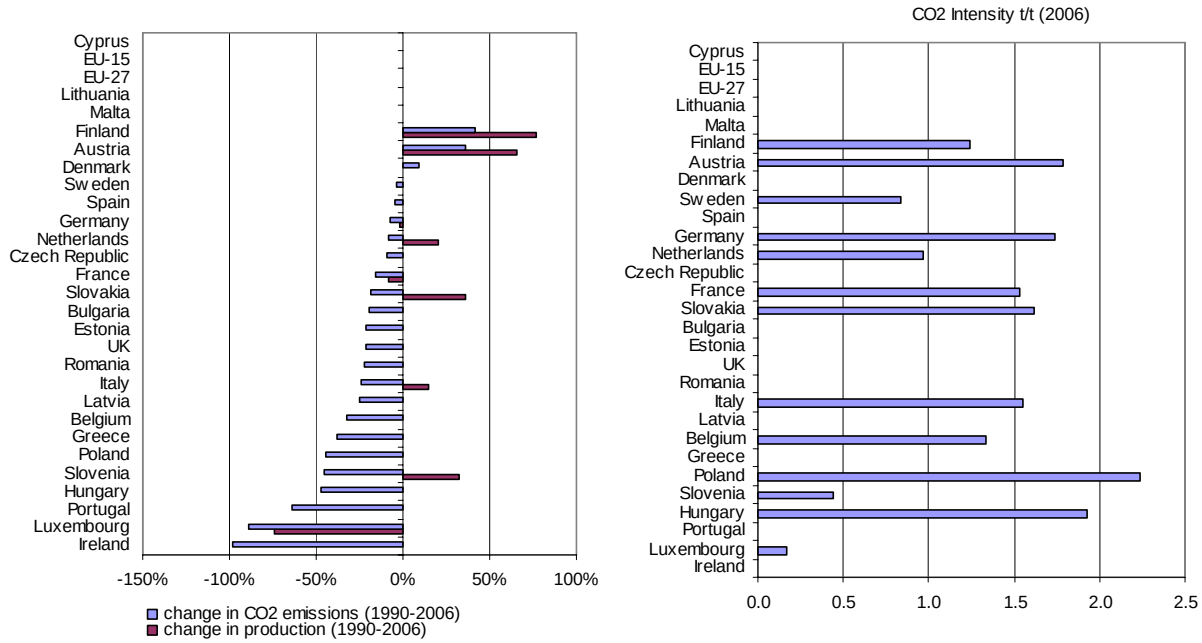
Note: Comparisons of absolute intensities are only of limited significance as data are not always consistent across countries.
Cyprus, Lithuania and Malta do not produce iron and steel.
Source: Member States' submissions

The reporting of Member States regarding CO_2 emissions from the iron and steel industry per unit of oxygen steel produced (additional priority indicator N°5) is substantially incomplete to allow meaningful EU-wide comparison. For Slovenia the value for gross value added includes non-ferrous metal industry. This might cause the low CO_2 intensities (Fig. 23). Austria, Finland, Slovakia and Slovenia had a strong increase in steel production between 1990 and 2006 (Figure 24).

([5]) Ratio of total CO_2 emissions by gross value added in the iron and steel industry.

In Luxembourg the value for production of oxygen steel also includes sinter, pig iron and electric arc furnace production. This explains the low CO_2 intensity in Luxembourg (Fig. 24).

Figure 24 CO_2 intensity - iron and steel industry per production of oxygen steel, t/t (change 1990–2006; absolute intensity) (Additional Priority Indicator N°5)



Note: Comparisons of absolute intensities are only of limited significance as data are not always consistent across countries. In Estonia (1990–2006) and Lithuania (2004–2006) production of oxygen steel is not occurring. In Bulgaria (2006), Latvia (1999–2006) and Spain (1990–2006) production of oxygen steel is confidential.

Source: Member States' submissions

A 1.3.3 CO_2 emissions from energy use in the chemical industry

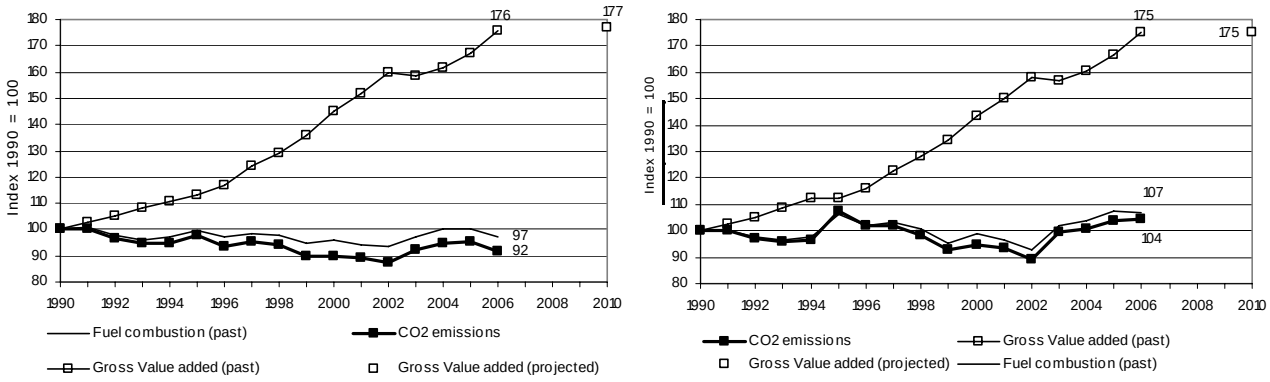
***Definition (IPCC sector 1A2c)**: emissions from combustion of fuels in the chemical industry (production of ammonia, nitric acid, adipic acid, carbides, etc.) including combustion for the generation of electricity and heat.*

- Between 1990 and 2006, EU-15 CO_2 emissions from chemical industry (combustion and process) decreased by 2 %, but have increased recently (+3 % between 2000 and 2006).
- While gross value added has been constantly increasing since 1990 (except in 2003), the amount of fuel combusted by the chemical industry and the related CO_2 emissions have decreased during the same period (Figure 25).
- The emission trend is closely linked to the amount of fuel combusted (Figure 25), which indicates that overall in the EU, this industry is reducing its energy intensity.

	Share in 1990 total GHG	Share in 2006 total GHG	Change 1990–2006	Change 2000–2006
CO_2 emission from 1A2c (combustion)				
EU-15	1.7 %	1.6 %	– 8.2 %	1.9 %
EU-27	1.5 %	1.7 %	4.2 %	10.1 %
CO_2 emissions from 2B (process)				
EU-15	0.7 %	0.8 %	12.7 %	3.6 %
EU-27	0.7 %	0.8 %	2.6 %	3.3 %
Total CO_2 emissions from chemical industry				
EU-15	2.3 %	2.3 %	– 2.3 %	2.5 %
EU-27	2.3 %	2.5 %	3.7 %	7.9 %

The CO_2 emissions from the chemical industry contributed (combustion and process) with 2 % to the total EU-15 GHG emissions. This share was the same in 2006 and 1990.

Figure 25 Trend of CO_2 emissions, fuel combustion of the chemical industry and gross values added for EU-15 Member States



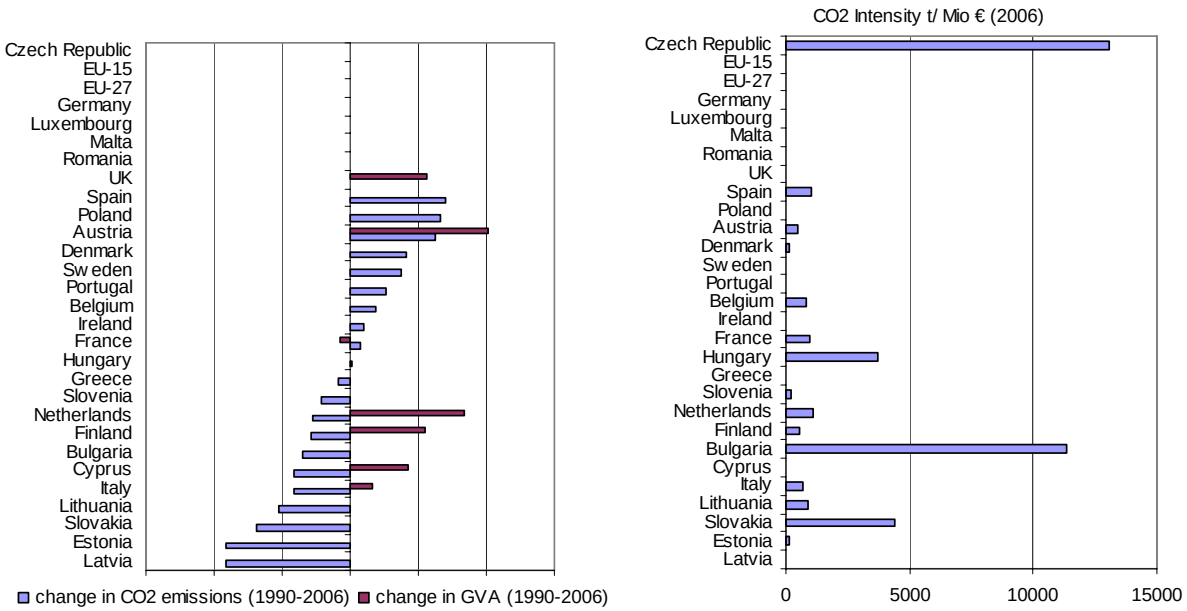
Source: EEA 2008a, PRIMES, Eurostat

Energy-related CO_2 intensity of the chemical industry (additional priority indicator 3)

- Energy-related CO_2 intensity in the chemical industry shows large differences among Member States for which data are available.

Additional Priority Indicator N°3 expresses the ratio between CO_2 emissions from combustion of fossil fuels in manufacture of chemicals and chemical products and the gross value added in this industry branch. It was only possible for six countries to show the change of CO_2 emissions and gross value added between 1990 and 2006 (Fig. 26). France is the only Member State to report that gross value added decreased while CO_2 emissions increased. Bulgaria, Czech Republic; Slovak Republic and Hungary show a much higher CO_2 intensity compared to other countries (Fig. 26).

Figure 26 Energy related intensity - chemical industry, t/Mio EUR, (change 1990–2006; absolute intensity) (Additional Priority Indicator N°3)



Note: Comparisons of absolute intensities are only of limited significance as data are not always consistent across countries. The Czech Republic (1990–2002), Romania and the United Kingdom include emissions under source category 1A2f 'other'. In Luxembourg and Malta (1990–2004) chemical industry is not occurring.

Source: Member States' submissions

A 1.3.4 CO_2 emissions from energy use in the pulp, paper and print industry

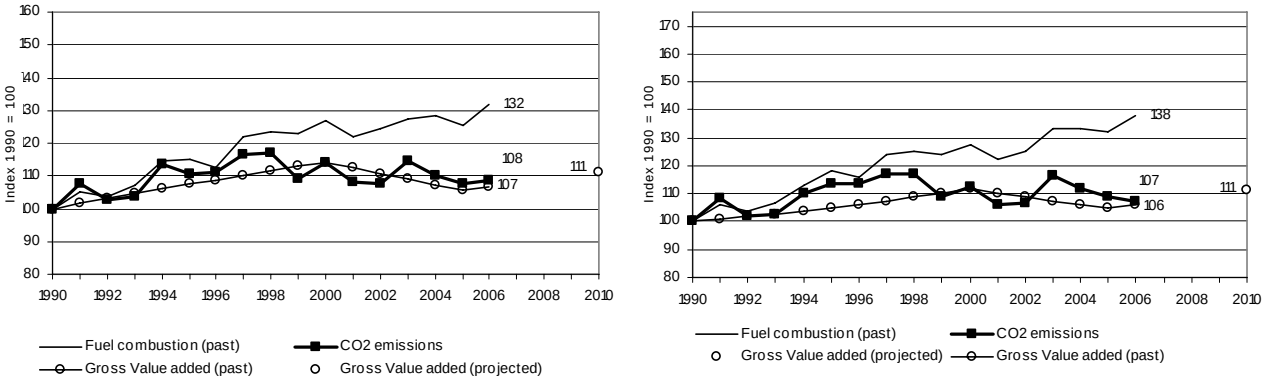
Definition (IPCC sector 1A2d)*: emissions from combustion of fuels in the pulp, paper and print industry including combustion for the generation of electricity and heat.*

- Between 1990 and 2006, CO_2 emissions from pulp, paper and print increased by 8 %, but they have decreased remarkably in the EU-15 since 2003 (– 5 % between 2000 and 2006).
- A shift from solid and liquid fuels to gas and biomass led to partial decoupling of CO_2 emissions from fuel combustion in the pulp, paper and print industry.

CO_2 emission from 1A2d	Share in 1990 total GHG	Share in 2006 total GHG	Change 1990–2006	Change 2000–2006
EU-15	0.6 %	0.7 %	8.4 %	– 5.0 %
EU-27	0.5 %	0.6 %	7.4 %	– 4.2 %

CO_2 emissions from pulp, paper and print industry account for 0.7 % of the total EU-15 emissions in 2006. Although the fuel combustion is increasing (+32 % in the EU-15 between 1990 and 2006), CO_2 emissions increased by only 8 % in the EU-15 and 7 % in the EU-27 (Fig. 27). This was mainly due to a shift from liquid and solid fuels to gas and biomass.

Figure 27 Trend of CO_2 emissions, energy demand of the pulp, paper and print industry and gross values added for EU-15 (left) and EU-27 (right)



Source: EEA 2008a, PRIMES, Eurostat

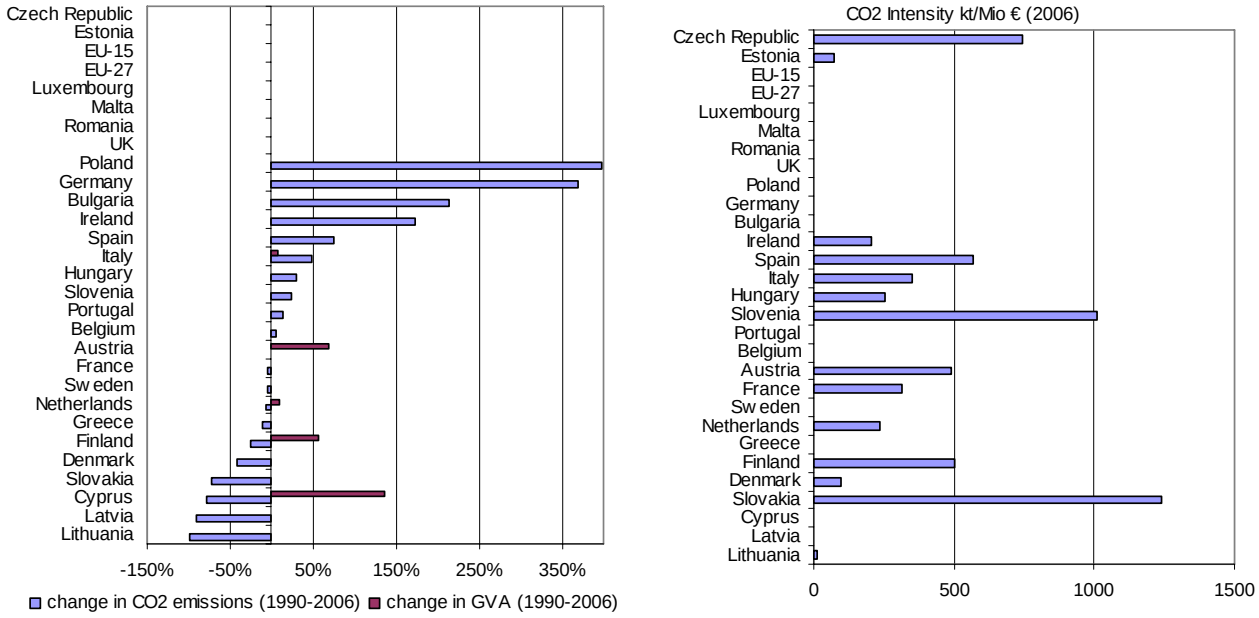
Energy-related CO_2 intensity in the paper and printing industry and specific energy-related CO_2 emissions of the paper industry (supplementary indicators 6 and 13)

- Bulgaria and Cyprus show exceptionally low energy-related CO_2 intensity in the paper and printing industry.

Two supplementary indicators (N°6 and N°13) show CO_2 intensities for the paper industry.

Supplementary Indicator N°6 compares CO_2 emissions with gross value added. The change of gross value added between 1990 and 2006 can only be shown for six countries (France reports a change of 0 % and therefore no bar is visible in the graph) (Figure 28).

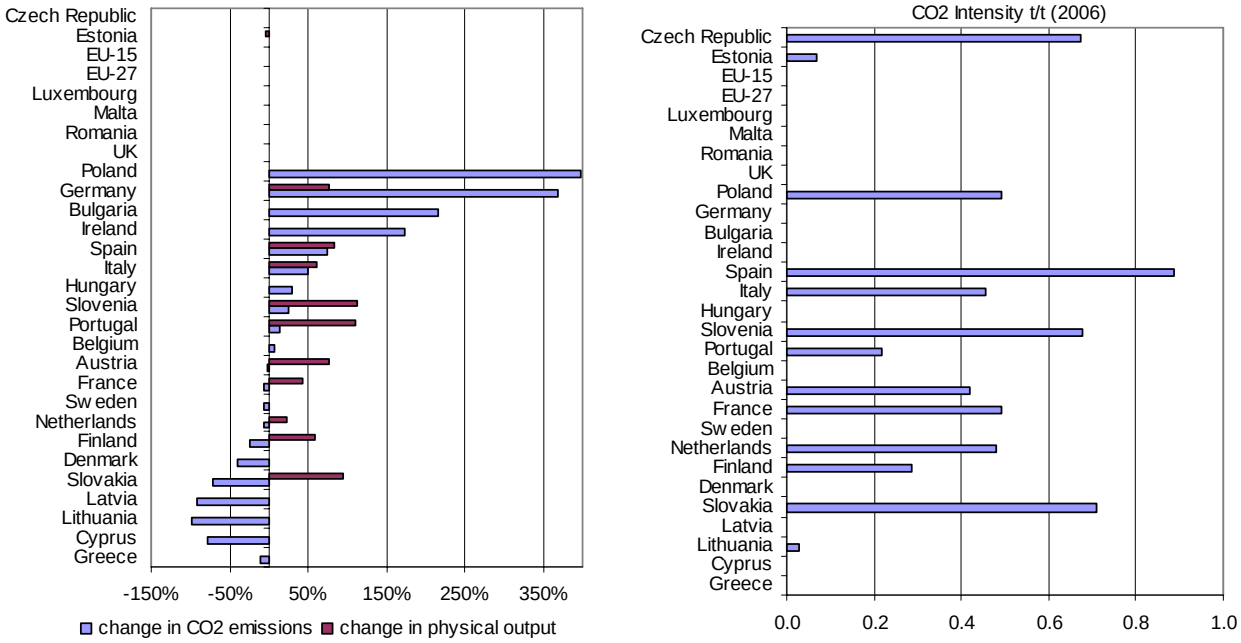
Figure 28 Energy related intensity – pulp, paper and print industry, t CO_2 / Mio EUR, (change 1990–2006; absolute intensity) (Supplementary Indicator N°6)



Note: Comparisons of absolute intensities are only of limited significance as data are not always consistent across countries.
Romania and the United Kingdom include emissions under source category 1A2f 'other'. Germany includes only emissions from other fuels. Estonia (1990, 1991, 1996), Luxembourg (1990–2006) and Malta (1990–2004) report emissions as not occurring.
Source: Member States' submissions

Supplementary Indicator N°13 shows the specific energy related CO_2 emissions of paper industry. Of the ten countries that reported both, change in CO_2 emissions from pulp, paper and print industry and physical output of paper in 1990 and 2006 five countries reported decreasing emissions and increasing physical output (Figure 29).

Figure 29 Specific energy related CO_2 emissions of the paper industry, t/t, (change 1990–2006; absolute intensity) (Supplementary Indicator N°13)



Note: Comparisons of absolute intensities are only of limited significance as data are not always consistent across countries. Estonia (1990, 1991, 1996), Luxembourg (1990–2006) and Malta (1990–2004) report emissions as not occurring. The physical output of paper is confidential in Ireland and Luxembourg.

Source: Member States' submission

A 1.3.5 CO_2 emissions from energy use in the food-processing, beverages and tobacco industry

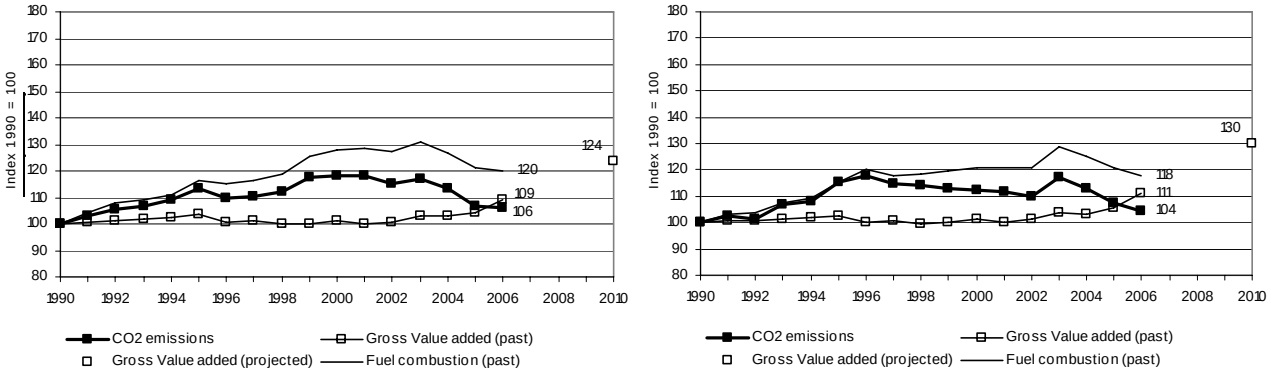
***Definition (IPCC sector 1A2e)**: emissions from combustion of fuels in the food-processing, beverages and tobacco industry including combustion for the generation of electricity and heat.*

- Between 1990 and 2006, CO_2 emissions increased by 6 %, but they decreased by 11 % between 2000 and 2006.
- A decoupling between activity in the food processing, beverages and tobacco industry and related CO_2 emissions can be observed in the EU-15 and the EU-27 (Figure 30).

CO_2 emission from 1A2e	Share in 1990 total GHG	Share in 2006 total GHG	Change 1990–2006	Change 2000–2006
EU-15	0.8 %	0.9 %	5.9 %	– 10.5 %
EU-27	0.8 %	0.9 %	4.2 %	– 7.2 %

CO_2 emissions and fuel combustion show similar trends, between 1990 and 2006 both in the EUf5 and in the EU-27 (Figure 30). It is projected that the gross value added will increase in the EU-15 and the EU-27 until 2010 (Figure 30).

Figure 30 CO_2 emissions, energy demand and gross value added in the food-processing, beverages and tobacco industry in the EU-15 and EU-27

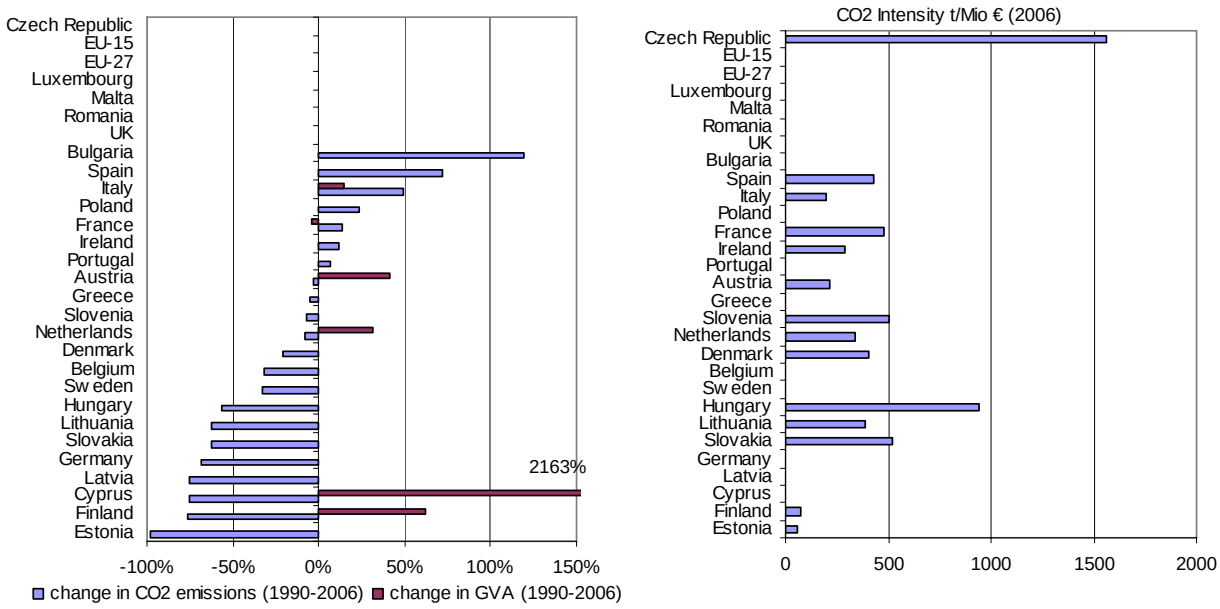


Source: EEA 2008a, PRIMES, Eurostat

Energy-related CO_2 intensity in the food, drink and tobacco industry (supplementary indicator 5)

Supplementary Indicator N°5 shows the energy-related CO_2 intensity of the food, drink and tobacco industry by comparing CO_2 emissions with gross value added. Between 1990 and 2006, CO_2 emissions decreased in most Member States. Major increases were only reported by Bulgaria, Italy and Spain (Figure 31). The change of gross value added between 1990 and 2006 can only be shown for six countries. Cyprus reports an exceptionally high increase in gross value added in the food, drink and tobacco industry (Figure 31).

Figure 31 Energy-related intensity – food, drink and tobacco industry, t CO_2 / EUR million (Supplementary Indicator N°5)



Note: Comparisons of absolute intensities are only of limited significance as data are not always consistent across countries.
Romania and the United Kingdom include emissions under source category 1A2f 'other'. Luxembourg reports emissions as not occurring. The Czech Republic (1990–2002), Luxembourg (1990–2006) and Malta (1990–2004) report emissions as not occurring.

Source: Member States' submission

A 1.3.6 CO_2 emissions from energy use in other industries

***Definition (IPCC sector 1A2f)**: emissions from combustion of fuels in all industries other than iron, steel, non-ferrous metals, chemicals, pulp, paper, print, food processing, beverage and tobacco (presented in categories 1A2a, 1A2b, 1A2c, 1A2d and 1A2e) and other than agriculture, forestry and fisheries (presented in category 1A4c – see next section).*

- In the EU-15, CO_2 emissions and fuel combustion from this source category have been relatively stable since 1998. Some decoupling between emissions and combustion can be observed since 2000.

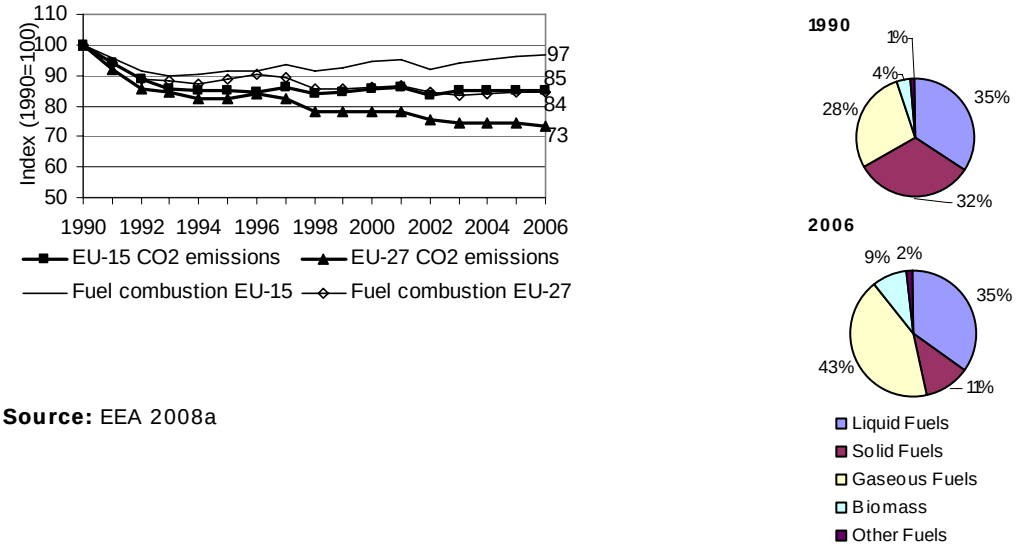
CO_2 emission from 1A2f	Share in 1990 total GHG	Share in 2006 total GHG	Change 1990–2006	Change 2000–2006
EU-15	8.4 %	7.3 %	– 14.8 %	– 0.7 %
EU-27	8.7 %	6.9 %	– 26.7 %	– 5.9 %

Some countries report in this category also emissions from the above mentioned industry branches when they cannot allocate the emissions to these specific branches (e.g. United Kingdom, Romania). For this reason, comparisons of emissions between countries have to be undertaken with care and consideration of national circumstances.

The CO_2 emissions of this source category contributed in 2006 with 7 % to the total EU-15 GHG emissions. CO_2 emissions decreased between 1990 and 2006 by 15 %. The decrease in emissions is partly due to the fuel shift, from solid to gaseous fuels (Fig. 32). The decrease observed on the trend for the EU-27 emissions is even higher and amounts to 27 % (Figure 32).

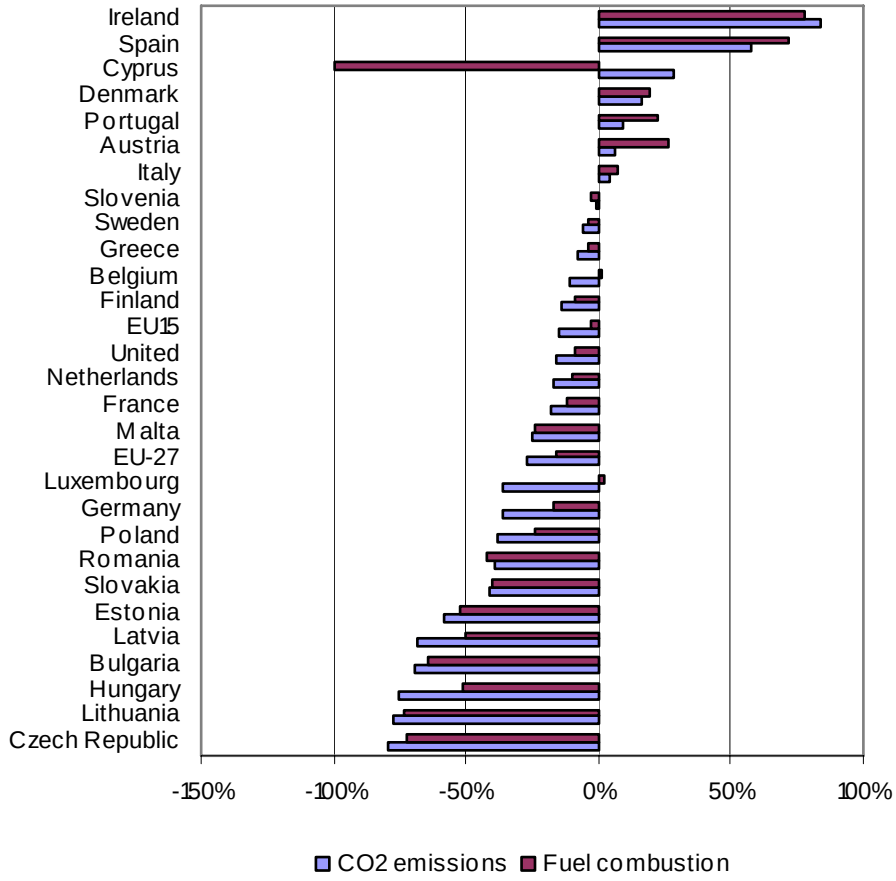
In seven Member States (thereof only one EU-12 Member State), emissions increased while in the majority of countries CO_2 emissions from this source category decreased (Figure 33).

Figure 32 EU-15 and EU-27 CO_2 emissions of other manufacturing industries and share of fuels for the EU-15, 1990–2006



Source: EEA 2008a

Figure 33 Change of CO_2 emissions and fuel combustion from other manufacturing industries between 1990 and 2006 for EU-27 Member States

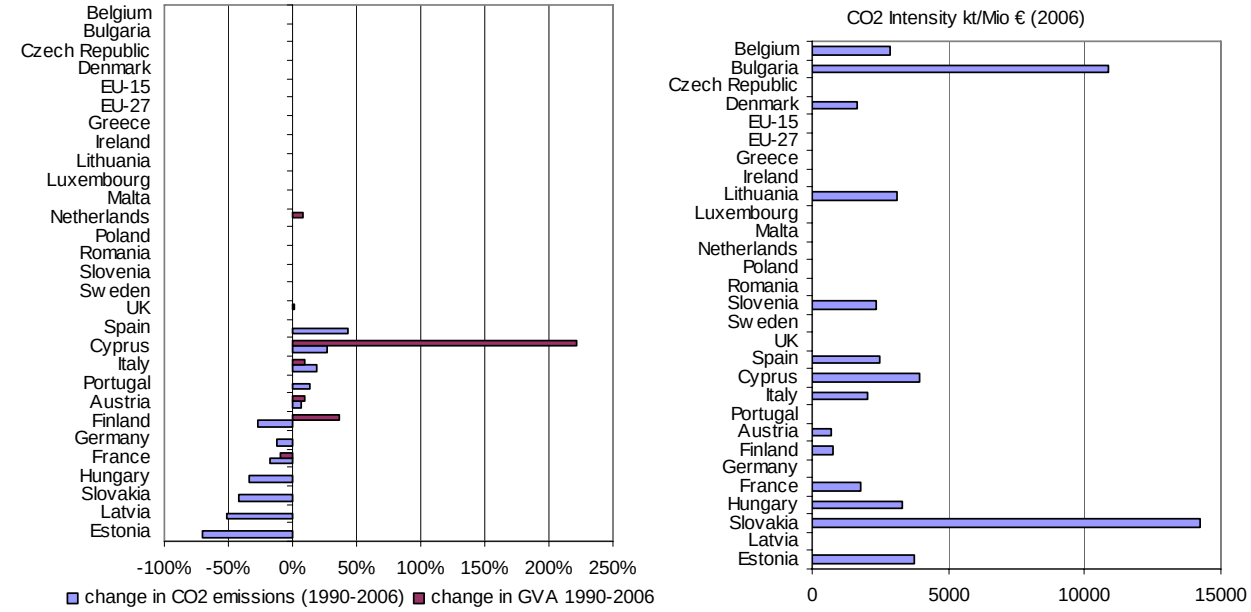


Source: EEA 2008a

Energy-related CO_2 intensity of the glass, pottery and buildings materials industry and of the cement industry (additional priority indicators N°4 and 6)

The Additional Priority Indicator 4 depicts the ratio of energy related CO_2 emissions from the glass, pottery and buildings materials industry and gross value added from mineral products. Seven Member States report decreasing emissions between 1990 and 2006 (Figure 34). For Spain emissions from plaster production; cement production, lime production (except lime production in paper and steel industries), glass production (including frits), brick and tiles, fine ceramic materials, and emissions from combustion (boilers, gas turbines, stationary engines) in the manufacture of non-metallic mineral products industry are included. In Denmark the energy related CO_2 emission is only related to consumption of fossil fuels at the production site.

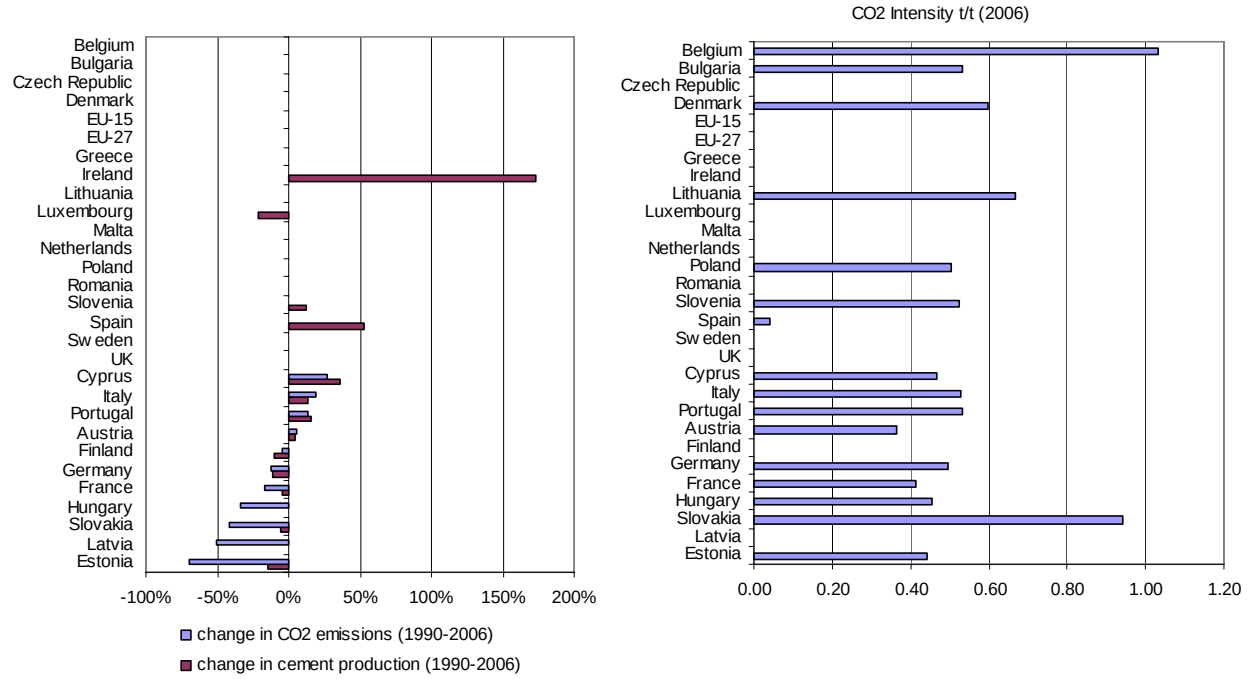
Figure 34 Specific energy-related CO_2 emissions and gross value added of mineral products (t CO_2/t) between 1990 and 2006 (change 1990–2006; absolute intensity) (Additional Priority Indicator N°4)



Note: Comparisons of absolute intensities are only of limited significance as data are not always consistent across countries.
Source: Member States' submissions

The Additional Priority Indicator 6 depicts the ratio of energy-related CO_2 emissions from the glass, pottery and buildings materials industry and cement production. Eleven countries report CO_2 emissions of cement industry. Seven countries report decreasing CO_2 emissions (Figure 35).

Figure 35 Change of specific energy-related CO_2 emissions of cement industry ($t\ CO_2/t$) between 1990 and 2006 (change 1990–2005; absolute intensity) (Additional Priority Indicator N°6)



Note: Comparisons of absolute intensities are only of limited significance as data are not always consistent across countries. . In Latvia cement production is confidential (1999–2006).
Source: Member States' submissions

For Spain, cement production corresponds to nationally produced clinker only and excludes imported clinker. In Denmark, energy-related CO_2 emissions are only related to consumption of fossil fuels at the production site.

A 1.3.7 CO_2 emissions from energy use in agriculture, forestry, fisheries

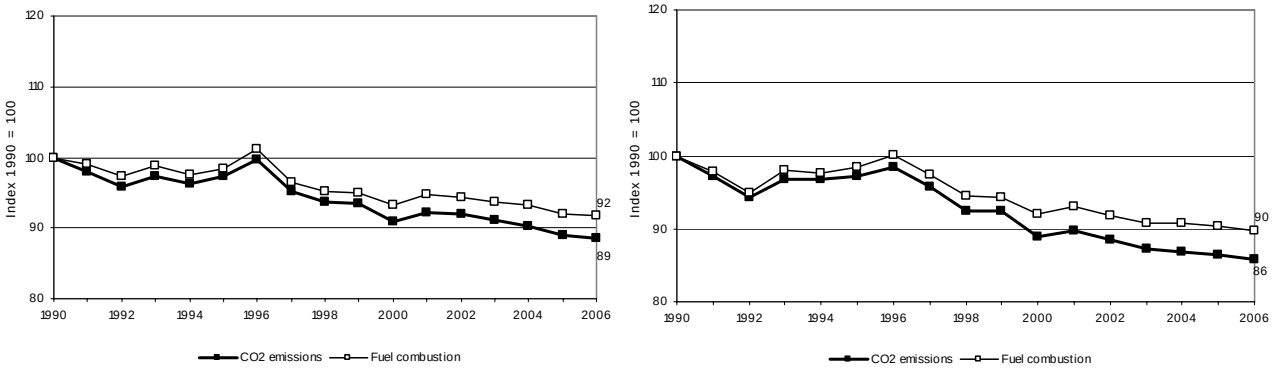
***Definition (IPCC sector 1A4c)**: emissions from fuel combustion in agriculture, forestry, or domestic inland, coastal and deep-sea fishing. This includes traction vehicles, pump fuel use, grain drying, horticultural greenhouses and other agriculture, forestry or fishing related fuel use.*

- Between 1990 and 2006, EU-15 CO_2 emissions from energy use in agriculture, forestry and fisheries decreased by 11 %, due to decreasing fuel use.

CO_2 emission from 1A4c	Share in 1990 total GHG	Share in 2006 total GHG	Change 1990–2006	Change 2000–2006
EU-15	1.7 %	1.5 %	– 11.4 %	– 2.5 %
EU-27	1.6 %	1.5 %	– 14.2 %	– 3.5 %

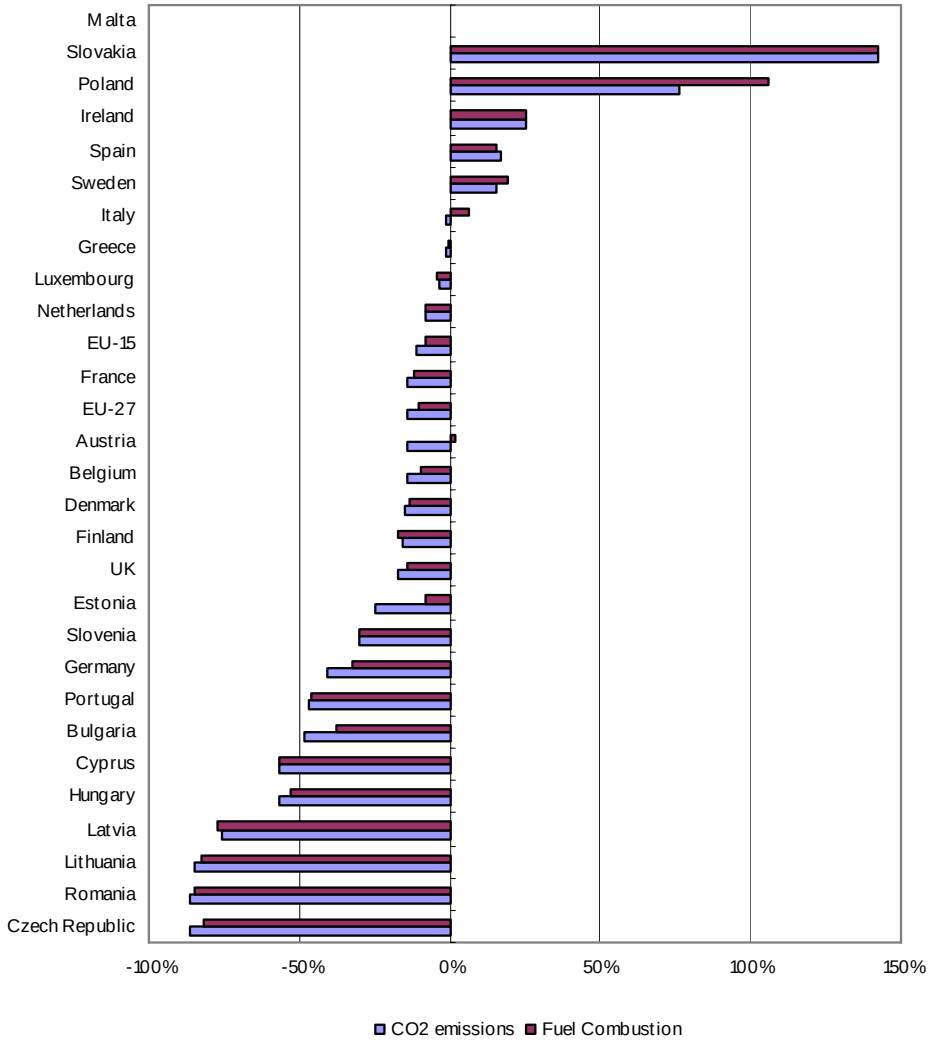
Between 1990 and 2006, CO_2 emissions and the amount of fuel combusted have decreased in most countries (Figure 37). Changes in CO_2 emissions and fuel combustion were tightly coupled in the EU-15 and the EU-27 (Figure 36). Changes in CO_2 emissions and fuel combustion were also tightly coupled for individual Member States, except in Austria, Bulgaria, Estonia, Italy, and Poland (Figure 37).

Figure 36 CO_2 emissions and fuel combustion in agriculture in the EU-15 (left) and EU-27 (right)



Source: EEA 2008a

Figure 37 Change of CO_2 emissions and fuel combustion between 1990 and 2006 for EU-27 Member States



Source: EEA 2008a

A 1.3.8 CO_2 emissions from energy use in services

***Definition (IPCC sector 1A4a)**: emission from fuel combustion in commercial and institutional buildings.*

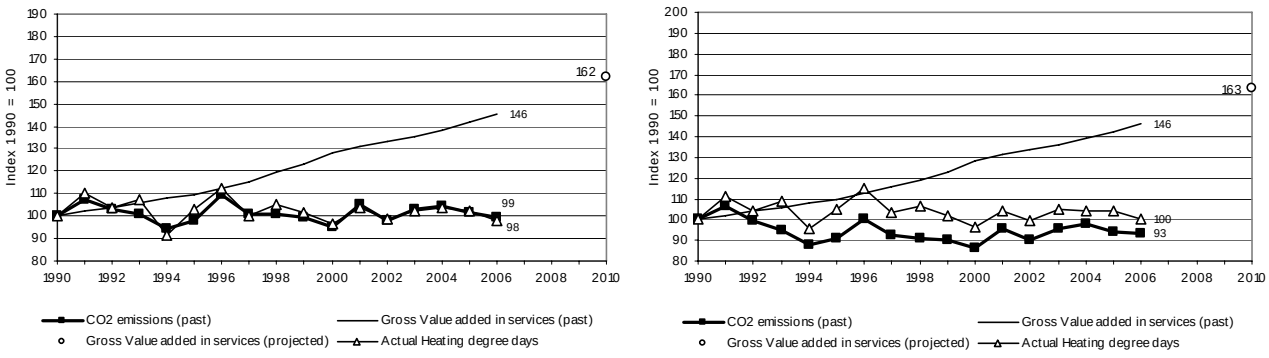
- Between 1990 and 2006, CO_2 emissions from energy use in services in the EU-15 decreased by 1 %.
- In all Member States that reported increasing emissions except Slovenia, emissions increased less than fuel combustion, which indicates that fuel switching has occurred.

CO_2 emission from 1A4a	Share in 1990 total GHG	Share in 2006 total GHG	Change 1990–2006	Change 2000–2006
EU-15	3.8 %	3.9 %	– 0.9 %	4.0 %
EU-27	3.6 %	3.6 %	– 7.1 %	7.3 %

CO_2 emissions from commercial and institutional buildings have a share of 4 % of total EU-15 GHG emissions in 2006. The trends observed in the EU-15 and in the EU-27 are similar. CO_2 emissions follow very closely the annual variations of heating degree days (Figure 38). For example, an increase in emissions from one year to another can be explained by colder weather, which results in a higher number of heating degree days. However, long term trends of CO_2 emissions depend also on other factors, such as the number of commercial and institutional buildings and the type of fuel used.

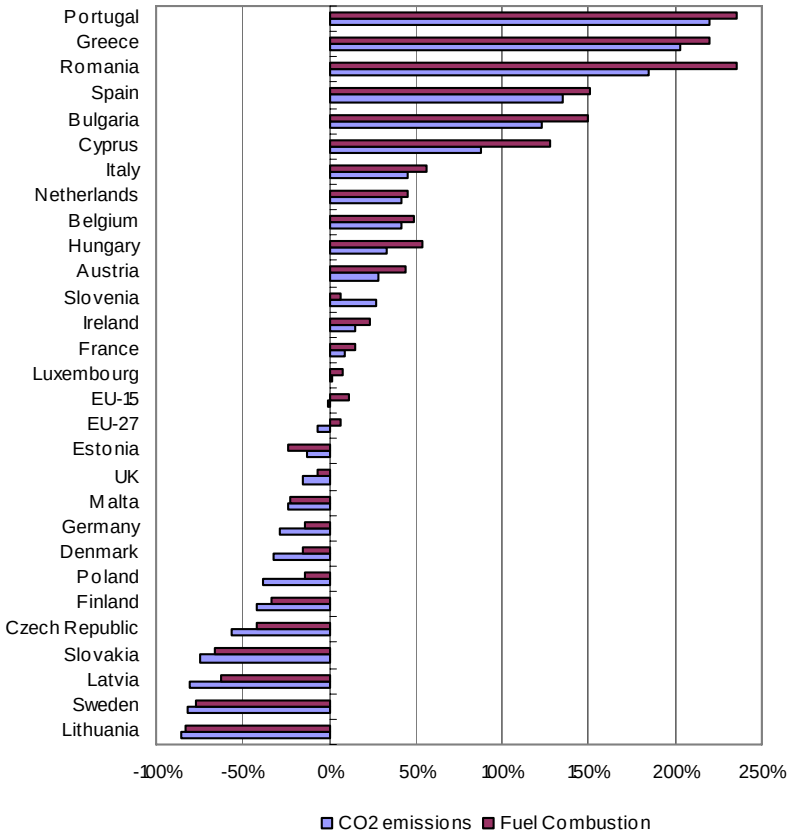
In the EU-15, the share of solid fuels in total fuel consumption decreased from 12 % in 1990 to 1 % in 2006 and the share of liquid fuels declined from 42 % to 29 %, the share of gaseous fuels increased from 44 % to 66 % (data not shown). This fuel shift can mainly explain why emissions from services have remained relatively stable between 1990 and 2006, while gross value added has been steadily increasing since 1990. In addition, as services do not represent an energy-intensive sector of the economy, gross value added depends little on energy use.

Figure 38 CO_2 emissions from energy use in services, gross value added of services and heating degree days in the EU-15 (left) and EU-27 (right)



Source: EEA 2008a, Eurostat, PRIMES

Figure 39 Change of CO_2 emissions and fuel combustion between 1990 and 2006 for EU-27 Member States



Source: EEA 2008a

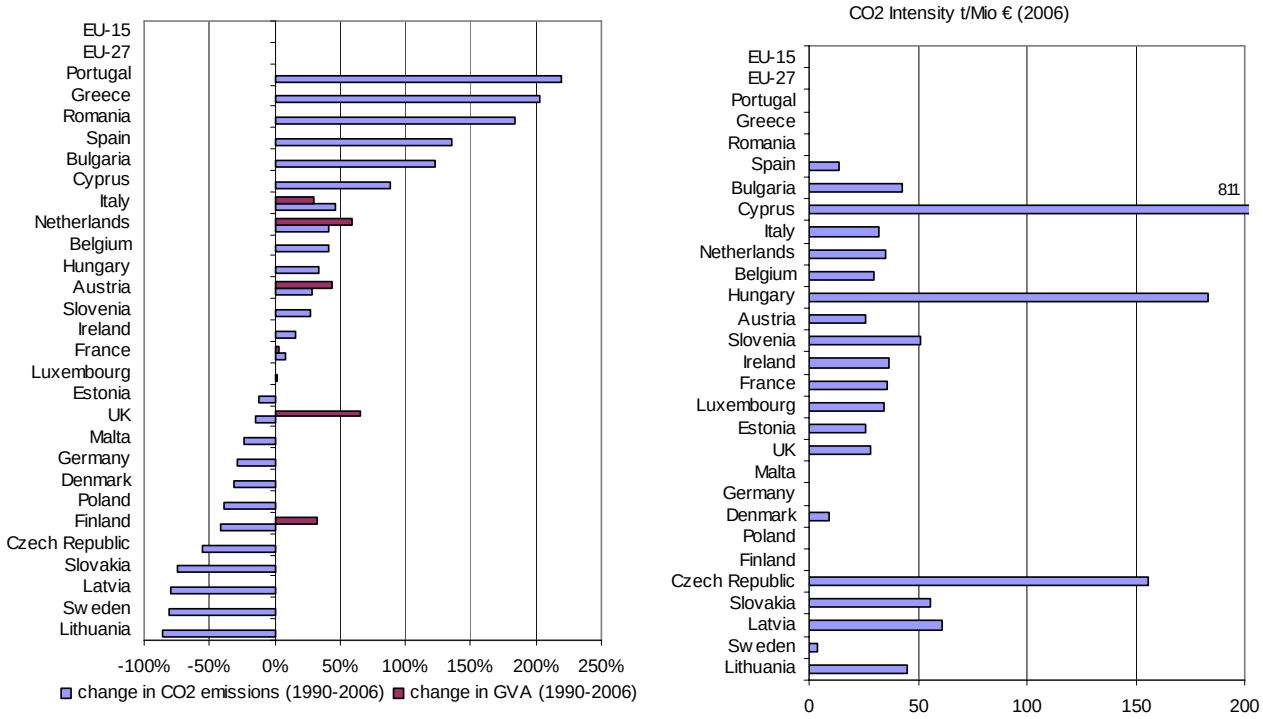
In all EU-27 Member States (except Luxembourg, Estonia and Slovenia), CO_2 emission trends have closely followed fuel combustion trends (Figure 39). However for the EU-15 and the EU-27, average changes in CO_2 emissions and in fuel combustion show opposite trends for the period 1990–2006. This can be explained by the relatively low extent of these changes compared to individual Member States.

CO_2 emission intensity of the commercial and institutional sector (priority indicator N°6, projected indicator N°6)

- Twenty-two Member States reported numerator and denominator for 2006.
- Three Member States (Czech Republic, Hungary and Cyprus) reported CO_2 intensities higher than 100 t CO_2 / EUR million (Figure 40).
- Fifteen Member States reported projected CO_2 emissions from fossil fuel consumption in commercial and institutional sector and fourteen reported projected gross value added for the respective sector. Seven of them project a decrease in emissions, but all an increase in gross value added (Figure 41).

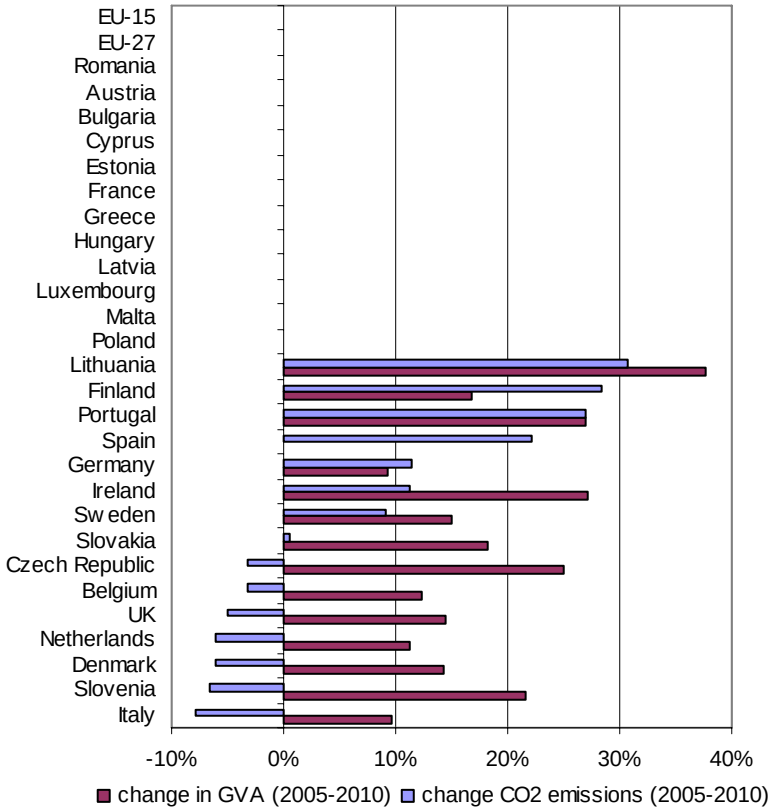
Member States have very different trend for their numerator and denominator of Priority Indicator N°6. The low intensities in Finland, Denmark and Sweden (Figure 40) are due to high shares of district heating or biomass combustion.

Figure 40 Change of CO_2 emissions and gross value added from energy use in services between 1990 and 2006 for EU-27 Member States (Priority Indicator N°6)



Note: Comparisons of absolute intensities are only of limited significance as data are not always consistent across countries.
Source: Member States' submissions, EEA 2008a

Figure 41 Projected Change of CO_2 emissions from fossil fuel consumption in services and gross value added in services between 2005 and 2010 (Projected Indicator N°6)



Source: Member States' submissions

A 1.3.9 CO_2 emissions from energy use in households

Definition (IPCC sector 1A4b)*: all emissions from fuel combustion in households.*

Key EU policies and measures

- Directive on the energy performance of buildings (2002)
- Appliances labelling schemes (several Directives 1996–2003)
- Schemes for energy efficiency standards

Trends

- Between 1990 and 2006, CO_2 emissions from energy use in households have remained relatively stable, with an overall change of – 1 %.
- Short-term variations of CO_2 emission from households are closely linked to climatic conditions, reflected in the annual variations of heating degree days. Long-term trends show a decoupling between emissions and the number of households (Figure 42).

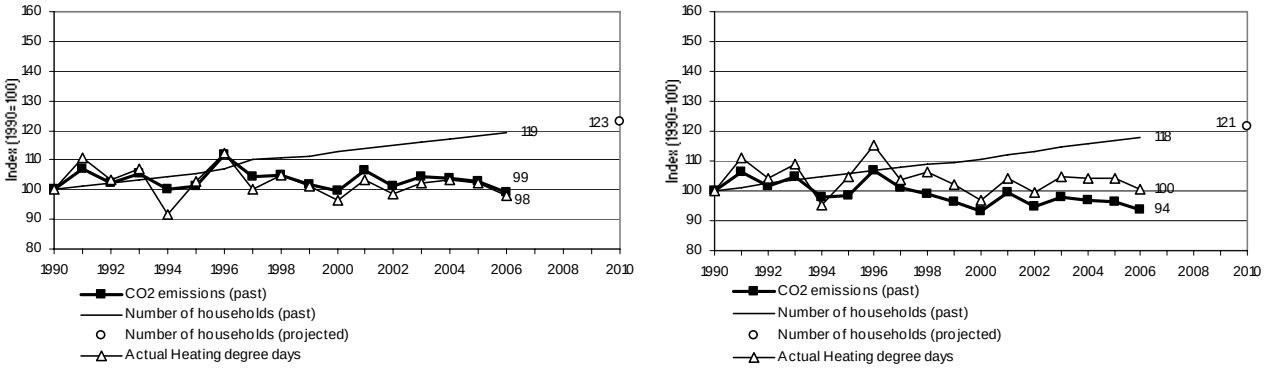
CO_2 emission from 1A4b	Share in 1990 total GHG	Share in 2006 total GHG	Change 1990–2006	Change 2000–2006
EU-15	9.6 %	9.7 %	– 0.7 %	– 0.5 %
EU-27	9.0 %	9.1 %	– 6.2 %	0.5 %

In 2006, CO_2 emissions from (direct) energy use households represented 10 % of total EU-15 GHG emissions. Indirect emissions from electricity consumption are not included, as these are reported under the category 'energy industries'. The trend in CO_2 emissions and heating degree-days shows some fluctuations between 1990 and 2006, but the 1990–2006 trend is relatively stable, with an overall change of – 1 % in the EU-15 and of – 6 % in the EU-27 (Figure 42).

CO_2 emissions from households are mainly influenced by outdoor temperatures, the number and size of dwellings, building code, the age distribution of the existing building stock and the fuel split for heating and warm water. Long-term trends show a clear decoupling of emissions from the number of household. This decoupling could be explained by:

- an improvement of energy efficiency from buildings;
- a shift from household heating boilers to district heating plants or to electric heating. That shift in heating facilities reduces CO_2 emissions from households but may result in increasing emissions from energy industries;
- a switch from solid to gaseous fuels: the respective shares of solid fuels and gaseous fuels changed from 12 % and 42 % in 1990, to 1 % and 57 % in 2006. The use of liquid fuels also decreased by 7 % between 1990 and 2006 (data not shown).

Figure 42 CO_2 emissions from household fuel consumption and number of households in the EU-15 (left) and EU-27 (right), 1990–2006

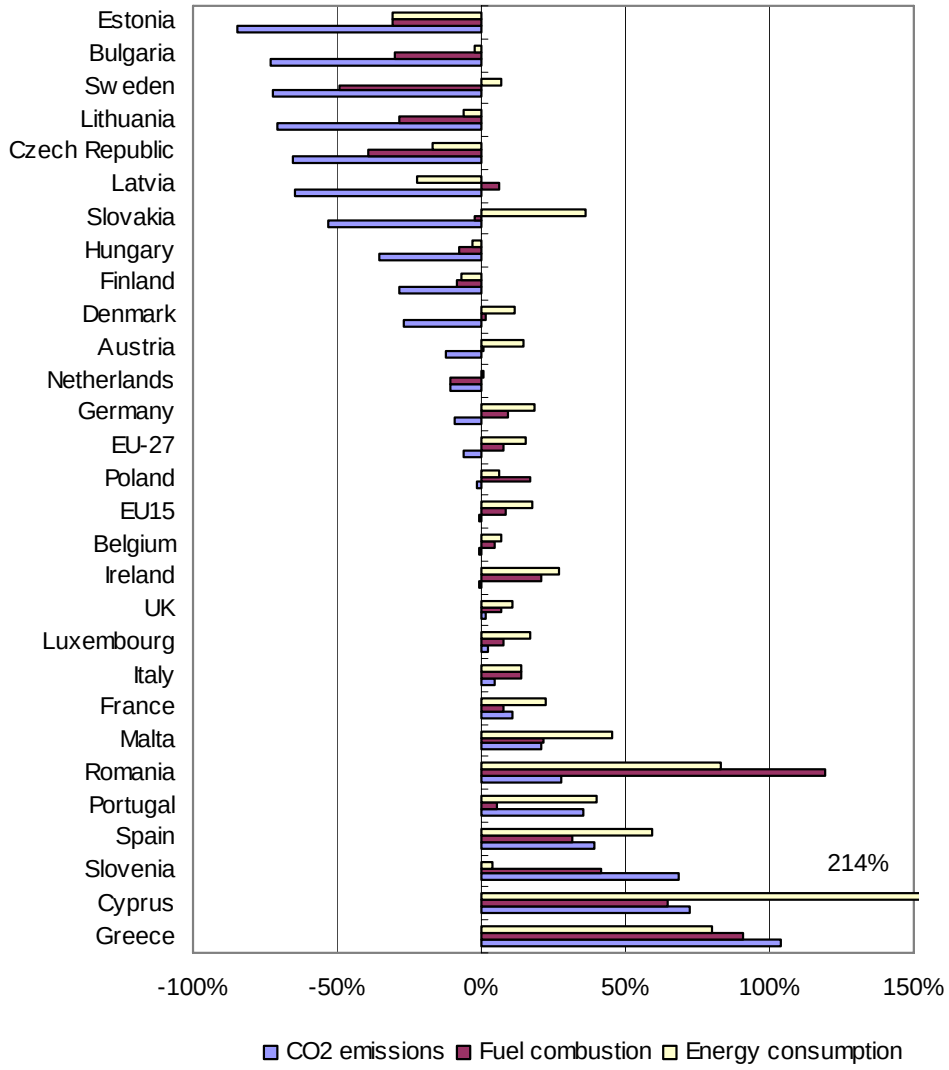


Source: EEA 2008a, PRIMES, EEA 2008a

According to projections, the number of households will increase by more than 20 % by 2010, compared to 1990 (Figure 42).

A main reason for the absolute reductions in CO_2 emissions observed in Denmark, Finland and Sweden between 1990 and 2006 (Figure 43) is the increase of district heating, which is indicated by a decrease in fuel combustion and/or an increase in final energy consumption. 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 reduction from households (EEA, 2006a).

Figure 43 Change of CO_2 emissions, fuel combustion and energy consumption between 1990 and 2006 for EU-27 Member States



Source: EEA 2008a, Eurostat

In most Member States, trends in CO_2 emissions and fuel combustion developed in the same direction. This, however, was not observed in Austria, Belgium, Denmark, Germany, Ireland, Latvia and Poland, where fuel combustion increased while CO_2 emissions decreased (Figure 43).

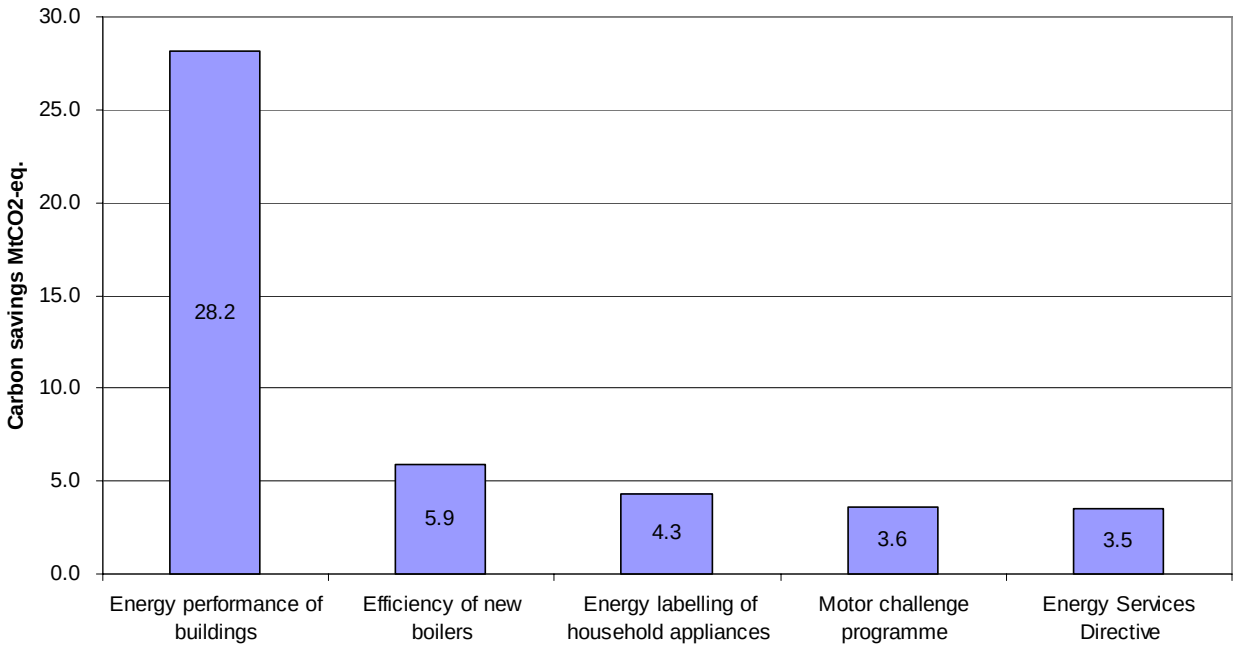
Projected savings from EU policies targeting energy use from households

The decoupling of CO_2 emissions from the number of dwellings in the last decade (see Figure 42) was mainly due to:

- efficiency improvements through thermal insulation of buildings;
- fuel switch;
- increases in solar thermal energy production and biomass district heating.

Member States project that these efficiency improvements will continue, encouraged 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. According to projections from Member States, the Directive on energy performance of buildings will reduce emissions by 28 Mt CO_2 in 2010 (Figure 44). 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. The CCPMs matrix presented in Chapter 4 of the report gives an overview of the implementation of these and other key policies across the EU.

Figure 44 EU-27 projected greenhouse gas emission savings by key CCPM addressing energy demand in 2010

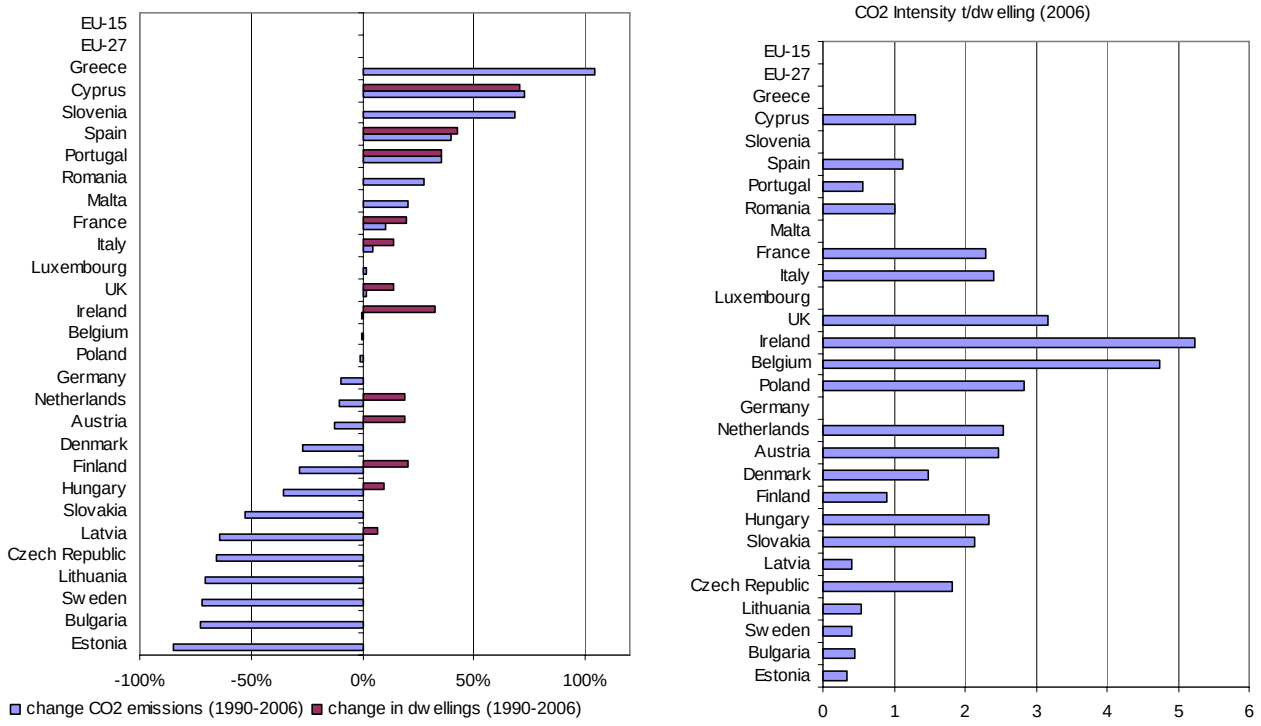


Source: Database on Policies and Measures in Europe (www.oeko.de/service/pam/sector.php) as of 17 July 2008.

Specific CO_2 emission intensity of households (priority indicator N°5, projected indicator N°5)

- Six Member States out of twelve reported an increasing stock of permanently occupied dwellings and still decreasing emissions (Figure 45).
- Three Member States report a CO_2 intensity exceeding 3 t CO_2 /dwelling (Belgium, Ireland and the United Kingdom) (Figure 45)
- An increase in the number of permanently occupied dwellings is projected by 13 of the 14 Member States which provided data. Ten of them project a decrease in emissions between 2005 and 2010 (Figure 46), which indicates further projected decoupling of emissions from the number of dwellings.

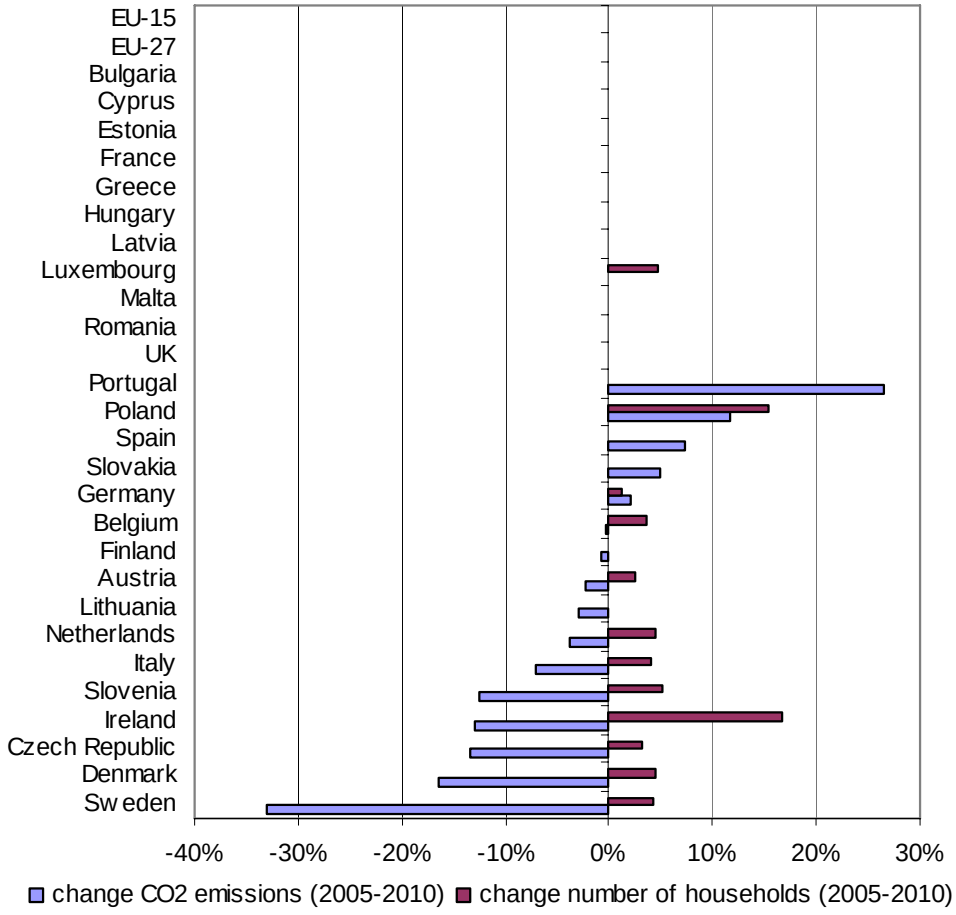
Figure 45 Change of CO_2 emissions of household for EU-27 Member States, (change 1990–2006, absolute intensity) (Priority Indicator N°5)



Note: Comparisons of absolute intensities are only of limited significance as data are not always consistent across countries.

Source: Member States' submissions, EEA 2008a

Figure 46 Projected Change of CO_2 emissions from fossil fuel consumption in households and number of dwellings between 2005 and 2010 (Projected Indicator N°5)

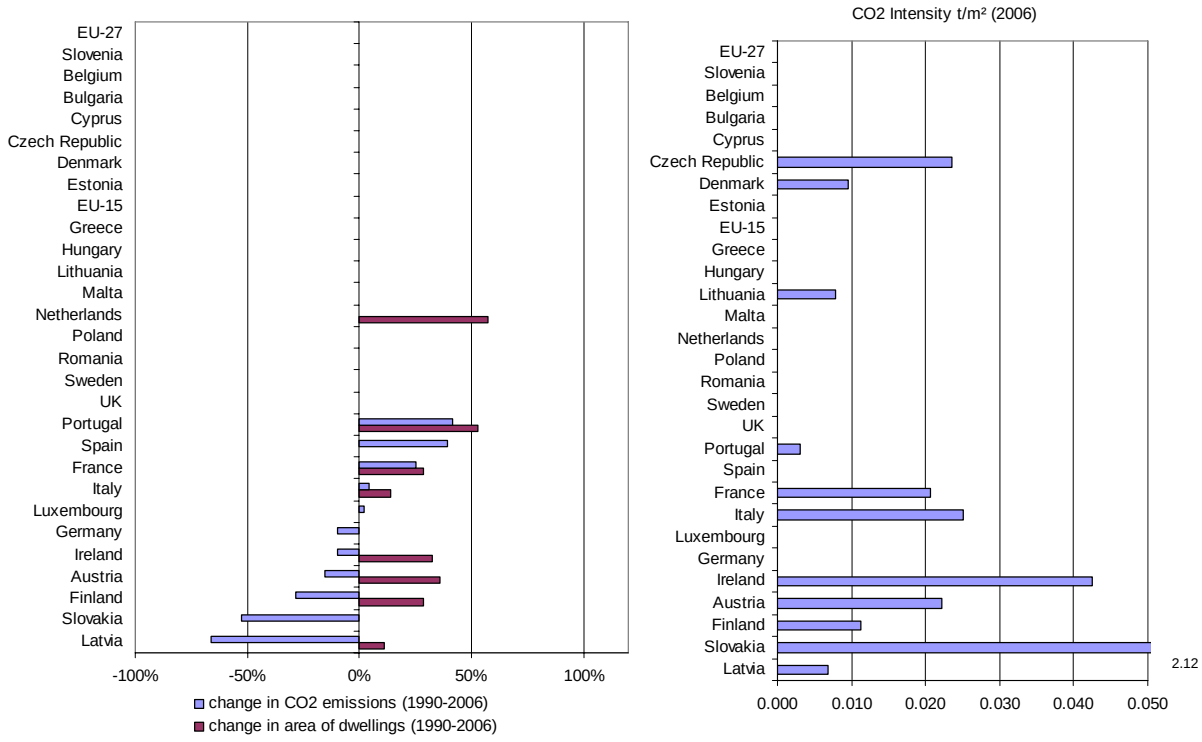


Source: Member States' submissions

Specific CO_2 emission of households for space heating (supplementary indicator N°7)

- Seven Member States reported both numerator and denominator for 1990 and 2006, whereby all report an increase in surface area of permanently occupied dwellings and four Member States report a decrease in emissions between 1990 and 2006.

Figure 47 Change of CO_2 emissions of households for space heating, (change 1990–2006, absolute intensity) (Supplementary Indicator N°7)



Note: Comparisons of absolute intensities are only of limited significance as data are not always consistent across countries.
The high CO_2 intensity in Slovakia can be explained by the inclusion of fuel sales for individual consumers.
Source: Member States' submissions

A 1.4 Energy use from transport

Definition (IPCC sector 1A3)*: emissions from the combustion and evaporation of fuel for all transport activity, regardless of the sector, specified by subsectors as follows. This category does not include emissions from fuel sold to any air or marine vessel engaged in international transport (international bunker fuels).*

Key EU policies and measures

- Biofuels Directive (2003);
- ACEA agreement (1999, 2000);
- Directives on Modal Shift (2001)
- Directive on labelling of cars (1999);
- Marco Polo Programme (environmental performance of freight transport) (2003).

Trends

- Between 1990 and 2006, GHG emissions from transport (all modes of transport) increased by 26 %. They increased between 2000 and 2006 by 5 %.
- Between 2005 and 2006, GHG emissions from transport increased by 0.4 %.

GHG emission from 1A3	Share in 1990 total GHG	Share in 2006 total GHG	Change 1990–2006	Change 2000–2006
EU-15	16.4 %	21.1 %	25.8 %	5.0 %
EU-27	14.0 %	19.3 %	27.4 %	7.4 %

Projections

- Emissions from transport are projected to increase from 1990 levels in all EU-15 Member States except in Germany. Ireland and Portugal even project an increase of more than 200 %. In the EU-15, emissions in 2010 are projected to remain at 2006 levels with the existing measures. Emissions could be reduced to +19 % above 1990 levels with the implementation of additional measures.
- Five EU-12 Member States did not report projections for transport. The Czech Republic and Romania project increase of more than 200 %. Lithuania is the only Member State in the EU-12 projecting emissions in 2010 to be lower than 1990.

Policies and measures targeting GHG emission from transport

The Community strategy ([6]) to reduce CO_2 emissions from passenger cars and improve fuel economy aimed at delivering an average CO_2 emission value for new passenger cars equal to 120 g CO_2/km. It was meant to help the EU meet its commitments under the Kyoto Protocol, and reduce the EU dependency on imported oil supplies. In order to meet these targets, voluntary commitments by the European, Japanese and Korean automobile manufacturers' associations (ACEA, JAMA, KAMA ([7])) were made, where the automobile industry committed itself to reach 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 sixth annual report on the effectiveness of the strategy to reduce CO_2 emissions from cars ([8]), all three associations reduced the average specific CO_2 emissions of their cars registered for the first time on the EU market in 2004 compared to 2003 (ACEA and JAMA by approximately 1.2 % and KAMA by approximately 6.1 %). Overall, average specific CO_2 emissions from new cars were equal to 163 g CO_2/vehicle-km in 2004. This was 0.6 % below the 2003 level and 12.4 % below 1995 levels. In order to meet the EU final target of 120 g CO_2/km, additional efforts are necessary.

Manufacturers would need to cut CO_2 by 3.3 % (ACEA and KAMA) and 3.5 % (JAMA) every year for the years remaining until 2008/09 in order to meet the final target of 140 g CO_2/km. It was anticipated from the beginning that the average reduction rates would be greater in the later years. However, it is noted that the gaps to be closed, expressed in required annual performance, further increased in 2004, putting into serious doubt the attainment of the targeted 140 g CO_2/km.

Figure 49 highlights five key CCPMs in the transport sector: the Biofuels Directive, the ACEA agreement, the Directives on modal shift ([9]), the Directive on labelling of cars and the Marco Polo Programme aimed at improving the environmental performance of freight transport. According to Member States reports, these CCPMs are projected to reduce emissions by 69 Mt in 2010 compared to a scenario where these measures did not exist.

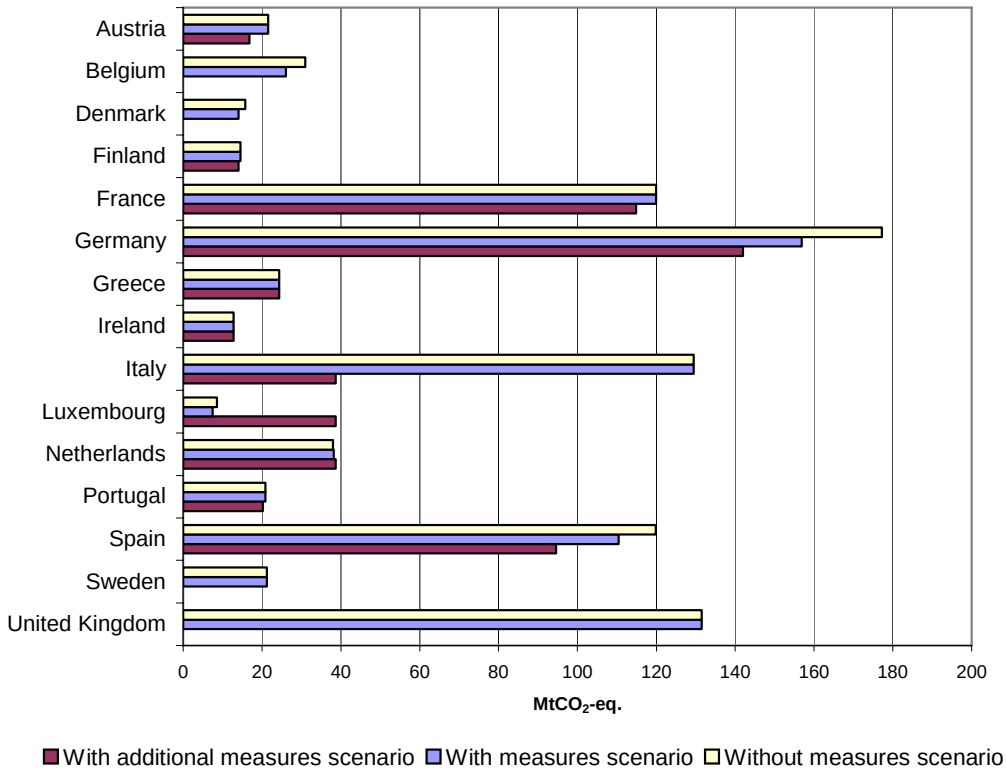
([6]) Community strategy to reduce CO_2 emissions from passenger cars and improve fuel economy - COM(95) 689 final, 20.12.1995.

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

([8]) Implementing the Community strategy to reduce CO_2 emissions from cars: Sixth annual Communication on the effectiveness of the strategy - COM (2006) 463 final, 24.8.2006.

([9]) Shifting the balance between modes of transport, in particular towards rail (Directives 2001/12/EC, 2001/13/EC and 2001/14/EC of 15/03/01, Regulation 881/2004 of 29/04/2004, and Directives 2001/49/EC, 2001/50/EC and 2001/51/EC of 29/04/2004).

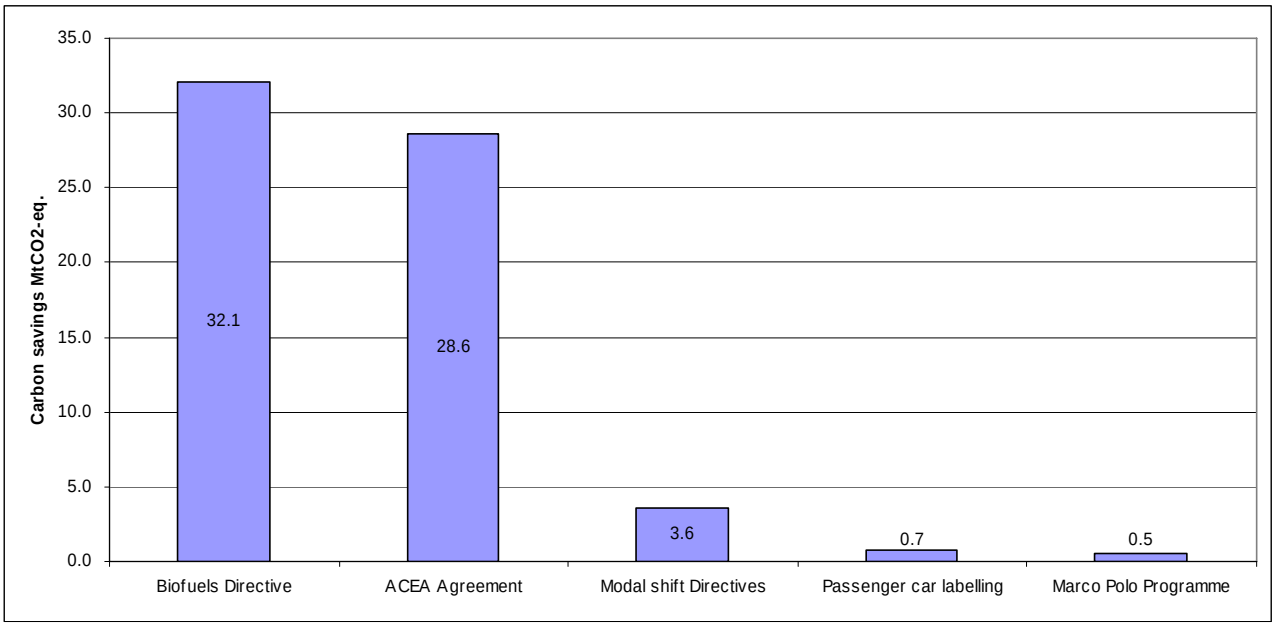
Figure 48 Contribution of policies and measures to emission reductions in the transport sector in 2010, EU15



Note: Belgium, Denmark, Greece, Ireland, Sweden and the United Kingdom did not define a scenario with additional measures.

Source: See Sources of Information (Chapter 7). Details on individual Member States can be found in Table 4 of the Country Profiles (Annex 8).

Figure 49 Emission reduction potential of CCPMs in the transport sector in 2010, EU27



Source: Database on Policies and Measures in Europe (www.oeko.de/service/pam/sector.php) as of 17 July 2008.

A 1.4.1 CO_2 emissions from road transport

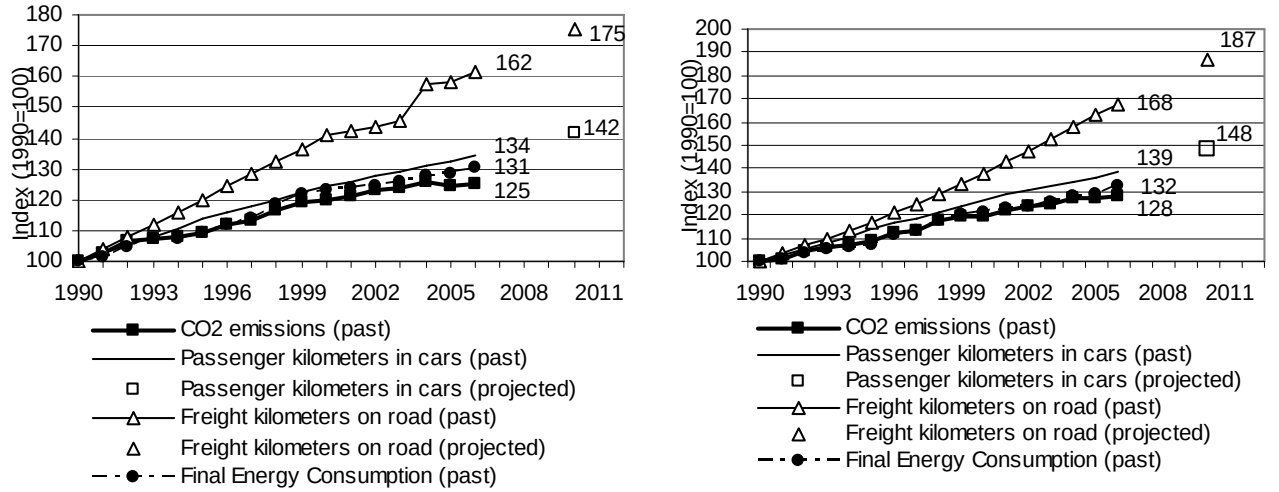
***Definition (IPCC sector 1A3b)**: all combustion and evaporative emissions arising from fuel use in road vehicles, including the use of agricultural vehicles on highways.*

- Between 1990 and 2006, CO_2 emissions from road transport increased by 25 %. They increased by 4 % between 2000 and 2006.
- Road transport represents 93 % (in 1990 as well as in 2006) of total transport CO_2 emissions (international aviation excluded).

CO_2 emission from 1A3b	Share in 1990 total GHG	Share in 2006 total GHG	Change 1990–2006	Change 2000–2006
EU-15	15.0 %	19.1 %	24.8 %	4.3 %
EU-27	12.6 %	17.5 %	28.2 %	7.1 %

CO_2 emission from road transport is the second largest key category in EU-15 and contributes 19 % to total GHG emissions in 2006. Final energy demand for transport, passenger kilometres in cars and CO_2 emissions show a very similar increasing trend of about 25–30 %, while the increase of freight transport is much stronger, about 60 % in the EU-15 (Figure 50).

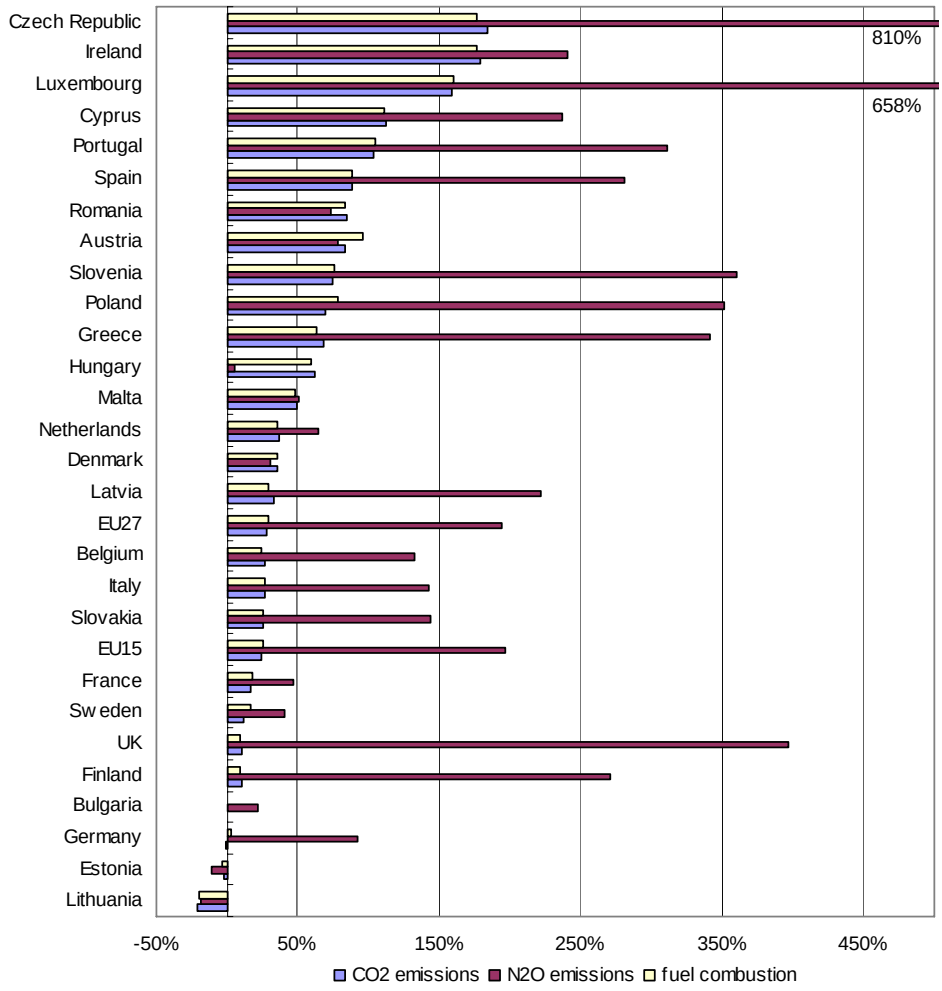
Figure 50 Trend of CO_2 emissions from transport and passenger and freight transport of the EU-15 (left) and the EU-27 (right)



Source: EEA 2008a, Eurostat, PRIMES

CO_2 emissions and fuel combustion show changes in the same range, while N_2O increased by 20 % or more in all Member States except Hungary. The increase in N_2O emissions is mainly due to the introduction of catalytic converters. Reductions of N_2O emissions are only reported by Estonia and Lithuania (Figure 51).

Figure 51 Change of CO_2, N_2O emissions from road transport and fuel combustion between 1990 and 2006 for EU-27 Member States

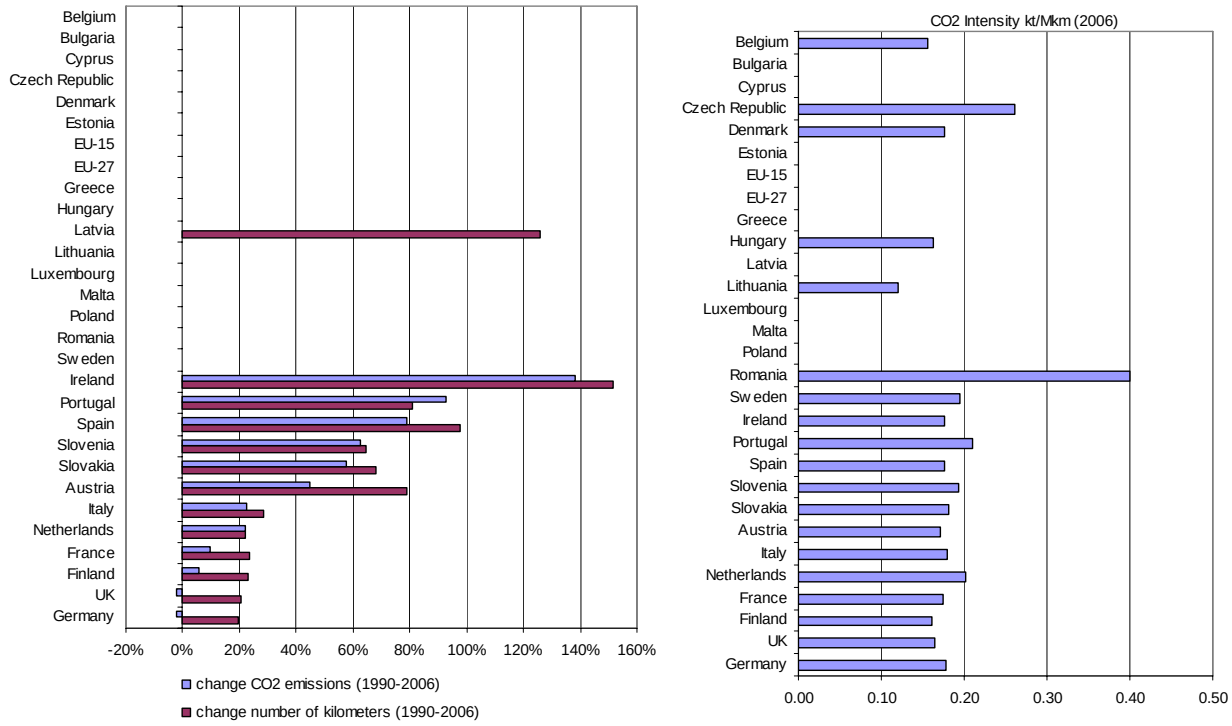


Source: EEA 2008a

Emissions intensity from passenger (priority indicator N°3, projected indicator N°2)

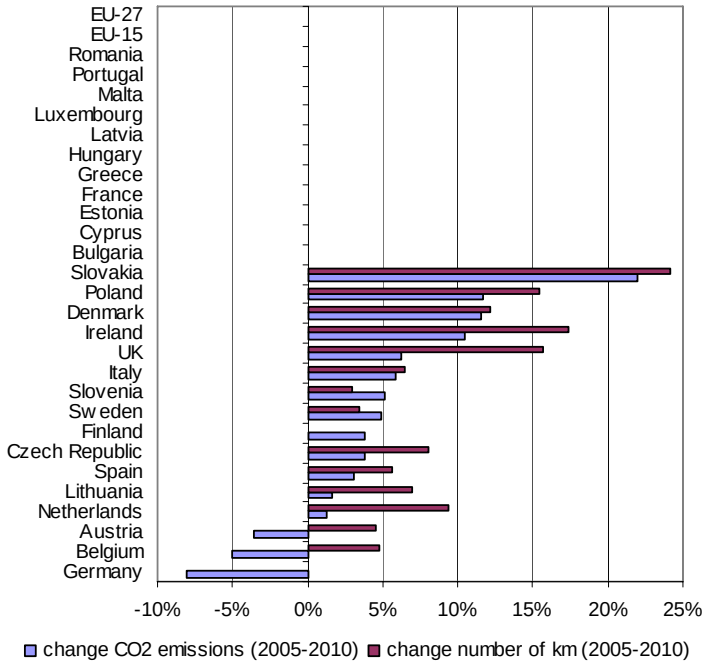
- The number of kilometres driven and emissions increased in all reporting countries, except Germany and the United Kingdom, where emissions decreased (Figure 52).
- All reporting Member States project a further increase of kilometres driven by 2010 (Figure 53).
- Despite improved efficiency of passenger cars, CO_2 emissions are projected to increase between 2005 and 2010 in all 16 reporting Member States, except in Germany, Belgium and Austria.

Figure 52 Change of CO_2 emission from passenger cars per number of km by passenger cars (change 1990–2006; absolute intensity) (Priority Indicator N°3)



Note: Comparisons of absolute intensities are only of limited significance as data are not always consistent across countries.
Source: Member State's submissions

Figure 53 Projected change of CO_2 from passenger cars and number of km by passenger cars between 2005 and 2010 (Projected Indicator N°2)

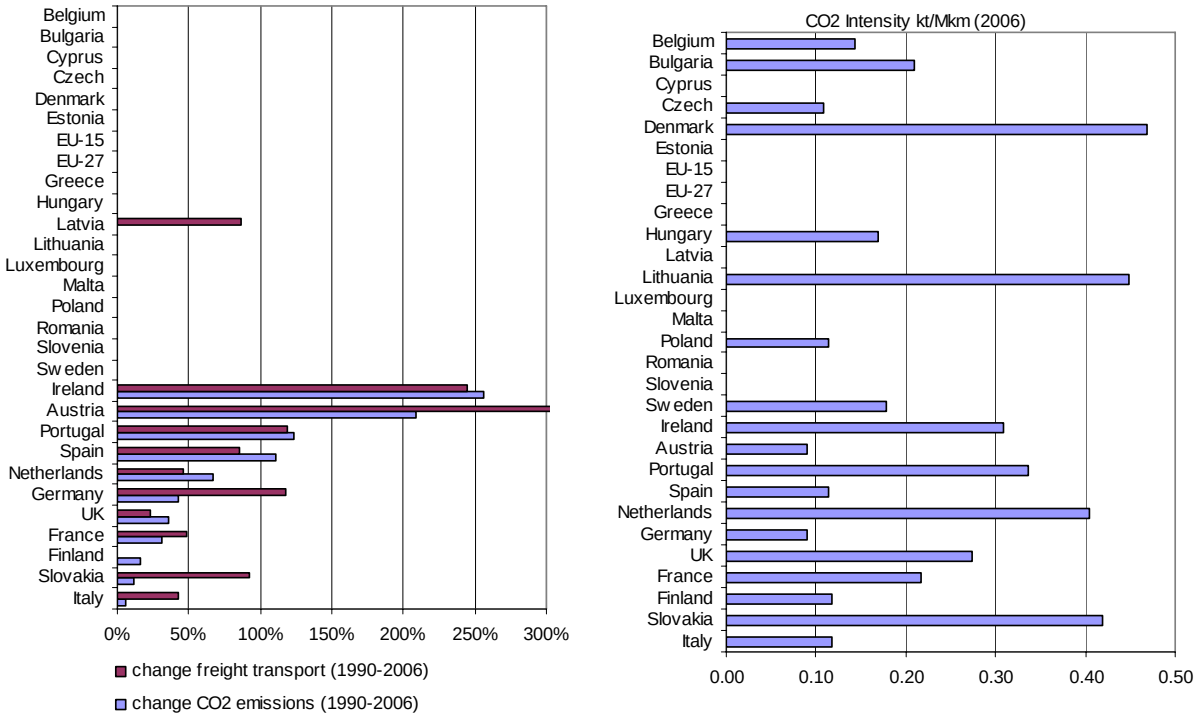


Source: Member States' submissions

Emissions intensity from freight transport (additional priority indicator N°1)

- Freight transportation on road and resulting CO_2 increased in all reporting countries between 1990 and 2006 (Figure 54).

Figure 54 Change of CO_2 emission from freight transport on road per freight transport on road (change 1990–2006; absolute intensity) (Additional Priority Indicator N°1)



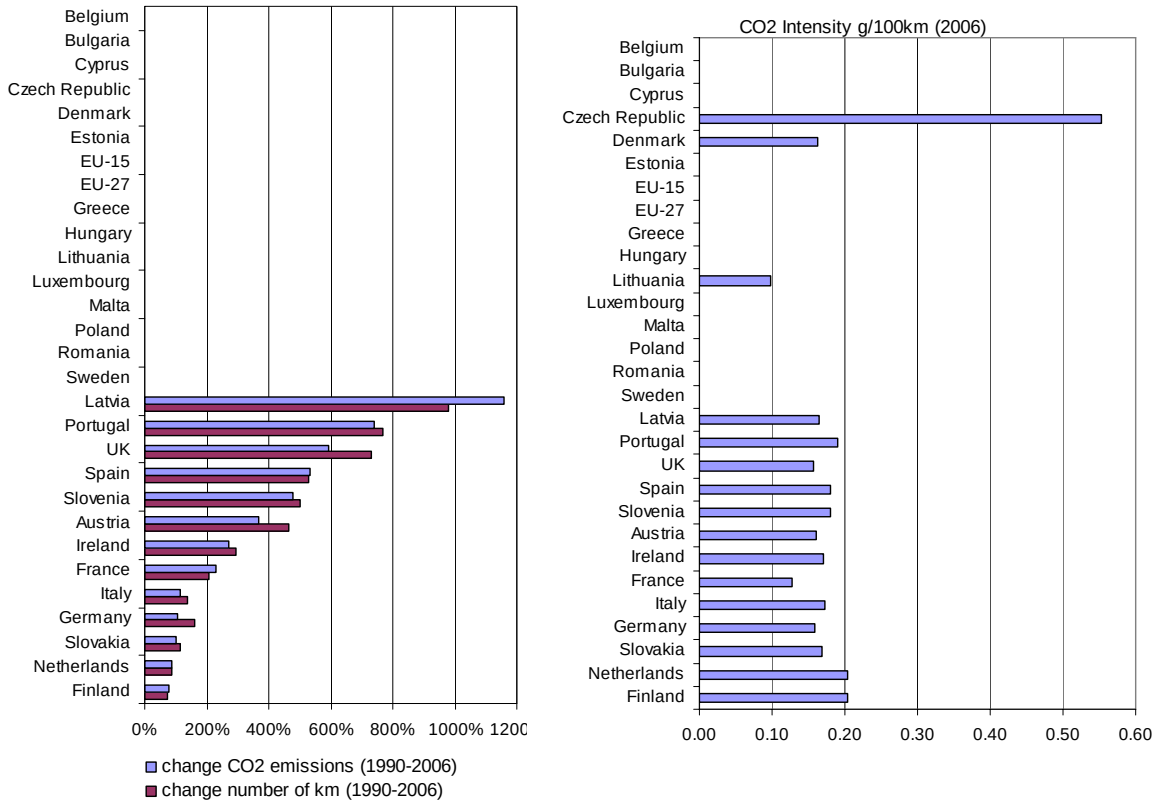
Note: Comparisons of absolute intensities are only of limited significance as data are not always consistent across countries.
Source: Member States' submissions

In Italy and Germany CO_2 emissions from freight transport on road include only heavy duty vehicles. In Germany these figures are inland related. For the United Kingdom figures refer only to Great Britain and exclude Northern Ireland. In Sweden CO_2 emissions from freight transport include emissions from busses and the freight transport on road includes only transport of goods by road by Swedish registered trucks.

Specific diesel-related CO_2 emissions of passenger cars (supplementary indicator N°1)

- The emissions resulting from diesel-driven cars and the number of driven kilometres increased in all reporting Member States between 1990 and 2006 (Figure 55).

Figure 55 Change of specific diesel related CO_2 emissions of passenger cars (g CO_2/100km) between 1990 and 2006 (change 1990–2006; absolute intensity) (Supplementary Indicator N°1)



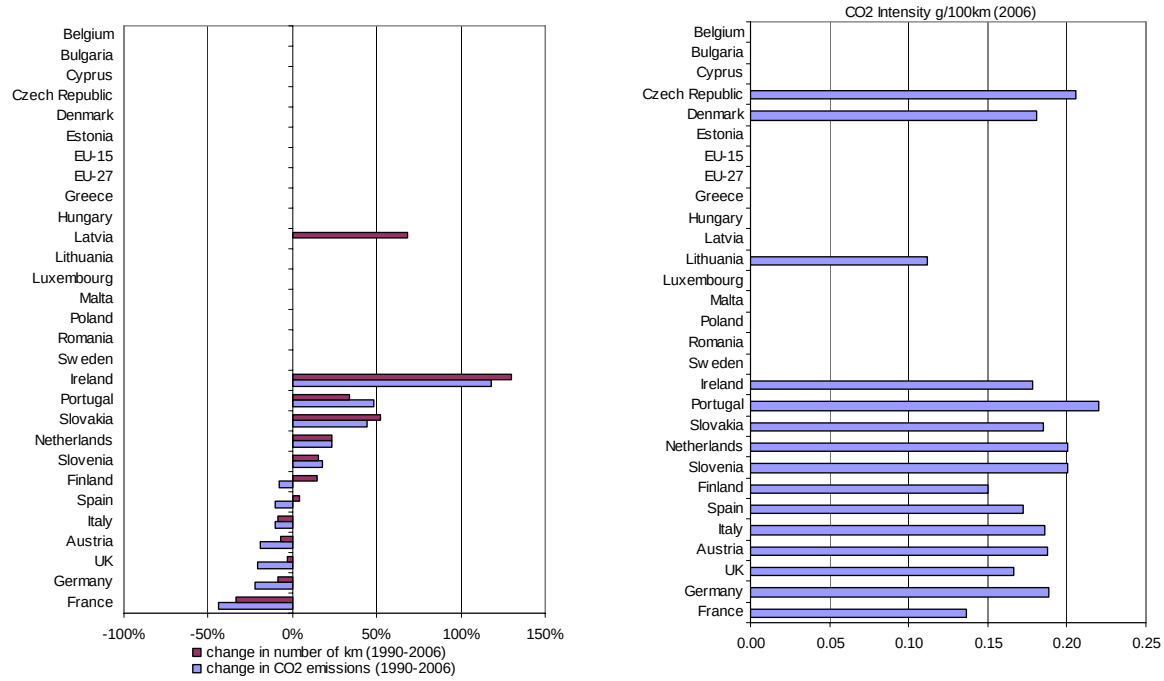
Note: Comparisons of absolute intensities are only of limited significance as data are not always consistent across countries.
Source: Member States' submissions

In Germany CO_2 emissions of diesel driven passenger cars and number of kilometres of diesel driven passenger cars are inland related. In the Netherlands only number of kilometres of diesel driven passenger cars are based on domestic driven kilometres.

Specific petrol-related CO_2 emissions of passenger cars (supplementary indicator N°2)

- Member States report very different trends for CO_2 emissions and kilometres from petrol-driven cars. In contrast to diesel-driven cars, decreases in CO_2 emissions and driven kilometres are reported by several counties (Figure 56). This reflects a shift from petrol to diesel-driven cars, as observed in Germany and Austria.

Figure 56 Change of petrol related CO_2 emissions of passenger cars between 1990 and 2006 (change 1990–2006; absolute intensity) (Supplementary Indicator N°2)



Note: Comparisons of absolute intensities are only of limited significance as data are not always consistent across countries.
Source: Member States' submissions

In Germany CO_2 emissions of petrol driven passenger cars and number of kilometres of petrol driven passenger cars are inland related. In the Netherlands only number of kilometres of petrol driven passenger cars are based on domestic driven kilometres.

A 1.4.2 CO_2 emissions from domestic civil aviation

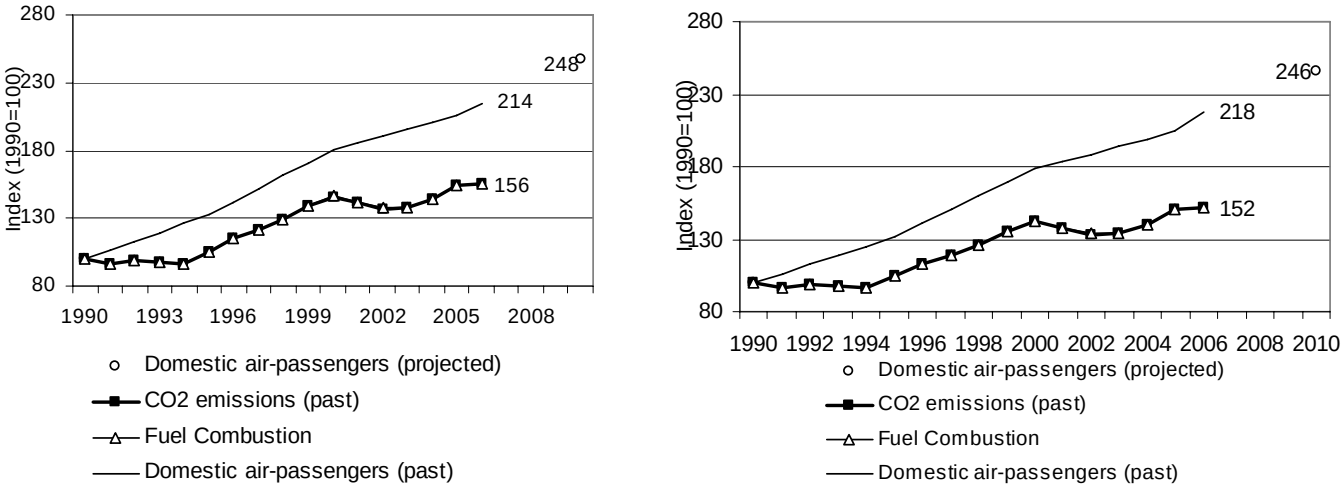
Definition (IPCC sector 1A3a)*: emissions from domestic air transport including all civil passenger and freight traffic inside a country (commercial, private, agricultural, etc.), including take-offs and landings for these flight stages. This category does not include emissions from fuel use at airports for ground transport, fuel for stationary combustion at airports and fuel sold to any air or marine vessel engaged in international transport (international bunker fuels).*

- Between 1990 and 2006, CO_2 emissions from domestic civil aviation increased by 56 %, which represents an annual average growth of +2.8 %. This was due to increased demand for air traffic, despite efficiency increases through technological improvements and operative measures.
- International aviation is not included; its contribution to GHG emissions is EU wide much higher than the domestic aviation.

CO_2 emission from 1A3a	Share in 1990 total GHG	Share in 2006 total GHG	Change 1990–2006	Change 2000–2006
EU-15	0.4 %	0.6 %	55.9 %	6.8 %
EU-27	0.3 %	0.5 %	52.1 %	7.3 %

CO_2 emissions from domestic civil aviation contribute 0.6 % to total EU-15 greenhouse gas emissions in 2006. For EU-15, the number of air passengers increased by about 114 % compared to 1990 (+4.9 % annual growth) and a further increase to about 148 % compared to 1990 is projected for 2010 (Figure 57). Compared to 2007's submission, Greece revised the time series now showing an emissions increase between 1990 and 2006 (EEA, 2008a). This increase is also reflected in the EU-15 and the EU-27 CO_2 emissions from domestic civil aviation.

Figure 57 CO_2 emissions and fuel combustion from domestic civil aviation and projected value for air passengers in the EU-15 (left) and EU-27 (right)



Source: EEA 2008a, PRIMES

CO_2 emissions from aviation represent approximately 2.5 % of global greenhouse gas emissions. The total impact of aviation on climate change is estimated to be two to five times higher than the effect of CO_2 alone, due to emissions of NO_X and cloud formation.

Emissions from international aviation are not covered by quantified emissions reduction commitment under the Kyoto Protocol, but according to the data included in national GHG inventory reports, international flights are responsible for about 80 % of total fuel consumption from aviation for the EU as a whole. The share is lowest in larger countries whereas international aviation is responsible for over 95 % of the emission in most small Member States with no or very little domestic flights.

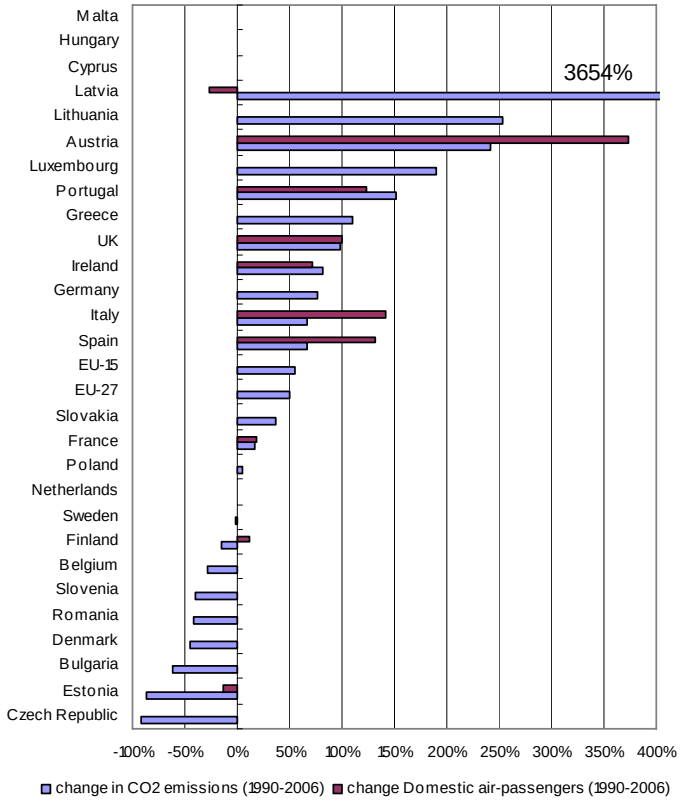
Air transport is steadily increasing although the attack on the World Trade Centre in New York City in September 2001 had clear impact on international traffic and related CO_2 emissions during two years. Projections show that CO_2 emissions will further increase for domestic as well as for international transport. For the EU-15 Member States, projected increases in CO_2 emission from domestic aviation range from 144 % to 309 % (ETC/ACC 2006).

Specific air transport emissions (supplementary indicator N°4)

- CO_2 emissions from domestic aviation increased in sixteen Member States and decreased in nine Member States between 1990 and 2006. The increase in CO_2 emissions is similar for EU-15 and EU-27 (56 and 52 % respectively) (Figure 58).
- Numbers on domestic air passenger are only reported by ten countries. Austria, Italy and Spain show a much smaller increase in CO_2 emissions from domestic aviation than in numbers of air passengers. Finland even shows a decrease in emissions while the number of air passengers is increasing.

In Denmark, emissions have decreased since the building of the Great Belt Bridge in 1997 (linking together the two largest Danish islands). In the Czech Republic, the strong decrease observed seems to be partly due to different methods used in 1990 and in 2006 to allocate emissions to domestic or to international aviation.

Figure 58 Change of CO_2 from civil aviation and number of domestic air-passengers between 1990 and 2006 for EU-27 Member States (Supplementary Indicator N°4)



Note: Cyprus, Hungary (2006) and Malta (1990) reported that CO2 emissions from civil aviation as not occurring). Cyprus (1990–2006), Luxembourg (1990–2006) and Slovenia (2003–2006) reported for domestic air passengers not occurring and Lithuania reported that there were no regular domestic flights.

Source: EEA 2008a, Member States' submissions.

A 1.5 Industrial processes

Definition (IPCC sector 2)*: by-product or fugitive emissions of greenhouse gases from industrial processes. Emissions from fuel combustion in industry are reported under the source category 1 Energy (see above).*

Trends

- Between 1990 and 2006, greenhouse gas emissions from industrial processes decreased by 12 %. They remained stable between 2000 and 2006.

total GHG emission from sector 2	Share in 1990 total GHG	Share in 2006 total GHG	Change 1990–2006	Change 2000–2006
EU-15	8.8 %	7.9 %	– 12.1 %	– 0.3 %
EU-27	8.6 %	8.1 %	– 12.8 %	3.1 %

Projections

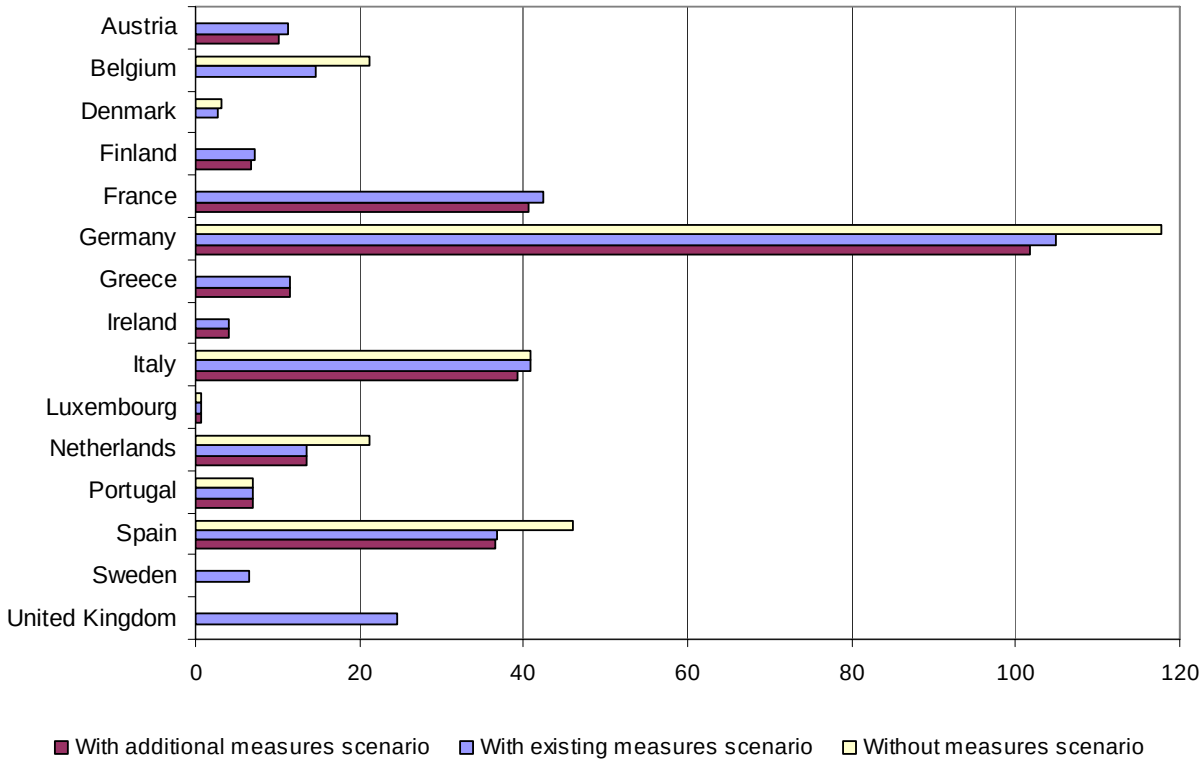
- Emissions from industrial process in the EU-15 are projected to remain at constant level with existing measures. Belgium, Germany, the Netherlands and the United Kingdom project that greenhouse gas emissions from industrial processes in 2010 will be lower than 1990 emissions with existing measures.
- Seven EU-12 Member States (Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Poland and Romania) project decreases in GHG emissions from industrial processes compared to 1990 emissions. Estonia even projects a 73 % decrease by 2010 with existing measures.
- Austria, Finland, Germany, Italy and Spain defined additional measures, whereas the other EU-15 Member States only provide projections for already existing measures. The highest relative reductions are projected the United Kingdom.

Projected savings from policies and measures targeting 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 in the 'with existing measures' projections, but some countries report both existing and additional domestic measures for the other process emissions. However, three of the EU-15 Member States did not report any policies and measures for these source categories. Member States expect some greenhouse gas savings in industrial processes to be achieved by regulatory policies and measures and through voluntary agreements. Policies and measures in most Member States to implement the F-gas regulation and directive are at an early stage of development.

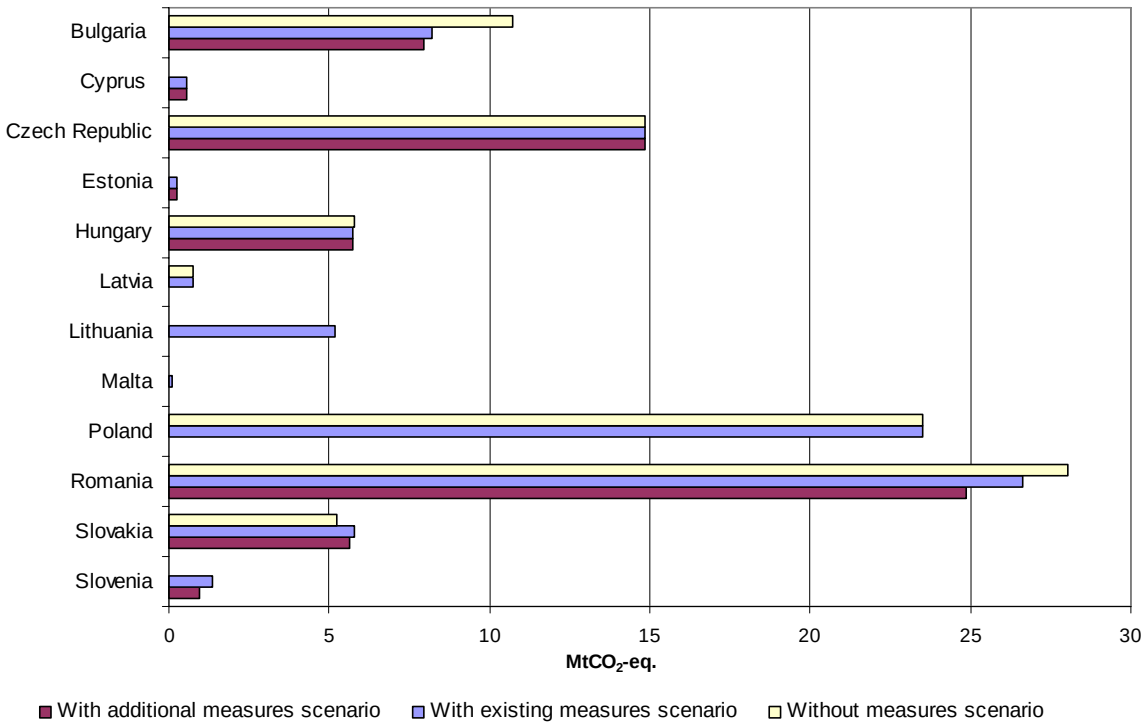
Figure 59 and Figure 60 illustrate the contribution of policies and measures to the reduction of emissions from the industrial process sector in 2010 for EU-15 and EU-12 respectively. Figure 61 highlights the two main CCPMs targeting emissions in the industrial process sector, which are projected to result in 1.6 Mt CO_2-eq. reductions across the EU-27 in 2010.

Figure 59 Contribution of policies and measures to emission reductions in the industrial process sector in 2010, EU15



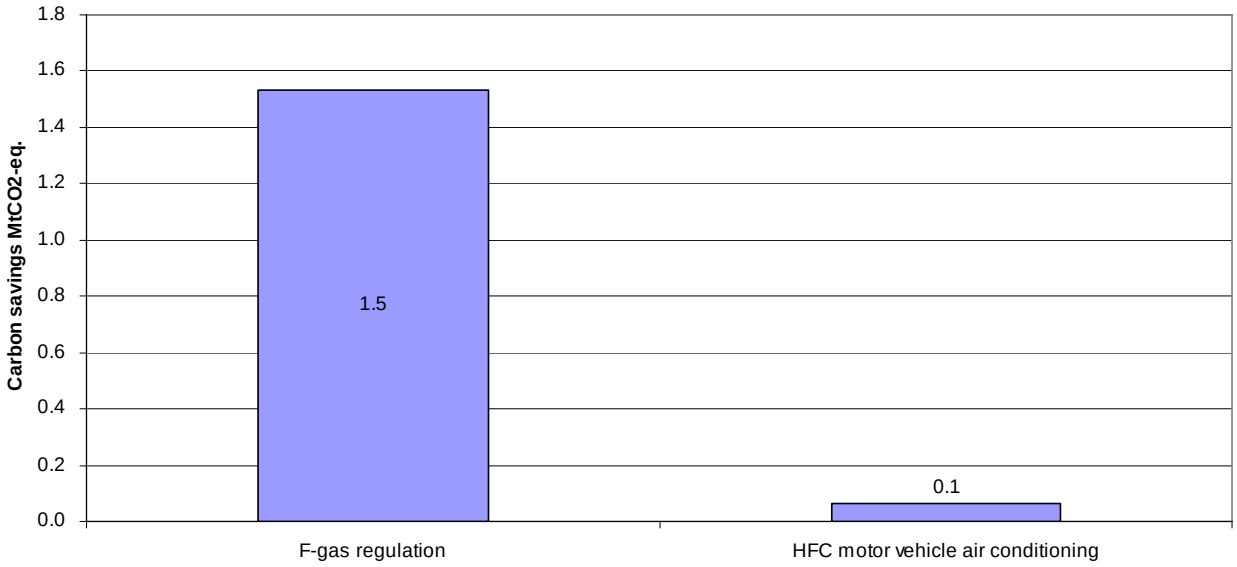
Source: See Sources of Information (Chapter 7). Details on individual Member States can be found in Table 4 of the Country Profiles (Annex 8).

Figure 60 Contribution of policies and measures to emission reductions in the industrial process sector in 2010, EU12



Source: See Sources of Information (Chapter 7). Details on individual Member States can be found in Table 4 of the Country Profiles (Annex 8).

Figure 61 Emission reduction potential of CCPMs in the industrial process sector in 2010, EU27



Source: Database on Policies and Measures in Europe (www.oeko.de/service/pam/sector.php) as of 17 July 2008.

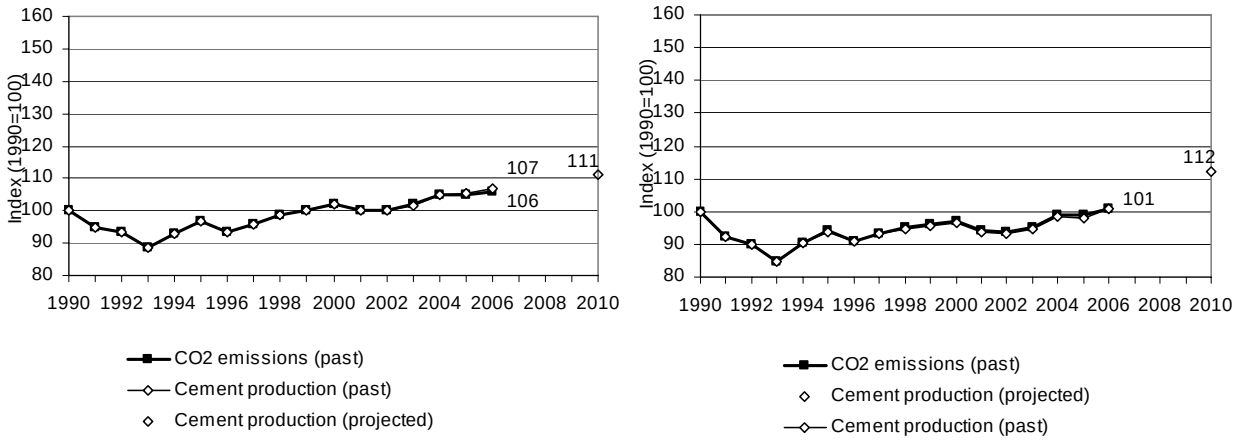
A 1.5.1 CO_2 emissions from cement production (2A1)

- Between 1990 and 2006, EU-15 CO_2 emissions from cement production increased by 6 %. Between 2000 and 2006 EU-15 emissions increased by 4 %.

CO_2 emission from 2A1	Share in 1990 total GHG	Share in 2006 total GHG	Change 1990–2006	Change 2000–2006
EU-15	1.9 %	2.1 %	6.0 %	3.7 %
EU-27	1.8 %	2.0 %	0.8 %	3.8 %

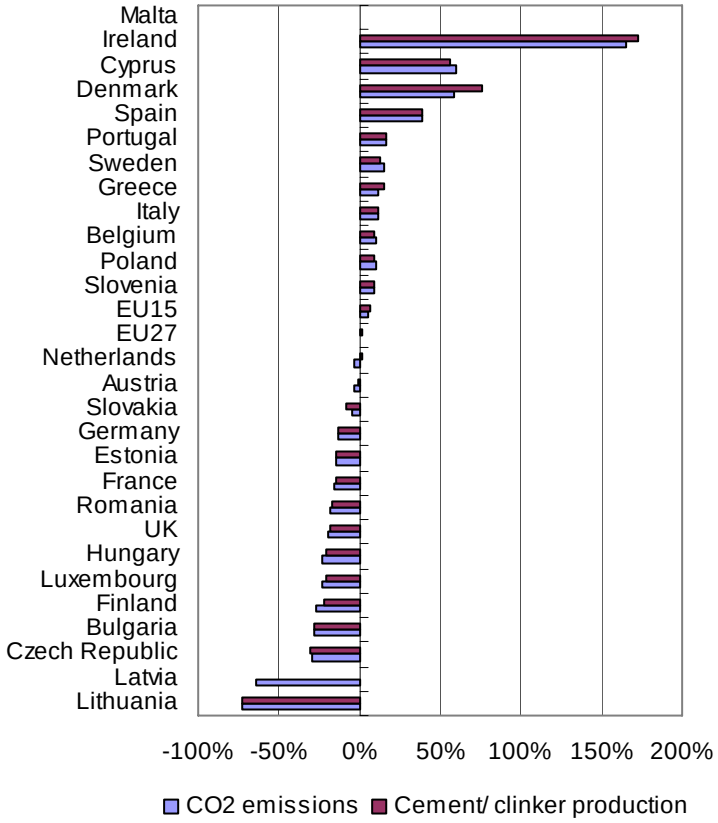
Cement production dominates the trend of total GHG emissions from industrial processes. Factors for declining emissions in the early 1990s were low economic growth and cement import from east European countries. It is projected that cement production in the EU-15 will increase by 2010 by 4 %.

Figure 62: Trend of CO_2 emissions from cement production of the EU-15 (left) and the EU-27 (right)



Source: EEA 2008a, PRIMES

Figure 63: Change of CO_2 emissions and cement production between 1990 and 2006 for EU-27 Member States



Source: EEA 2008a
Note: Latvia reports cement production as confidential. Malta reports cement production as not occurring.

Production and emissions are strongly correlated in most Member States (Fig. 63). Consequently, the trends in emissions generally followed the trends in production, with approximately half of the Member States reporting increases in production and emissions, and the other half reporting decreases. Strong increases in cement production (> 50 %) can be seen for Cyprus, Denmark and Ireland (Fig. 63).

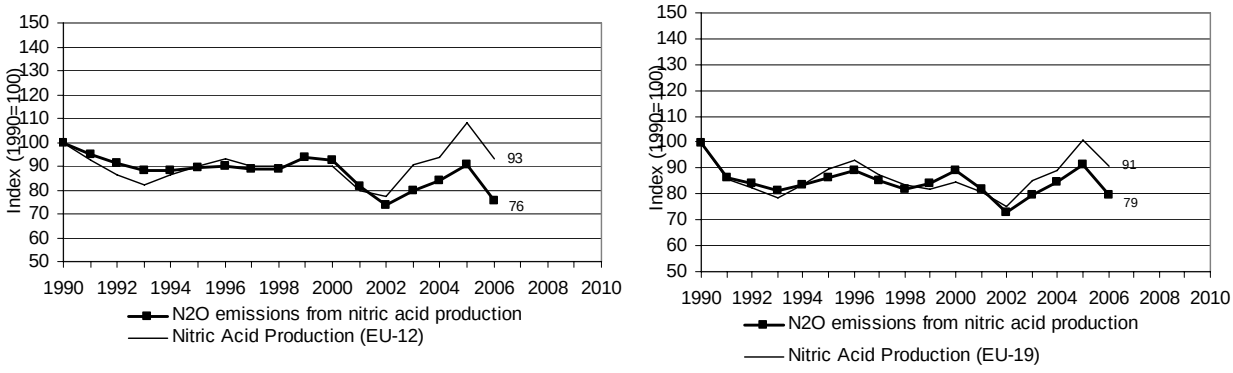
N_2O emissions from nitric acid production (2B2)

- Between 1990 and 2006, N_2O emissions from nitric acid production decreased by 24 %. Between 2000 and 2006 emissions decreased by 18 %.

N_2O emission from 2B2	Share in 1990 total GHG	Share in 2006 total GHG	Change 1990–2006	Change 2000–2006
EU-15	0.9 %	0.7 %	– 24.3 %	– 18.4 %
EU-27	0.9 %	0.8 %	– 20.6 %	– 11.1 %

The N_2O emissions trend from nitric acid production in the EU-15 and the EU-27 was very similar and decreased until 2002 and showed then a strong increase to approximately 90 % compared to 1990 (Fig. 64) and decreased between 2005 and 2006 again. The share of N_2O emissions to total EU-15 GHG emissions in 2006 is approximately 1 %.

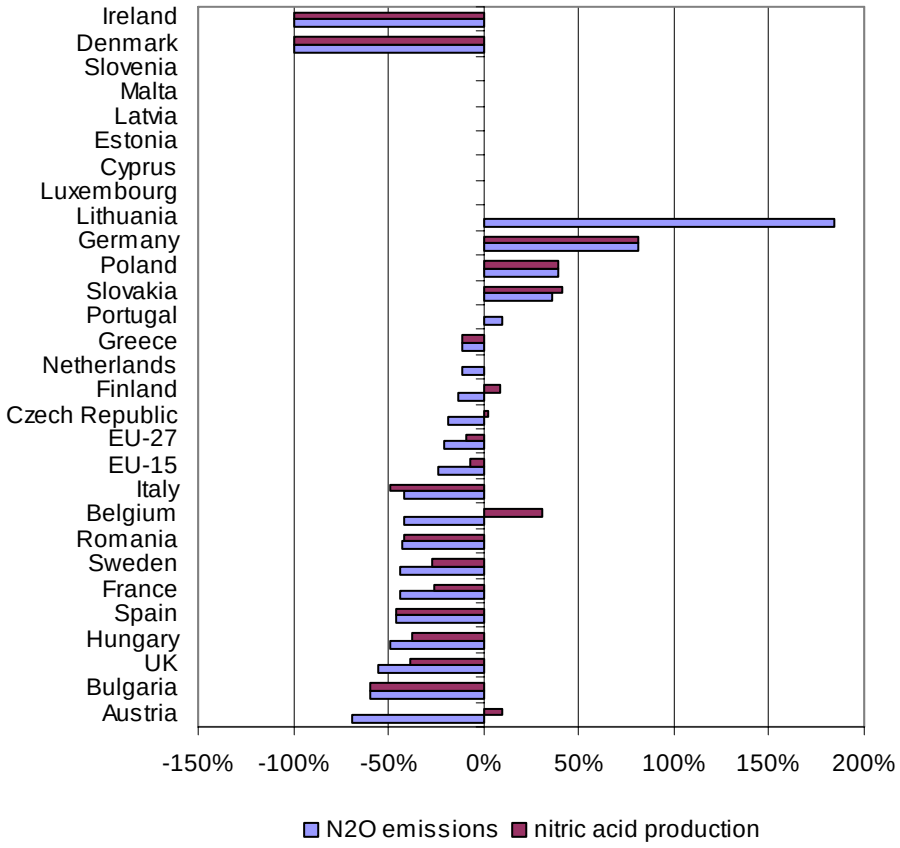
Figure 64: Trend of N_2O emissions from nitric acid production of the EU-15 (left) and the EU-27 (right)



Note: Nitric acid production for EU-15 does not include Belgium, the Netherlands and Portugal; nitric acid production for EU-27 does not include Belgium, Lithuania, the Netherlands and Portugal.
Source: EEA 2008a

In the early 1990s, emissions decreased mainly due to production decreases in several of the main emitting Member States, in particular France, Germany, Spain and Italy. The decline between 2000 and 2002 was mainly due to the change in the production patterns in the United Kingdom (increasing weight of nitric acid plants with lower emission factors). After 2002, the trend was dominated by Germany, where N_2O emissions increased between 2002 and 2005 by 203 % due to the start-ups of two new plants. Nitric acid production in Germany decreased sharply (– 23 %) between 2005 and 2006 (Fig. 64). This sharp decrease is also reflected in EU-15 and EU-27 N_2O emissions.

Figure 65: Trend of N_2O emissions and nitric acid production for EU-27 Member States



Source: EEA 2008a
Note: Denmark (2005, 2006), Ireland (2003–2006), Estonia, Latvia, Malta and Slovenia report emissions as not occurring.

Most reporting countries show a decrease between 1990 and 2006 in N_2O emissions and in nitric acid production (Fig. 65). Ireland and Denmark phased out nitric production all together. In Austria, Belgium, the Czech Republic and Finland emissions were reduced despite increases in nitric acid production. In Austria this was due to the installation of a N_2O decomposition facility in the nitric acid plant in 2003. In Belgium catalysts were introduced in various installations.

A 1.5.2 HFC emissions from refrigeration and air conditioning equipment (2F1)

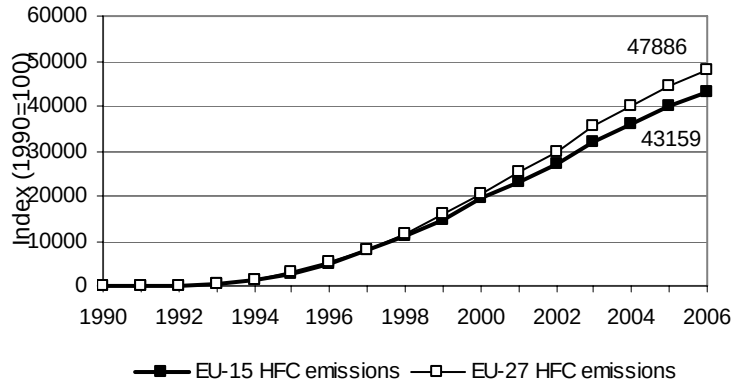
- Between 1990 and 2006, HFC emissions from refrigeration and air conditioning equipment increased from almost zero to almost 38 Mt CO_2-eq. in EU-15. Between 2000 and 2006 EU-15 emissions increased by 123 %.

HFC emission from 2F1	Share in 1990 total GHG	Share in 2006 total GHG	Change 1990–2006	Change 2000–2006
EU-15	0.0 %	0.9 %	43059.2 %	123.2 %
EU-27	0.0 %	0.8 %	48470.8 %	135.2 %

HFC emissions from refrigeration and air conditioning equipment contribute 1 % of total EU-15 emissions in 2006.

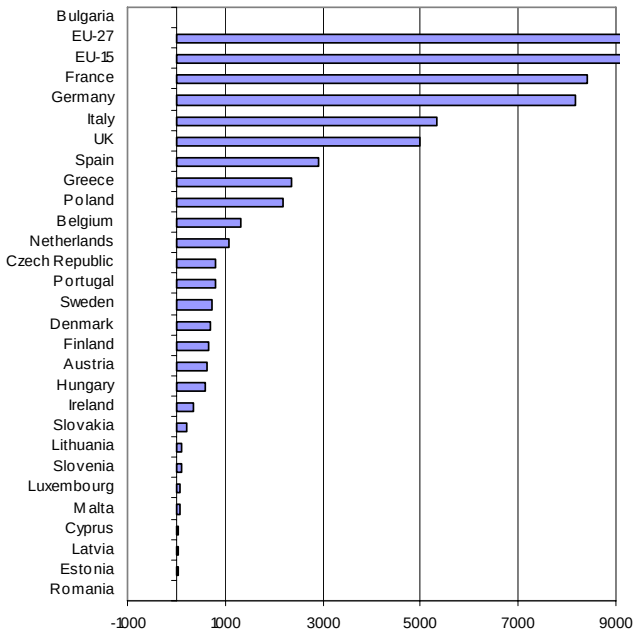
The main reason for this strong increase is the phase-out of ozone-depleting substances such as chlorofluorocarbons under the Montreal Protocol and the replacement of these substances with HFCs.

Figure 66: Trend of HFC emissions refrigeration and air conditioning of the EU-15 and the EU-27



Generally EU-15 Member States show much higher HFC emissions than in the EU-12 (Figure 67). Numbers below are presented in absolute values for 2006, because in 1990 HFC emissions in most countries were not occurring.

Figure 67: HFC emissions from refrigeration and air conditioning for EU-27 Member States (absolute values 2006 in kt CO_2-eq.)



Source: EEA 2008a

A 1.6 Agriculture

Trends

- Between 1990 and 2006, GHG emissions from agriculture decreased by 11 %. The decrease was – 7 % between 2000 and 2006.

GHG emission from 4	Share in 1990 total GHG	Share in 2006 total GHG	Change 1990–2006	Change 2000–2006
EU-15	10.2 %	9.3 %	– 11.4 %	– 6.9 %
EU-27	10.6 %	9.2 %	– 20.1 %	– 5.7 %

Projections

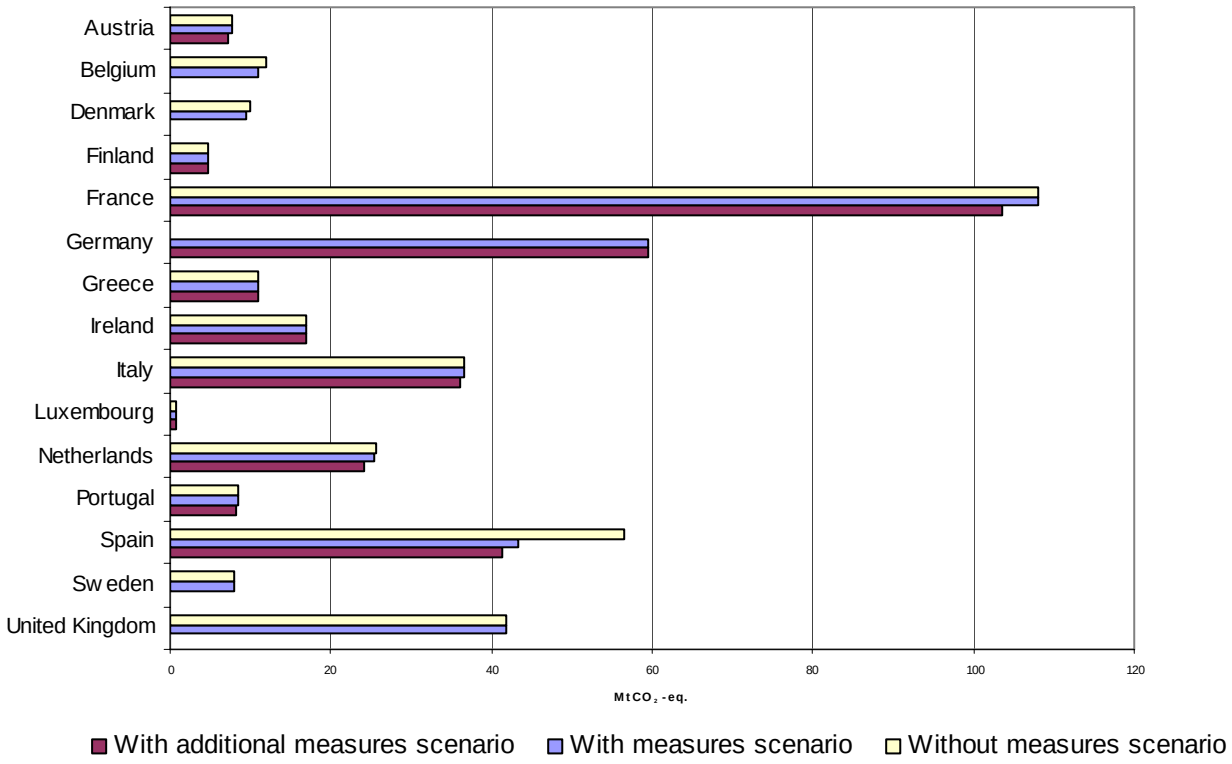
- With the existing measures, EU-15 emissions from agriculture are projected to decrease from current levels to 13 % below 1990 levels. Portugal and Spain project that their greenhouse gas emissions from agriculture in 2010 will be higher than in 1990.
- All EU-12 Member States except Cyprus project decreases in greenhouse gas emissions from agriculture compared to 1990 emissions.
- Only Austria, Italy, Portugal and Spain defined additional measures, whereas the other EU-15 Member States only provide projections for already existing measures. The highest relative reductions with all measures considered (more than 20 %) are projected by Austria, Denmark, Finland, Germany, the Netherlands and the United Kingdom.

Contribution of policies and measures to greenhouse gas emission reductions in 2010 in the agricultural sector

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.

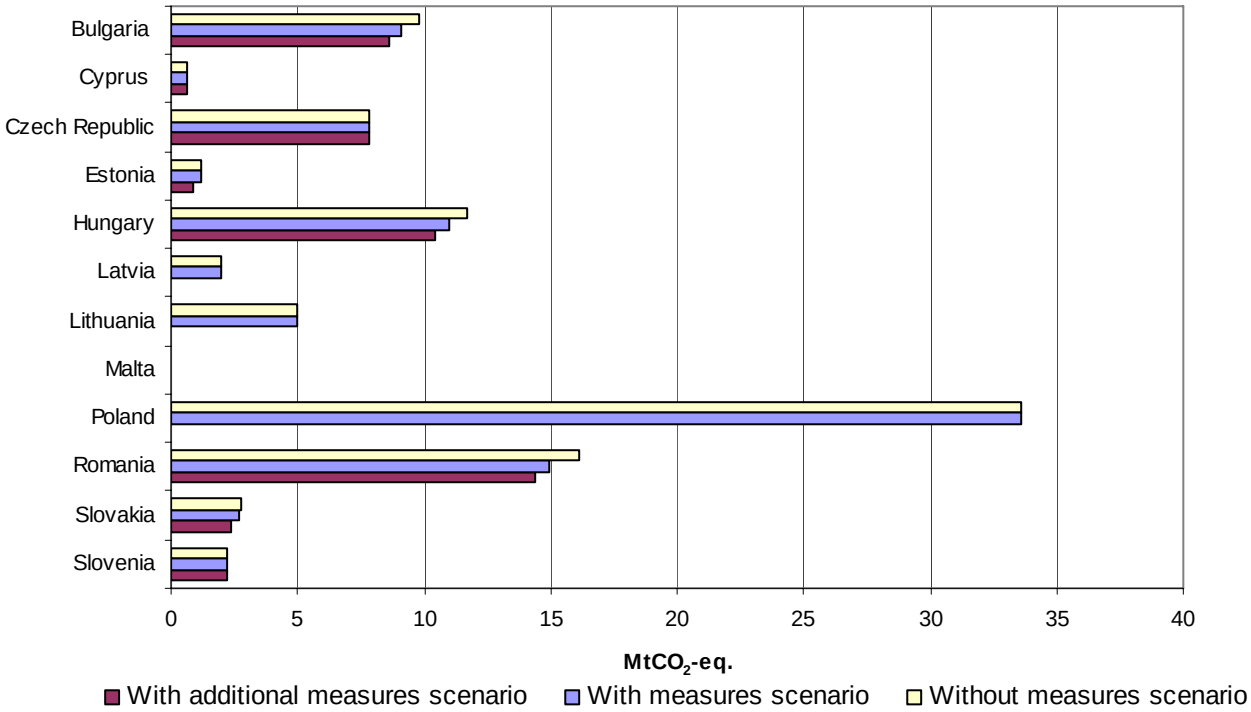
The drop in fertiliser use between 1990 and 2004 was achieved partly through the 1992 reform of the common agricultural policy (CAP), resulting in a shift from production-based support mechanisms to direct area payments in arable production. The 2003 CAP reform, which included further decoupling of payments from production and cross compliance, and the new Rural Development Policy, are expected to lead to a further decline in greenhouse gas emissions. 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. Changes in agricultural emissions are generally driven by economic policies or those aimed at the wider issue of sustainable production, rather than targeting specifically climate change. There is an increasing awareness of the potential impacts of climate change on agriculture and the need to develop adaptation measures, although policy development is at an early stage. Figure 68 and Figure 69 illustrate the contribution of policies and measures to the reduction of emissions from the agricultural sector in 2010 for EU-15 and EU-12 respectively. Figure 70 highlights a number of CCPMs targeting emissions in the agricultural sector and projected to result in 11 Mt CO_2-eq. reductions across the EU-27 in 2010.

Figure 68 Contribution of policies and measures to emission reductions in the agricultural sector in 2010, EU15



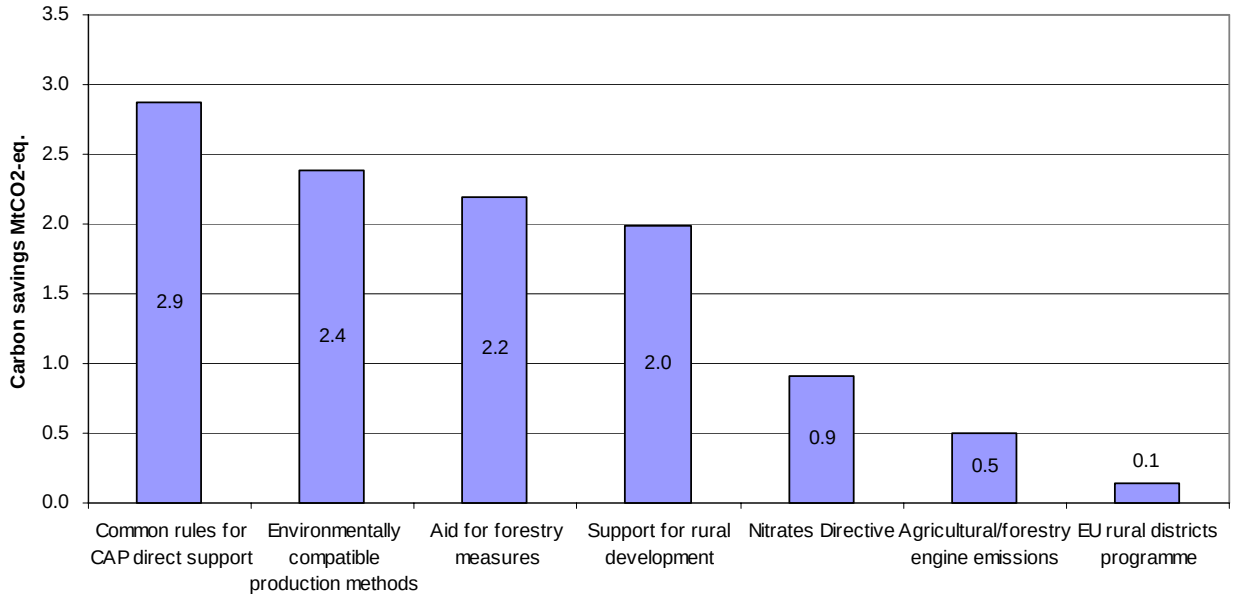
Source: See Sources of Information (Chapter 7). Details on individual Member States can be found in Table 4 of the Country Profiles (Annex 8).

Figure 69 Contribution of policies and measures to emission reductions in the agricultural sector in 2010, EU12



Source: See Sources of Information (Chapter 7). Details on individual Member States can be found in Table 4 of the Country Profiles (Annex 8).

Figure 70 Emission reduction potential of CCPMs in the agricultural sector in 2010, EU27



Source: Database on Policies and Measures in Europe (www.oeko.de/service/pam/sector.php) as of 17 July 2008.

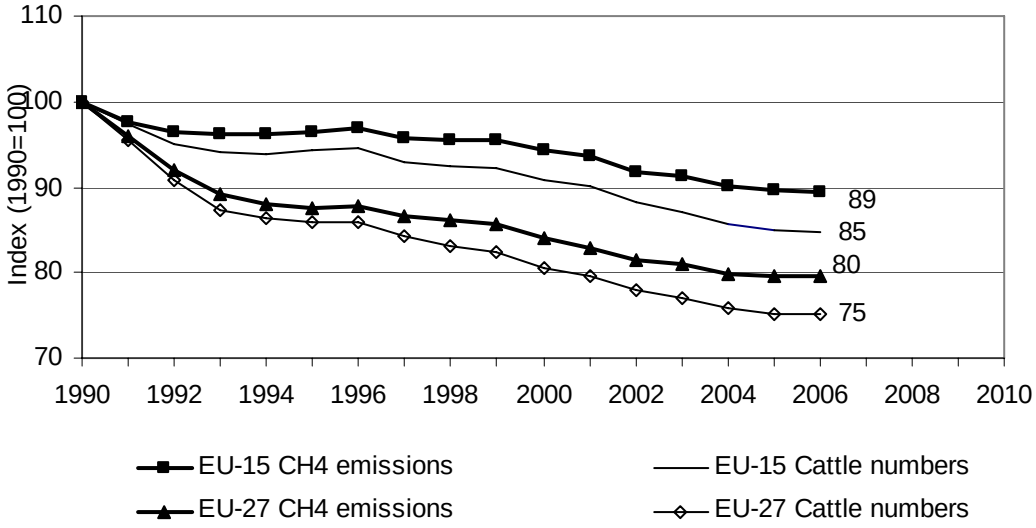
A 1.6.1 CH_4 emissions from enteric fermentation (4A)

- Between 1990 and 2006, CH_4 emissions from enteric fermentation decreased by 11 %. Between 2000 and 2006 emissions decreased by 5 %.

CH_4 emission from 4A	Share in 1990 total GHG	Share in 2006 total GHG	Change 1990–2006	Change 2000–2006
EU-15	3.2 %	2.9 %	– 10.6 %	– 5.3 %
EU-27	3.3 %	2.8 %	– 20.5 %	– 5.2 %

In 2006, CH_4 emissions from enteric fermentation accounted for 3 % of total greenhouse gas emissions in the EU-15. Most emissions are due to cattle (source category 4A1). Between 1990 and 2006, CH_4 emissions from enteric fermentation have decreased by more than 20 % in the EU-27 and by about 11 % in the EU-15 (Fig. 71).

Figure 71: Trend of CH_4 emissions and number of cattle from enteric fermentation in the EU-15 and CH_4 emissions of the EU-27



Source: EEA 2008a

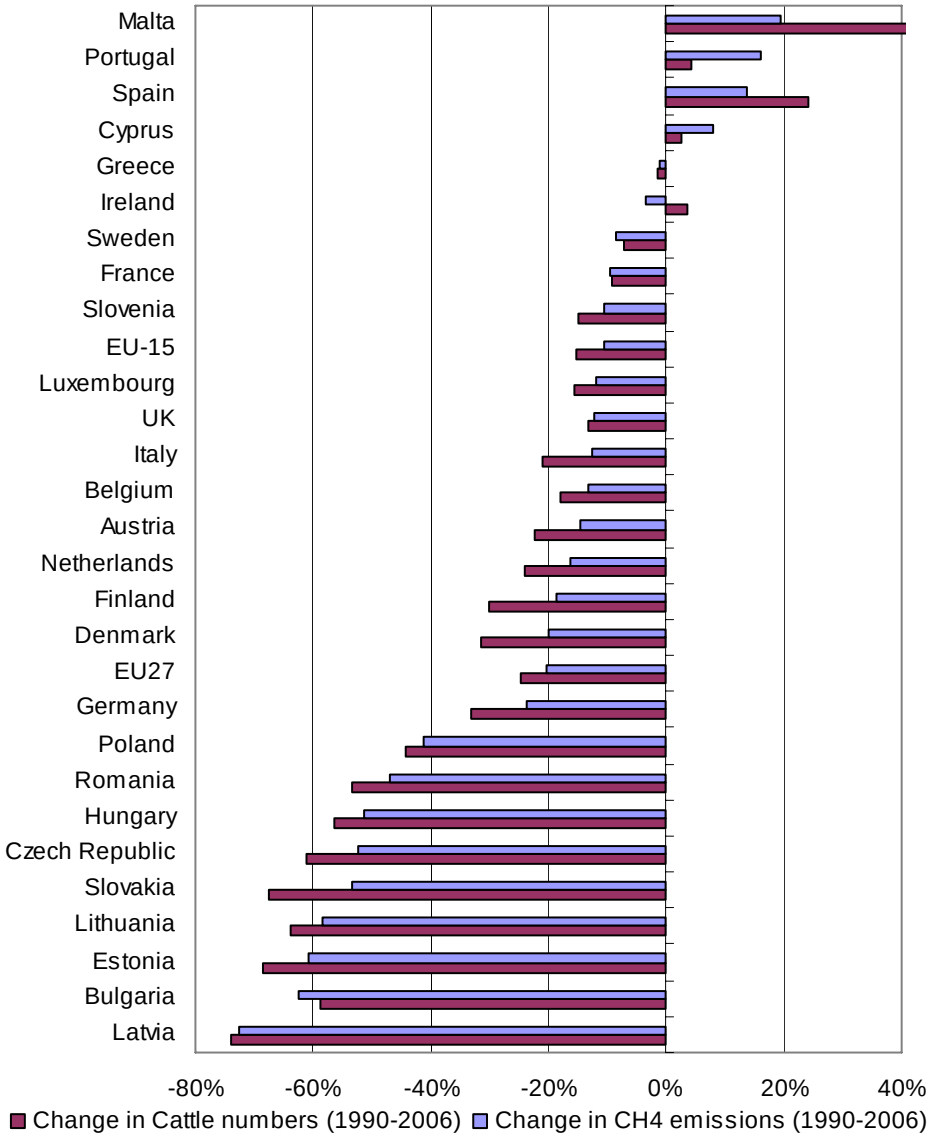
Animal numbers are coupled to emissions from enteric fermentation. One important indicator for animal productivity is the average daily gross energy intake for dairy and non-dairy cattle and sheep.

The trend in animal numbers is to a large extent influenced by EU policy such as suckler cow premia, milk quota, but also environmental legislation. Animal development is also determined by epidemics such as the avian flu (reducing e.g. the number of poultry in the Netherlands in 2003), the BSE crisis between 2001 and 2003, to name just the most important. (EEA, 2008a)

For cattle, the decrease in numbers is mainly explained by an increase in milk production per dairy cow combined with an unchanged total milk production. Milk production per cow increased between 1990 and 2005. This development has resulted from both genetic changes in cattle (due to breeding programmes) and the change in amount and composition of feed intake. (EEA, 2008a)

The decrease in emissions can also be explained by the effects of the EU accession, not only for EU-12 Member States, but also for Finland and Belgium (EEA, 2008a). It results in changes in the economic structure followed by an increase in the average farm size and a decrease in the number of small farms. It generally can be observed that small businesses are disappearing.

Figure 72 Change of CH_4 emission from enteric fermentation and number of cattle per EU Member States between 1990 and 2006



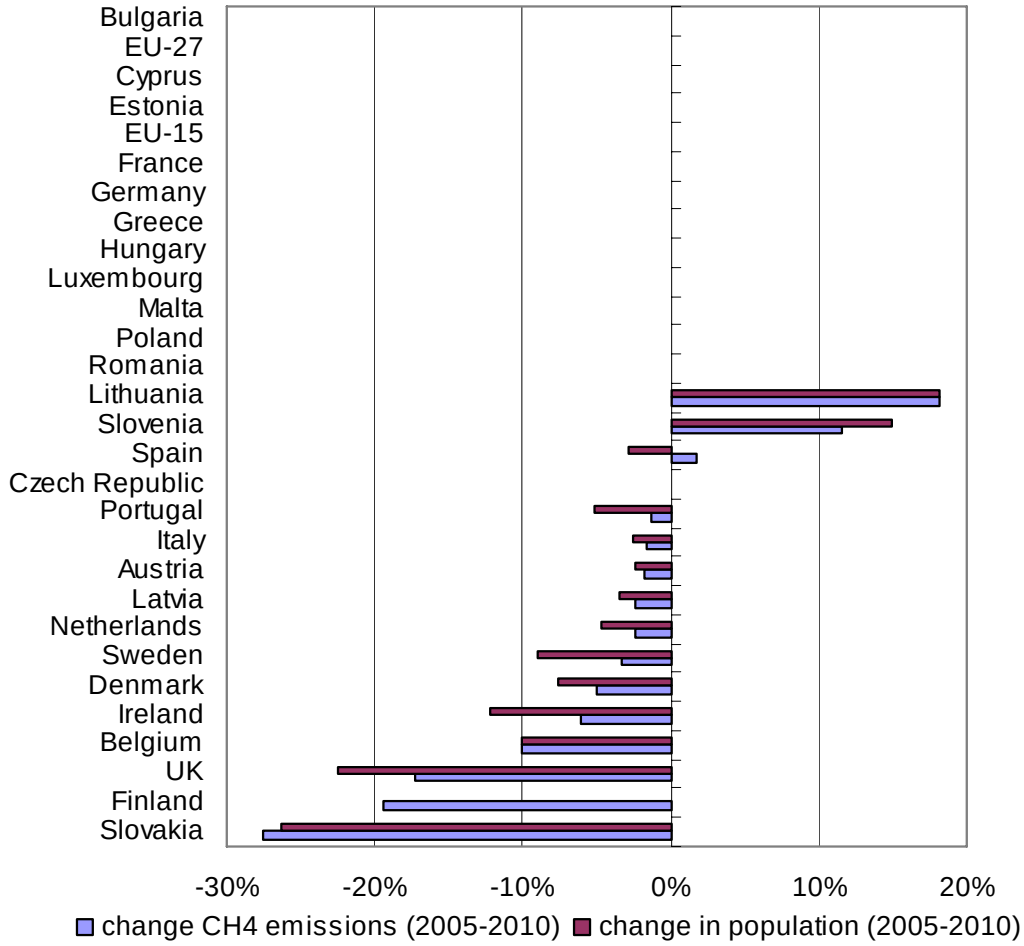
Source: EEA 2008a

The number of cattle and CH_4 emissions from this category are rather closely linked in most countries (Fig. 72). However, it has to be taken into account that – apart from the cattle specific emission factors – also the development of other animal population numbers (in particular sheep) influences overall CH_4 emissions from enteric fermentation.

Specific CH_4 emissions of cattle production (projected indicator N°9)

- In most Member States cattle numbers are projected to further decrease, so are the resulting CH_4 emissions.
- Lithuania and Slovenia expect increasing numbers of cattle and CO_2 emissions from enteric fermentation.

Figure 73 Projected change of CH_4 emission from cattle and number of cattle per EU Member State between 2005 and 2010 (Projected Indicator N°9)



Source: Member States' submissions

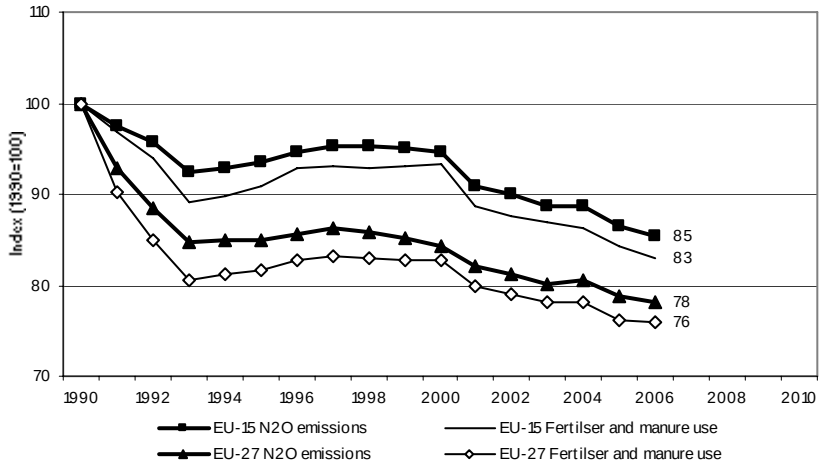
A 1.6.2 N_2O emissions from agricultural soils (4D)

- Between 1990 and 2006, EU-15 N_2O emissions from agricultural soils decreased by 15 %. Between 2000 and 2006 emissions decreased by 10 %.

N_2O emission from 4D	Share in 1990 total GHG	Share in 2006 total GHG	Change 1990–2006	Change 2000–2006
EU-15	5.3 %	4.7 %	– 14.6 %	– 9.7 %
EU-27	5.5 %	4.6 %	– 21.9 %	– 7.5 %

N_2O emissions from agricultural soils due to synthetic fertilizer and manure application account for 5 % of total greenhouse gas emissions in the EU-15 in 2006. N_2O emissions from synthetic fertiliser and manure use decreased in the EU-27 by more than 20 % whereas in the EU-15 by 15 % since 1990 (Fig. 74).

Figure 74: Trend of N_2O emissions and fertiliser and manure use from agricultural soils in the EU-15 and EU-27



Source: EEA 2008a

The decrease in emissions is largely a consequence of efficiency improvements, the reform of the EU common agricultural policy (CAP) as well as the implementation of the Nitrate Directive aimed at reducing water pollution.

The decoupling of emissions from soils and fertiliser use in the Netherlands is due to the phasing out of manure spreading on the land and the incorporation of manure into the soil: this measure aimed at reducing ammonia emissions from manure has the negative side-effect of increasing N_2O emissions. In Greece, the decoupling of emissions results from the relatively low share of direct emissions from soils, so total N_2O emissions from soils are not as closely linked to fertiliser and manure use as in other Member States.

The decrease in total N_2O emissions from agricultural soils in Denmark can largely be attributed to the introduction of a series of measures to prevent loss of nitrogen from agricultural soil to the aquatic environment. The measures include improvements to the utilisation of nitrogen in manure, a ban on manure application during autumn and winter, increasing area with winter-green fields

to catch nitrogen, a maximum number of animals per hectare and maximum nitrogen application rates for agricultural crops. (EEA, 2008a)

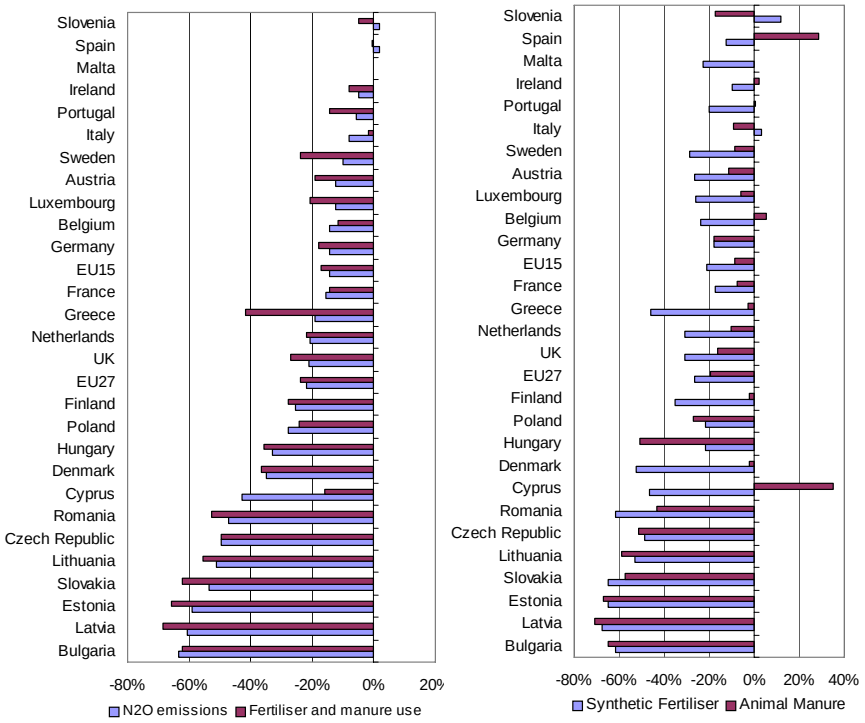
In Finland, emissions from agricultural soils have decreased 25 %, from 1990 to 2006. The main reasons causing this reduction are:

- the decrease in animal numbers which affects the amount of nitrogen excreted annually to soils,
- the decrease in the amount of synthetic fertilisers sold annually,
- the decrease in the area of cultivated organic soils.

Some parameters, e.g. the annual crop yields affecting the amount of crop residues produced annually, cause the fluctuation in the time series but this fluctuation does not have much effect on the overall N_2O emissions trend (EEA, 2008a).

Fertiliser and manure use together decreased in all countries. (Figure 75). In Belgium, Cyprus, Ireland, Portugal and Spain the use of animal manure increased between 1990 and 2006, whereas in Italy and Slovenia the use of Synthetic fertilizer increased. In Slovenia and Spain, emissions and fertiliser use show different trends. In most Member States, the application of synthetic fertiliser is decreasing faster than the application of animal manure (Fig. 75).

Figure 75 Change of N_2O emission and fertiliser and manure use (left), split for synthetic fertiliser and animal manure (right) per EU Member States between 1990 and 2005

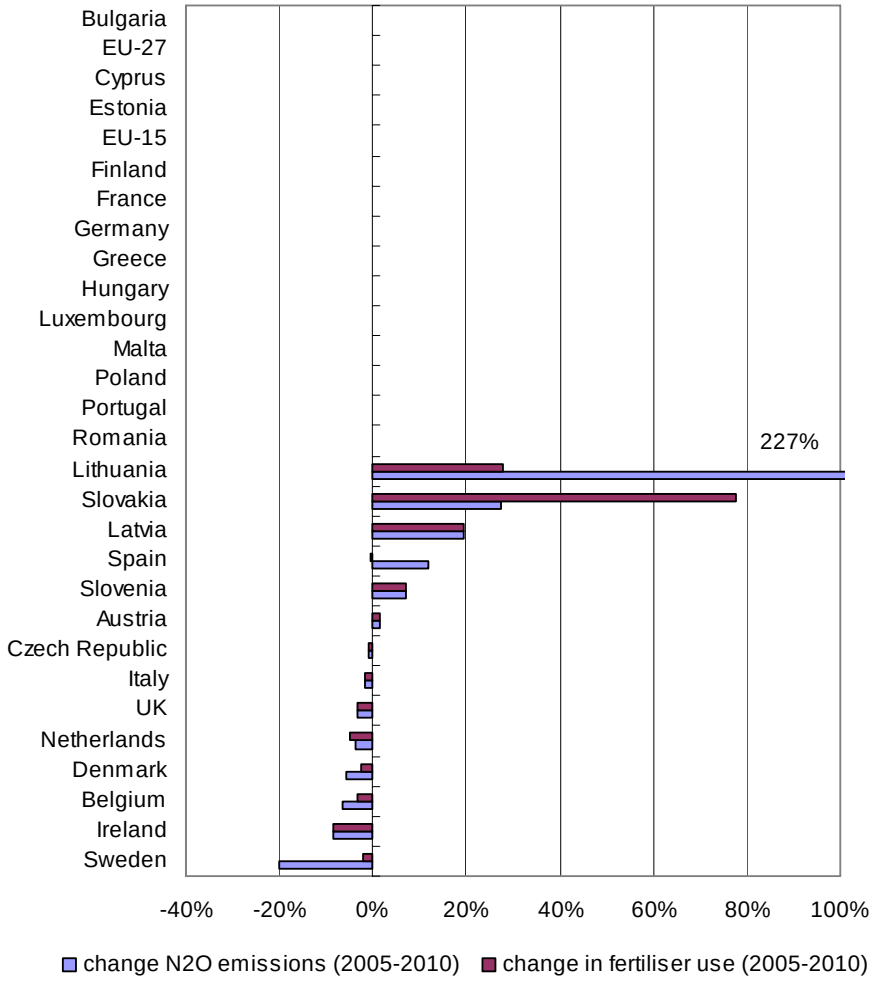


Source: EEA 2008a

Specific N_2O emissions of fertiliser and manure use (projected indicator N°8)

- Fourteen Member States reported numerator and denominator for 2005 and 2010. In eight countries, emissions from fertiliser and manure use are projected to decrease between 2005 and 2010 (Fig. 76).

Figure 76 Projected Change in N_2O emission from manuring and fertiliser and manure use per EU Member State between 2005 and 2010 (Projected Indicator N°8)



Source: Member States' submissions

A 1.7 Waste

Trends

- Between 1990 and 2006, greenhouse gas emissions from sector waste decreased by 39 %. Between 2000 and 2006 they decreased by 23 %.

GHG emission from 6	Share in 1990 total GHG	Share in 2006 total GHG	Change 1990–2006	Change 2000–2006
EU-15	4.1 %	2.6 %	– 38.7 %	– 22.7 %
EU-27	3.9 %	2.9 %	– 31.5 %	– 17.6 %

Projections

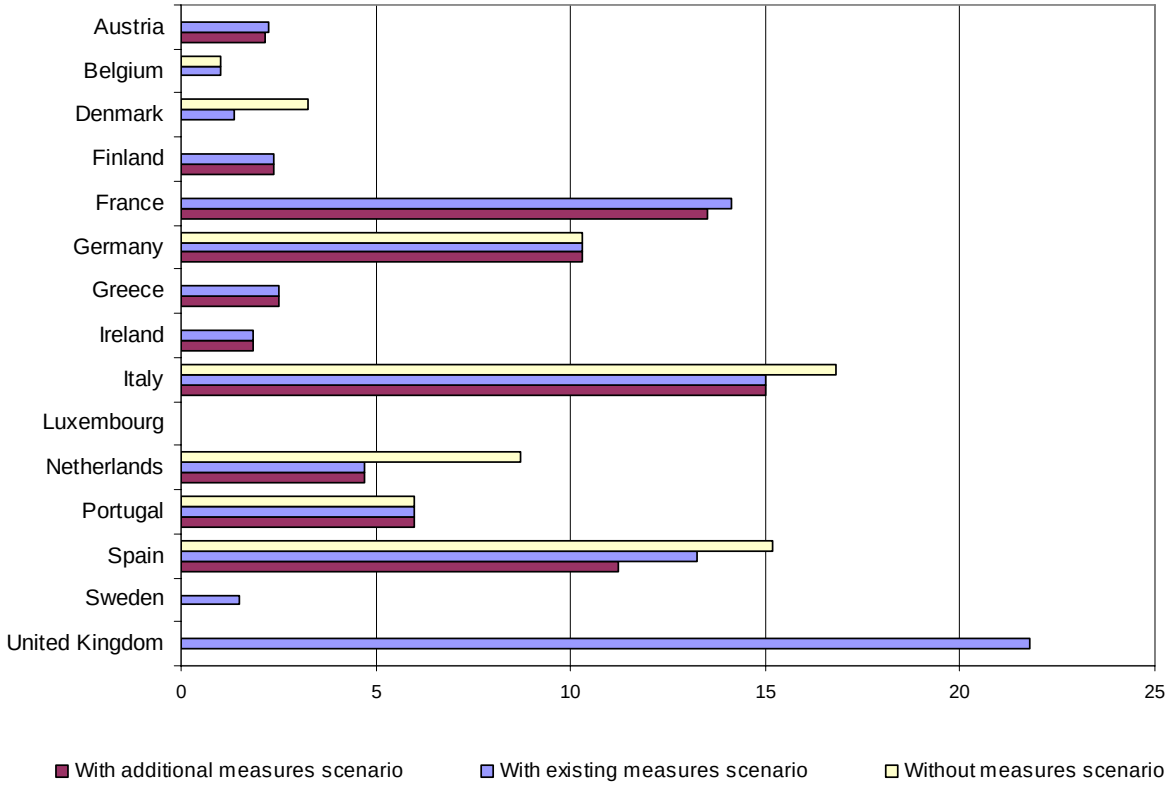
- Emissions from waste sector are projected to decrease more than in any other sector by 2010 (– 44 % with existing measures). Only Ireland, Portugal and Spain project that their greenhouse gas emissions from waste in 2010 will be higher than in 1990.
- Only three EU-12 Member States (Bulgaria, Cyprus and Lithuania) project decreases in greenhouse gas emissions from waste compared to 1990 emissions.
- Only Austria and Spain defined additional measures, whereas the other EU-15 Member States only provide projections for already existing measures. The highest reductions (more than 50 %) are projected by Belgium, Germany, the Netherlands, Sweden and the United Kingdom.

Contribution of policies and measures to greenhouse gas emission reductions in 2010 in the waste sector

Decreases in emissions of methane in particular but also carbon dioxide and nitrous oxide are expected to result from a range of (solid and water) waste management schemes, taxes and other measures such as the EU Landfill Tax, which is expected to reduce emissions by 7.3 Mt CO_2-eq. in 2010.

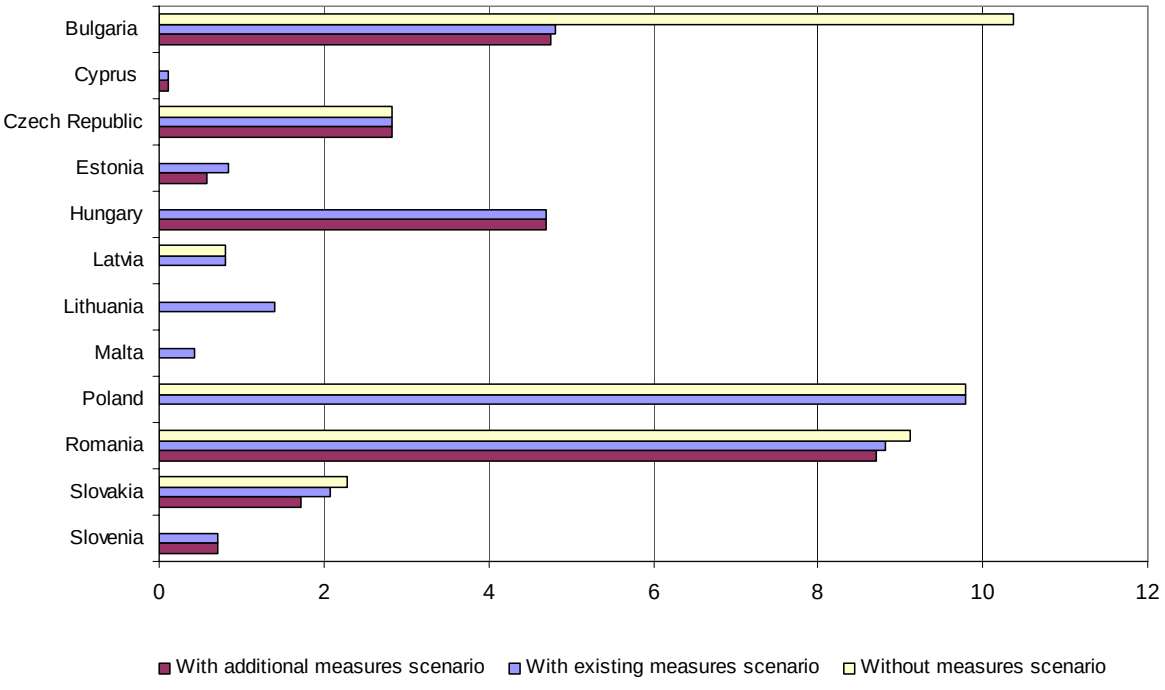
Figure 68 and Figure 69 illustrate the contribution of policies and measures to the reduction of emissions from the waste sector in 2010 for EU-15 and EU-12 respectively.

Figure 77 Contribution of policies and measures to emission reductions in the waste sector in 2010, EU15



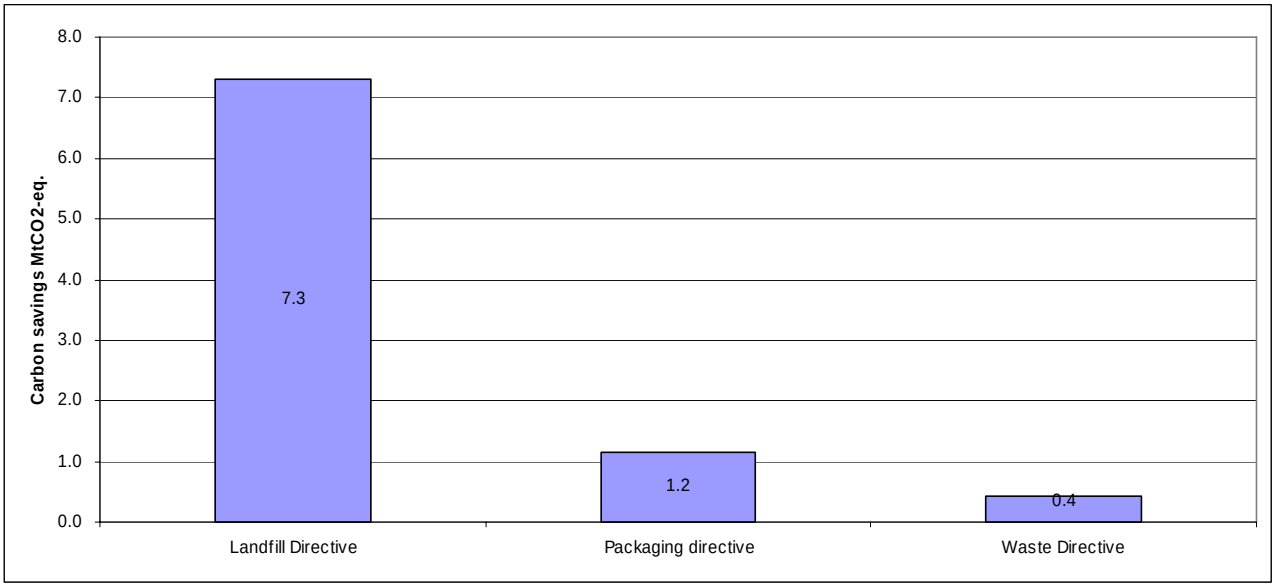
Source: See Sources of Information (Chapter 7). Details on individual Member States can be found in Table 4 of the Country Profiles (Annex 8).

Figure 78 Contribution of policies and measures to emission reductions in the waste sector in 2010, EU12



Source: See Sources of Information (Chapter 7). Details on individual Member States can be found in Table 4 of the Country Profiles (Annex 8).

Figure 79 Emission reduction potential of CCPMs in the waste sector in 2010, EU27



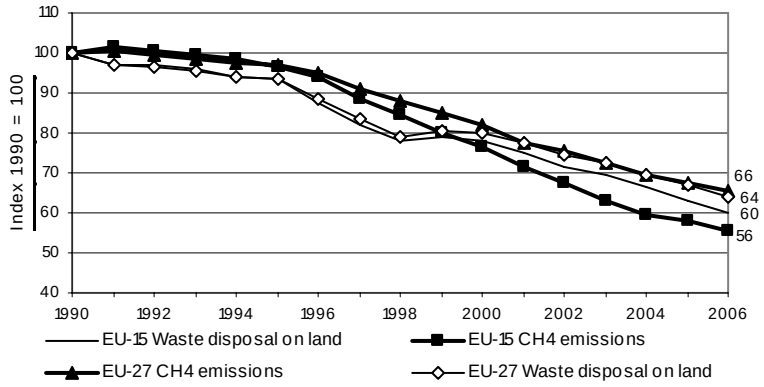
Source: Database on Policies and Measures in Europe (www.oeko.de/service/pam/sector.php) as of 17 July 2008.

CH_4 emissions from solid waste disposal (6A)

- Between 1990 and 2006, EU-15 CH_4 emissions from solid waste disposal decreased by 45 %. Between 2000 and 2006 they decreased by 28 %.

CH_4 emission from 6A	Share in 1990 total GHG	Share in 2006 total GHG	Change 1990–2006	Change 2000–2006
EU-15	3.4 %	2.0 %	– 44.5 %	– 27.5 %
EU-27	3.1 %	2.2 %	– 36.1 %	– 21.8 %

Figure 80: Trend of CH_4 emissions and amount of solid waste disposed on land in the EU-15 and CH_4 emissions of the EU-27



Source: EEA 2008a

Between 1990 and 2006, the amount of landfilled waste decreased in all EU-15 Member States except France, Greece, Ireland, Portugal and Spain (Fig. 80). Germany is the first Member State that stopped landfilling of biodegradable components completely. In the EU-12, emissions are mostly increasing (except in Bulgaria, Estonia, Lithuania and Poland). As emissions occur with a delay to the disposal it can occur that the amount of landfilled waste is decreasing and emissions are still increasing.

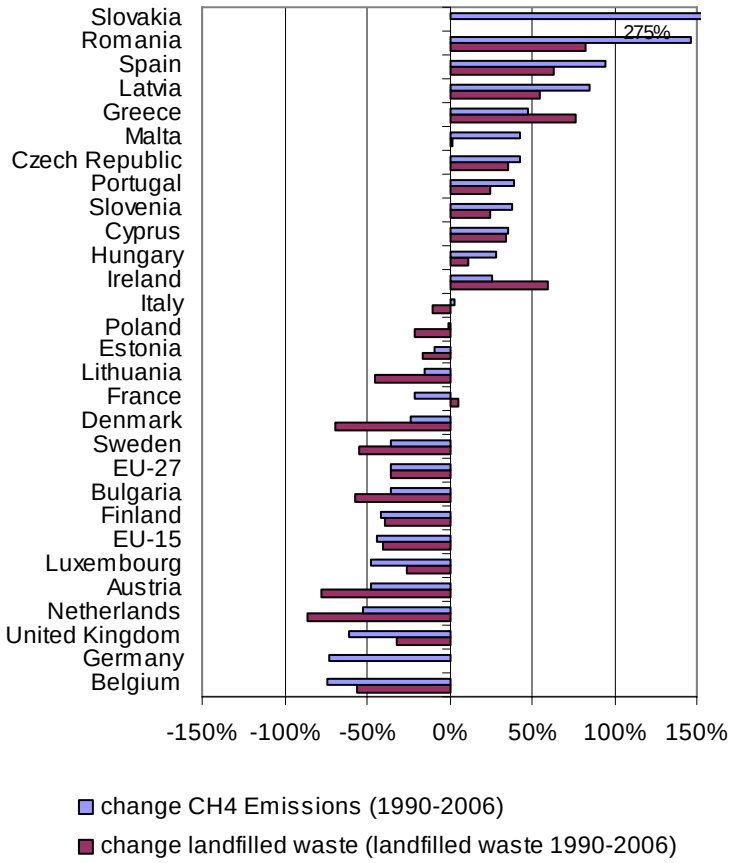
The main driving force of CH_4 emissions from solid waste disposal is the amount of biodegradable waste and the amount of CH_4 recovered and utilised or flared. The Landfill Directive limits the amount of biodegradable waste going to landfill to 65 % (by 2006), 50 % (by 2009) and 35 % (by 2016) of the waste generated in 1995. The implementation of the Directive means also that all new landfill sites must have gas recovery facilities and that such facilities will need to be installed in all existing landfill sites by 2009. The achievement of these goals implies further reductions in methane emissions, part of which have already occurred. Increased recovery of waste, and increasing use of recycling and incineration with energy recovery are expected to reduce considerably net greenhouse gas emissions from municipal waste management by 2020 ([10]). However, many Member States are still far from fulfilling the Directive's targets.

Municipal waste generation rates in central and Eastern Europe are lower than in western European countries. Whether this is due to different consumption patterns or underdeveloped

([10]) EEA, 2008b.

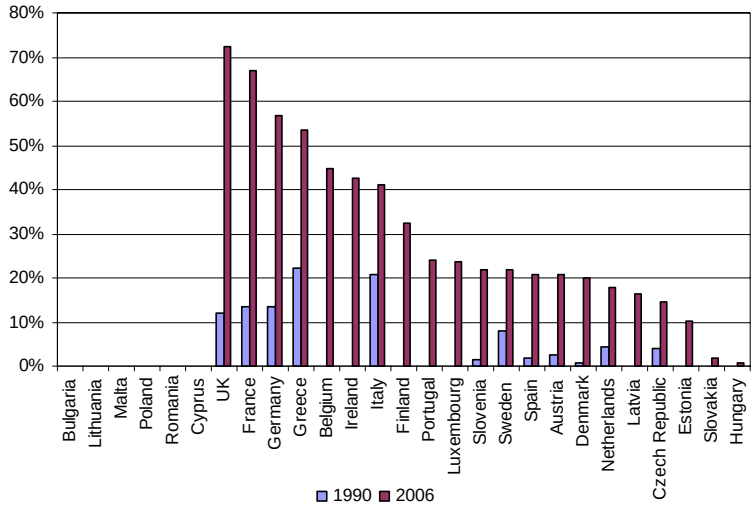
municipal waste collection and disposal systems needs further clarification. Reporting systems also need further development (EEA, 2005).

Figure 81 Change of CH_4 emissions and amount of landfilled waste per EU Member States between 1990 and 2006



Source: EEA 2008a

Figure 82 Methane recovery per Member State in 1990 and 2006



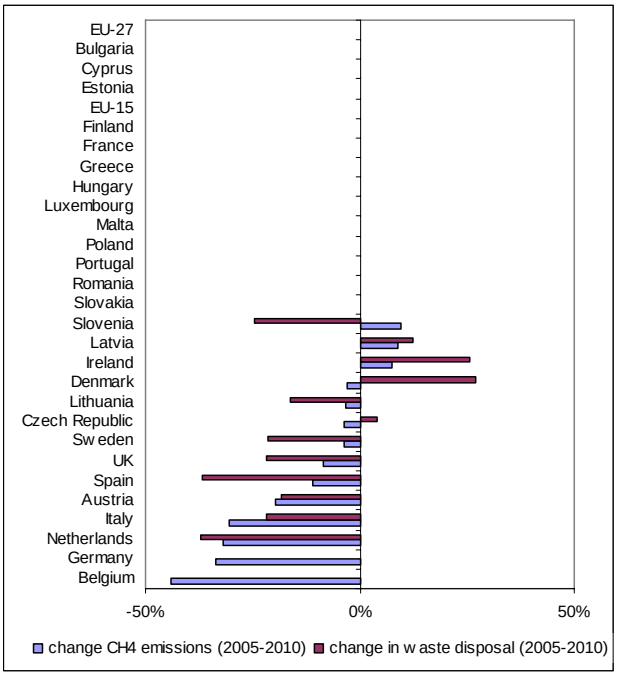
Source: EEA 2008a
Note: Bulgaria and Lithuania report CH_4 recovery as not occurring. Poland and Romania have not estimated CH_4 recovery.

Specific CH_4 emissions from landfills (projected indicator N°10)

- Most reporting Member States project that 2010 CH_4 emissions from landfills will stay below 2005 levels, except Ireland, Latvia and Slovenia (Fig. 82).

Projected Indicator N°10 depicts CH_4 emissions from landfills. Fourteen Member States report data on projections of amount of CH_4 emissions from landfills and change in population for 2005 and 2010. (Belgium reports 0 % change in waste disposal and thus there is no bar for change in waste disposal) (Figure 83).

Figure 83 Projected change of CH_4 emissions and amount of landfilled waste per EU Member States between 2005 and 2010 (Projected Indicator N°10)



Source: Member States' submissions

A 2 Key policies and measures

A 2.1 Savings from the main EU 'common and coordinated policies and measures' (CCPMs)

- Just under 94 % of the savings from all policies coordinated across the EU (CCPMs) are projected to be delivered by thirteen main CCPMs.
- Member States project that the Directive on emission trading will deliver the largest reduction of greenhouse gas emissions by 2010 in the EU-27. The Directive on renewable electricity represents the second highest potential for greenhouse gas savings.
- Several policy developments occurred in 2007 and 2008, including the European Council autonomous commitment to reduce EU greenhouse gas emissions by 20 % before 2020, substantiated in January 2008 by a Commission package of proposals on climate change and energy.

A 2.1.1 Key EU CCPMs

The European Climate Change Programme (ECCP) ([11]), launched in 2000, provides a cohesive framework to identify and develop all the necessary elements of an EU strategy to implement the Kyoto Protocol. Under the first phase of the Programme, the focus was on the Kyoto flexible mechanisms, the energy supply, energy consumption, transport and industry sectors and research. The Commission committed to 12 priority actions in ECCP I, and almost all have been or are close to being implemented. In October 2005, the Commission launched ECCP II. It investigated new policy areas such as adaptation, aviation and carbon capture and storage, as well as reviewing ECCP I and doing further work on the implementation of existing policies and measures.

Table 1 provides a full description of the key CCPMs referred to in this section. The CCPMs are generally EU-wide Directives, which are then transposed into national policies and measures by each Member State.

Table 1 Full description of key EU CCPMs

CCPM reference	CCPM full description
EU Emission Trading Scheme (ETS)	Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC
RES-E Directive	Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001on the promotion of electricity produced from renewable energy sources in the internal electricity market
Kyoto Protocol project mechanisms	Directive 2004/101/EC of the European Parliament and of the Council of 27 October 2004 amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms
Co-generation Directive	Directive 2004/7/EC on the promotion of cogeneration
Energy performance of	Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002

([11]) Report on the first phase of the ECCP: www.europa.eu.int/comm/environment/climat/pdf/eccp_longreport_0106.pdf, Second ECCP progress report: www.europa.eu.int/comm/environment/climat/pdf/second_eccp_report.pdf, Details of Phase II of the ECCP: http://ec.europa.eu/environment/climat/eccp.htm

CCPM reference	CCPM full description
buildings	on the energy performance of buildings
Directive on energy taxation	Council Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity
Efficiency of new boilers	Council Directive 92/42/EEC of 21 May 1992 on efficiency requirements for new hot-water boilers fired with liquid or gaseous fuels
Motor Challenge Programme	European Commission voluntary programme launched in February 2003, through which industrial companies are aided in improving the energy efficiency of their Motor Driven Systems.
Biofuels Directive	Directive 2003/30/EC of the European Parliament and the Council of 8 May 2003 on the promotion of the use of biofuels or other renewable fuels for transport
ACEA agreement	Commission Recommendations of 5 February 1999 and 13 April 2000 on the reduction of CO_2 emissions from passenger cars (voluntary agreement with car manufacturers from EU, Japan and Korea to reduce fleet average CO_2 emissions to 140 g/km by 2008/09)
F-gas regulation	Regulation (EC) No. 842/2006 of the European Parliament and of the Council of May 17, 2006 on certain fluorinated greenhouse gases
IPPC Directive	Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control
HFC motor vehicle air conditioning	Directive 2006/40/EC of the European Parliament and of the Council of 17 May 2006 relating to emissions from air conditioning systems in motor vehicles
Large combustion plant Directive	Council Directive 88/609/EEC of 24 November 1988 on the limitation of emissions of certain pollutants into the air from large combustion plants
Common rules for CAP direct support	Council Regulation (EC) No. 1782/2003 of 29 September 2003 establishing common rules for direct support schemes under the common agricultural policy and establishing certain support schemes for farmers
Landfill Directive	Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste
Directive on waste	Directive 2006/12/EC of the European Parliament and of the Council of 5 April 2006 on waste

A 2.1.2 Estimated savings from EU CCPMs

This section examines the contribution of EU CCPMs to greenhouse gas emission reductions across the EU. It presents and compares data on the expected savings from EU CCPMs by 2010 from two sources:

- The Commission's ex-ante estimates as submitted under the EC greenhouse gas monitoring mechanism in 2007, in fourth national communications to the UNFCCC and in demonstrable progress reports under the Kyoto Protocol.
- Member States estimates in national reporting.

The figures in the tables below are mainly based on ex-ante estimates of the emissions reduction potential made by the Commission of policies and measures identified in ECCP I. The estimates were reviewed as part of ECCP II, but there were generally insufficient quantified estimates by Member States to comment on the ex-ante estimates in detail. However, a number of reasons were identified as to why, in some cases, these measures are unlikely to deliver the full amount of the ex-ante estimates.

While no estimate of savings from the Directive on emissions trading was included in the Commission's ex-ante estimates, Member States' assessments of impacts indicate that it is projected to deliver the largest reduction in greenhouse gas emission by 2010. The Directive on renewable electricity is projected to deliver the second largest reduction in greenhouse gas emission in the EU-15, which concurs with the Commission's ex-ante estimates below.

Table 2 Summary of implemented and planned policies and measures, and reduction potentials in the EU-15 estimated by the European Commission

Policies and measures	Emission reduction potential by 2010 in EU-15 (Mt CO_2-eq.)	Stage of implementation / timetable / comments
Cross-cutting		
1. EU Emission Trading Scheme	N/a	In force. Legislative proposal in January 2008 to expand and strengthen scheme post 2012
2. Revision of the monitoring mechanism	N/a	In force
3. Link Kyoto flexible mechanisms to emissions trading	N/a	In force
Energy supply		
4. Directive on renewable electricity	**100–125 ([12])**	In force. Legislative proposal in January 2008 to set new target for all renewable energy for 2020.
5. Directive on the promotion of transport bio-fuels	**35–40 ([12])**	In force
6. Directive on promotion of cogeneration	**22–42 ([13])**	In force
7. Further measures on renewable heat (including biomass action plan)	**36–48**	Biomass Action Plan, Dec 2005[14], over 20 further actions planned. Renewable heat included in proposed new Directive on renewable energy
8. Intelligent Energy for Europe: programme for renewable energy	N/a	Programme for policy support in renewable energy
TOTAL in implementation	**193–255**	

([12]) Second ECCP progress report April 2003 http://europa.eu.int/comm/environment/climat/pdf/second_eccp_report.pdf

([13]) The share of renewable energy in the EU - COM(2004) 366 final, 26.5.2004.

([14]) Biomass Action Plan - COM(2005) 628 final, 7.12.2005.

Policies and measures	Emission reduction potential by 2010 in EU-15 (Mt CO_2-eq.)	Stage of implementation / timetable / comments
Energy demand		
9. Directive on the energy performance of buildings	**20 ([13])**	In force Monitoring and review
10. Directive requiring energy labelling of domestic appliances • Existing labels • New (el. ovens &AC) • Envisaged revisions (refrigerators / freezers / dishwashers) • Planned new (hot water heaters) • Extension of scope of Directive	 **20 ([12])** **1** **10** **23** Not known	In force: monitoring and review In force In force In force In preparation Consultation on amending Directive held in 2008.
11. Framework Directive on eco-efficiency requirements of energy-using products	dependent on implementation of daughter directives	In force; preparatory studies for daughter directives underway; adoption of first daughter directives expected in 2008
12. Directive on Energy services	**40–55 ([12])**	In force
13. Action Plan on Energy efficiency as a follow-up to the Green Paper	N/a	Launched Oct 2006 ([15]). Identifies 10 priority actions to achieve up to 20 % energy savings by 2020.
14. Action under the directive on integrated pollution prevention and control (IPPC) on energy efficiency	Not known	Reference document on Best Available Techniques regarding Energy Efficiency now finalised and will be adopted in 2008
15. Intelligent Energy for Europe programme for energy efficiency	N/a	Programme for policy support in energy efficiency
16. Public awareness campaign on energy efficiency	N/a	Supporting program as part of Intelligent Energy for Europe: In implementation
17. Programme for voluntary action on motors (Motor Challenge)	30 ([12])	Supporting programme for voluntary action on efficient motor systems
18. Public procurement	25–40 ([12])	EU Handbook developed for guidance for increased energy efficient public procurement
TOTAL in implementation	**169–199**	

([15]) Action Plan for Energy Efficiency: Realising the Potential - COM(2006) 545 final, 19.10.2006.

Policies and measures	Emission reduction potential by 2010 in EU-15 (Mt CO_2-eq.)	Stage of implementation / timetable / comments
Transport		
19. Community strategy on CO_2 from passenger cars, including voluntary commitment (VC) of car manufacturers' associations	Total **107–115** Of which VC: **75–80 ([12])**	VC: monitoring; review ongoing Labelling: in force, to be revised Communication on fiscal measures: in implementation Directive on taxation of passenger cars: in preparation Strategy reviewed in 2007 ([16]) and Regulation on CO_2 emissions from cars now in preparation ([17]).
20. Framework Directive Infrastructure use and charging	Not known	In implementation, in relation to heavy duty road transport only; amending 'Eurovignette' Directive (which aims, among other actions, to introduce external costs into calculations of tolls for heavy vehicles on European roads) is now proposed ([18]).
21. Shifting the balance of transport modes	Not known	Package of measures in implementation
22. Fuel taxation	Not known	In force Focus on EU harmonisation of taxation, not on CO_2 reduction; ongoing review
23. Directive on mobile air conditioning systems: HFCs	See regulation on fluorinated gases	In force
TOTAL in implementation	**107–115**	
Industry		
24. Regulation on fluorinated gases	**23 ([19])**	In force
25. IPPC & non-CO_2 gases	Not known	In force Review periodically
Waste		
26. Landfill Directive	**41 ([12])**	In force
27. Thematic strategy on waste	Not known	Launched December 2005 ([20])
Integration Research & Development		
28. R&D framework Program	N/a	In force. Under the 6th Framework Programme (FP) for research and development (2000–2006) EUR 2 billion of support was available for climate change related research, including the fields of energy and transport. Under the 7th FP (2007–2013), it is EUR 11 billion.
Integration Structural funds		
29. Integration climate change in structural funds &cohesion funds	N/a	EUR 308 billion (2004 prices) have been allocated for the new budgetary period of 2007–2013 Strategic guidelines highlight investments to promote Kyoto commitments, including renewable energy, energy efficiency and sustainable transport systems as eligible areas for support.

([16]) Results of the review of the Community Strategy to reduce CO_2 emissions from passenger cars and light-commercial vehicles - COM(2007) 19 final, 7.2.2007.

([17]) Regulation proposal setting emission performance standards for new passenger cars as part of the Community's integrated approach to reduce CO_2 emissions from light-duty vehicles - COM(2007) 856 final, 19.12.2007.

([18]) Directive proposal amending Directive 1999/62/EC on the charging of heavy goods vehicles for the use of certain infrastructures - COM(2008) 436 final, 8.7.2008.

([19]) Regulation proposal on certain fluorinated greenhouse gases - COM(2003) 492 final, 11.8.2003.

([20]) Taking sustainable use of resources forward: A Thematic Strategy on the prevention and recycling of waste' - COM(2005) 666 final and Directive proposal on waste - COM(2005) 667 final, 21.12.2005.

Policies and measures	Emission reduction potential by 2010 in EU-15 (Mt CO_2-eq.)	Stage of implementation / timetable / comments
Agriculture		
30. Integration climate change in rural development	N/a	Improvement of the environment is a key theme, and strategic guidelines identify combating climate change including development of renewable energy, material sources for bioenergy and preserving the carbon sink in soils as eligible areas for support. The budget for rural development is EUR 77 billion for 2007–2013.
31. Support scheme for energy crops	N/a	In force
32. N_2O from soils	**10**	Improved implementation of the nitrates Directive
Forests		
33. Afforestation and reforestation: - Afforestation programmes - Natural forest expansion	**14**[12]	Possibility for support through forestry scheme of rural development
34. Forest management (various measures)	**19**[12]	Possibility for support through forestry scheme of rural development, dependent on national implementation.

Note: The emission reduction potentials by 2010 in EU-15 presented are based on ex-ante estimates of the emissions reduction potential made by the Commission.

Source: European Climate Change Program, ex-ante estimates in information submitted under the EC greenhouse gas monitoring mechanism in 2007, in fourth national communications to the UNFCCC and in demonstrable progress reports under the Kyoto Protocol. Individual Member States detail can be found in Table 4 of the Country Profiles (Annex 8).

A 2.1.3 Estimated savings from CCPMs at EU-27, EU-15 and EU-12 level

Data on savings for the key CCPMs was obtained from Member States estimates of the expected reduction effect of individual policies in 2010. Data was not available for four Member States (Belgium, Cyprus, Poland and Romania). The figures in this section for EU-12, EU-15 and EU-27 simply represent the sum of those reported by Member States. For additional information on methodological issues relating to the calculation of savings from CCPMs, please refer to Annex 5 The reporting scheme.

Eight widespread policies (CCPMs) are projected to deliver significant greenhouse gas emissions savings across the EU-27 (from 10 to 123 Mt CO_2-eq. per policy). These are:

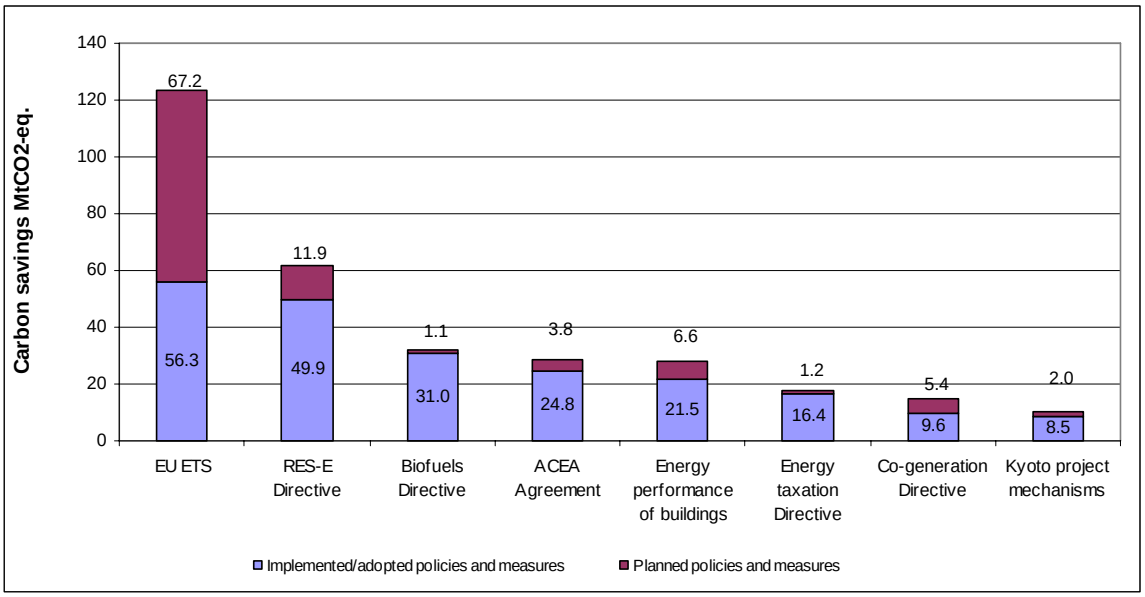
- the EU Emission Trading Scheme (ETS) and Kyoto project flexible mechanisms;
- the RES-E Directive (related to the promotion of electricity produced from renewable energy sources) and Directives on the energy performance of buildings, energy taxation and promotion of co-generation (combined heat and power);
- the Biofuels Directive and EU-wide ACEA Agreement with car manufacturers.

These top eight policies account for 86 % of the total savings attributed to CCPMs in the EU-27.

Of all the EU CCPMs, the EU ETS and RES-E Directive are predicted to deliver the greatest savings across EU-27 Member States (Figure 84). The EU ETS is also estimated to deliver the greatest savings from PAMs that have already been implemented or adopted.

The top eight policies identified in 2008 are estimated to deliver a total emission saving of 317 Mt CO_2-eq. in 2010 compared to 378 Mt CO_2-eq. for the same top eight policies examined in the 2007 report.

Figure 84 EU-27 estimated savings from top eight CCPMs in 2010, split by status (implemented/adopted or planned)

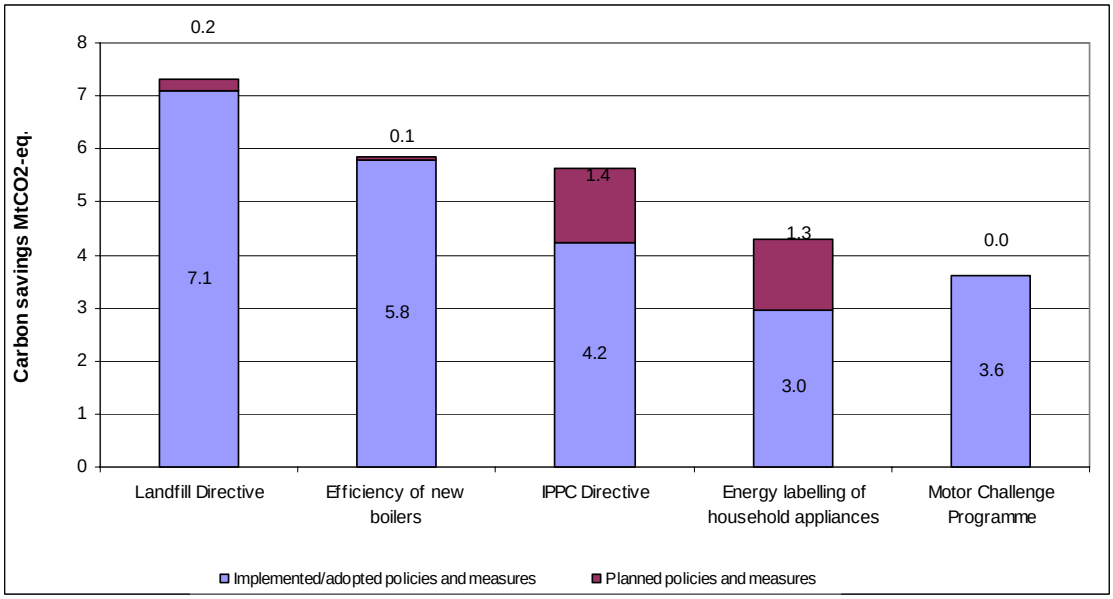


Source: Database on Policies and Measures in Europe (www.oeko.de/service/pam/sector.php) as of 17 July 2008.

In addition, a further five CCPMs were identified that are also predicted to deliver important savings across the EU (from 4 to 7 Mt CO_2-eq. per policy). These five policies are: the Landfill Directive, efficiency requirements for new hot-water boilers, the Directive on Integrated pollution prevention and control (IPPC), the Directives on energy labelling of household appliances and the Motor Challenge Programme.

Estimated savings from these five policies amount to 27 Mt CO_2-eq., bringing the total of the top 13 CCPMs to 344 Mt CO_2-eq., or 94 % of the savings from all CCPMs across the EU. The 2007 and 2008 results are very similar; in 2007, 95 % of all savings from CCPMs was derived from the top 13 policies.

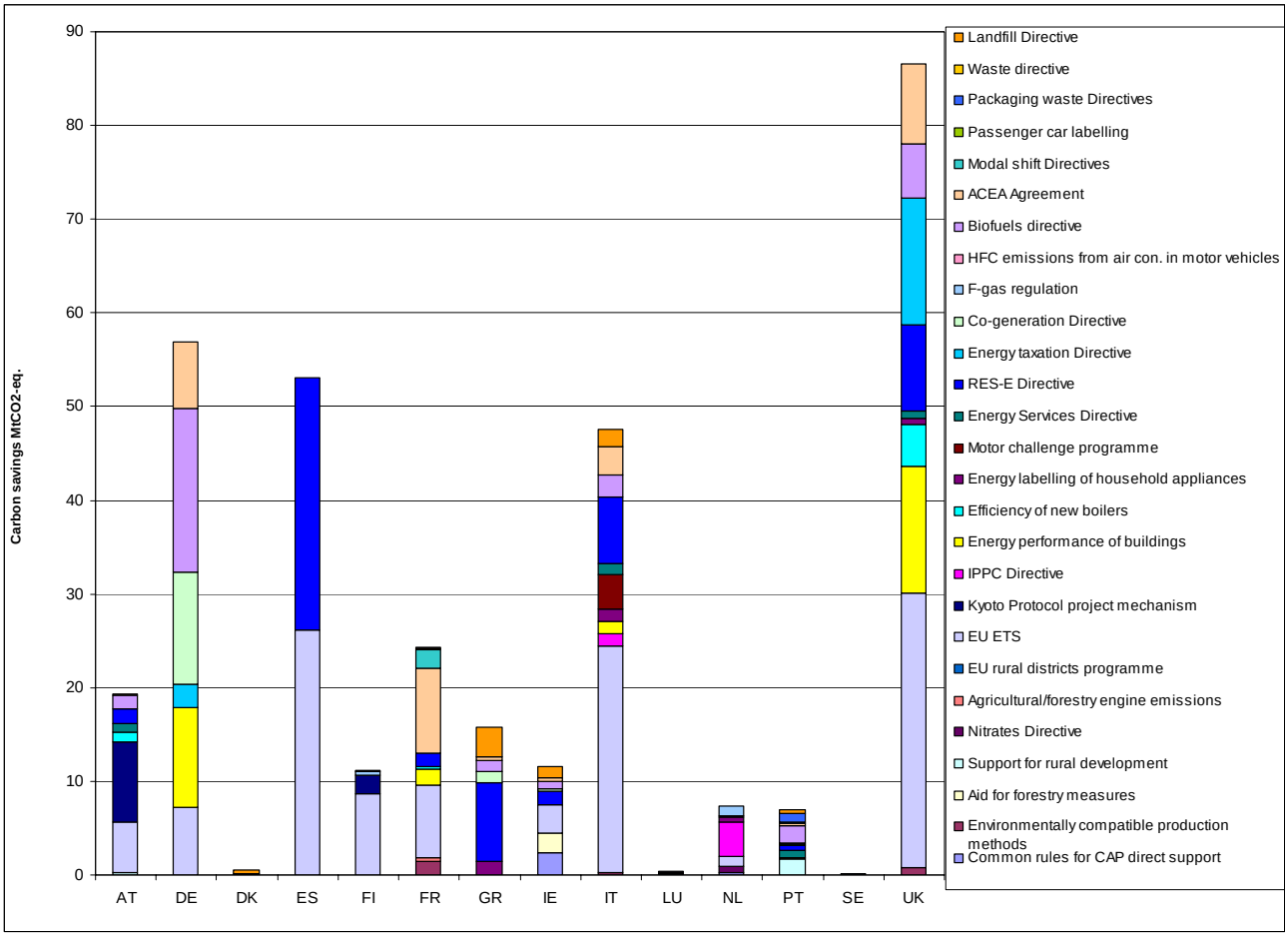
Figure 85 EU-27 estimated savings from next highest five CCPMs in 2010, split by status (implemented/adopted or planned)



Source: Database on Policies and Measures in Europe (www.oeko.de/service/pam/sector.php) as of 17 July 2008.

A 2.1.4 Estimated savings from CCPMs by Member State

Figure 86 CCPMs estimated to deliver the greatest savings in EU-15 Member States, 2010



Note: AT: Austria, DE: Germany, DK: Denmark, ES: Spain, FI: Finland, FR: France, GR: Greece, IE: Ireland, IT: Italy, LU: Luxembourg, NL: Netherlands, PT: Portugal, SE: Sweden, UK: United Kingdom

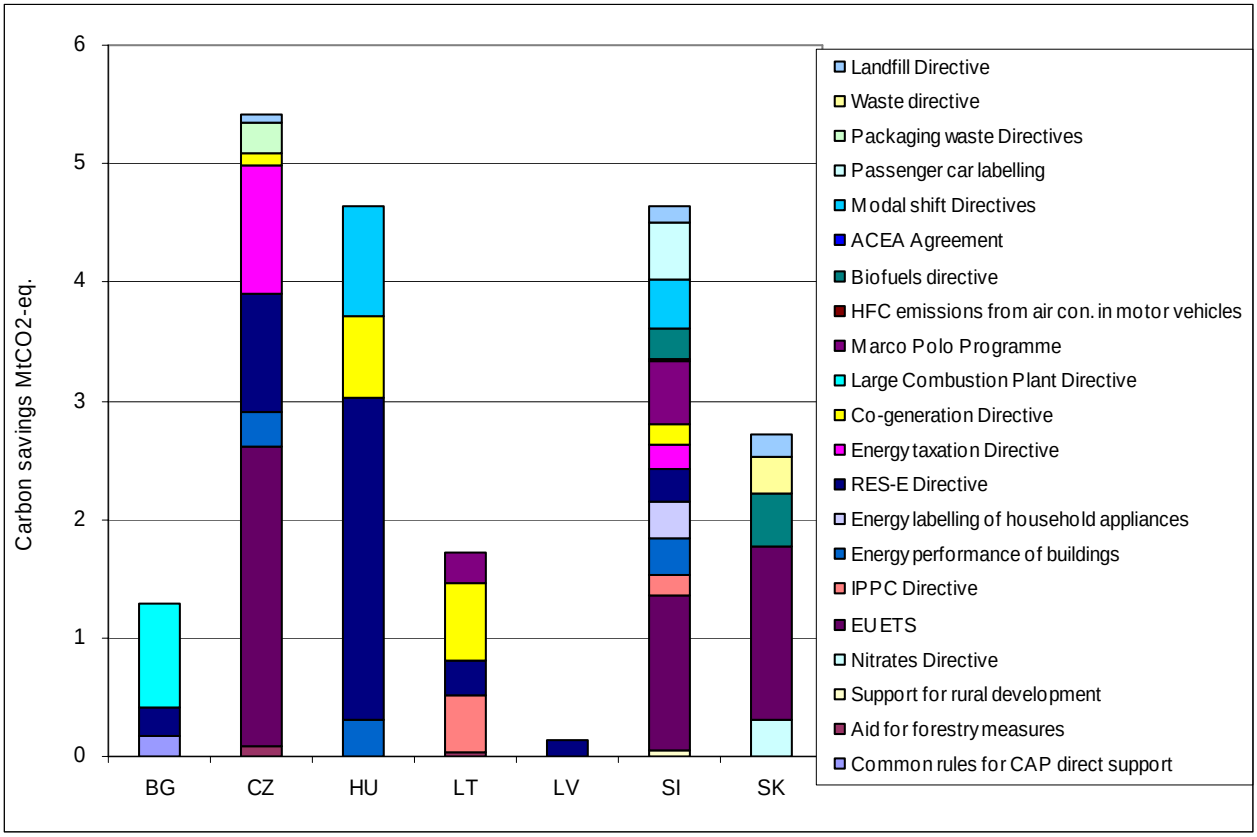
Source: Database on Policies and Measures in Europe (www.oeko.de/service/pam/sector.php) as of 17 July 2008.

Figure 86 shows, for each EU-15 Member State for which data is available, the policies that are projected to deliver savings in 2010.

The United Kingdom, Germany, Spain and Italy and show the largest projected savings from CCPMs. Across the EU-15 the most significant savings are expected from the EU ETS, the RES-E Directive, the Biofuels Directive, the voluntary agreement with car manufacturers on CO_2, and the Directive on the energy performance of buildings.

The equivalent data for EU-12 Member States for which data is available is shown on Figure 87.

Figure 87 CCPMs estimated to deliver the greatest savings in EU-12 Member States, 2010



Source: Database on Policies and Measures in Europe (www.oeko.de/service/pam/sector.php) as of 17 July 2008.

The Czech Republic, Hungary and Slovenia show the largest projected savings in the EU-12 with the most significant savings coming from the EU ETS and the Renewables Directive.

In terms of differences between 2007 and 2008 findings, most of the key CCPMs across the EU-27 are unchanged, though EU ETS has become more prominent. The estimated impact on emissions reductions of the Directives has decreased slightly for several policies and total savings from CCPMs have also reduced by 13 % compared to 2007. The split between implemented/adopted and planned measures is broadly similar to 2007, with a slight movement towards planned policies.

Member States have transposed EU CCPMs using a variety of domestic PAMs. It has proved difficult to separate out savings for domestic PAMs directly resulting from CCPMs, and the savings presented in this section on key policies may also cover measures not directly implemented as a result of a CCPM.

Some of the observed differences in estimated savings attributed to each CCPM from year to year may be due to different methods of assigning reported savings either to the CCPM or to national PAMs that were in place before the CCPM (which are not considered here). In particular, this is likely to account for most of the apparent difference in the effect of the Landfill Directive, as several Member States had national measures in place before the introduction of the CCPM.

A 2.1.5 Recent developments and proposals relating to EU CCPMs

In 2007 the European Council made an autonomous commitment to reduce EU greenhouse gas emissions by 20 % before 2020, with a more ambitious 30 % reduction possible, provided that other developed countries commit themselves to comparable reductions ([21]). The Commission continues to integrate climate change into other policy areas of the EU. The most important recent development (in January 2008) is Commission's release of the EU climate action and renewable energy package which further developed some of the key measures set out in the earlier (January 2007) integrated energy and climate change package ([22])([23]). It included:

- **EU ETS:** A legislative proposal ([24]) to expand, strengthen and improve the functioning of the EU ETS in its next Phase post-2012 (cf. section 3.5 of the report)
- **Effort Sharing**: A legislative proposal ([25]) for a framework for national commitments to reduce emissions which are outside the scope of the EU ETS (cf. section 3.5 of the report)
- **Renewables**: A legislative proposal ([26]) to increase the share of renewable energy in the EU final energy consumption to 20 % by 2020, and of biofuels in transport to 10 %. (cf. section 5.2.2 of the report)
- **Carbon Capture and Storage:** Policies ([27]) to encourage early demonstration of capture and geological storage of carbon including a legislative proposal for a regulatory framework ([28]).

Other recent important developments include:

- **Fluorinated gases**: adoption of a Regulation and Directive (July 2006) to limit emissions of fluorinated gases, including those from air-conditioning in cars.
- **Energy Efficiency**: Action Plan for Energy Efficiency (October 2006), which sets out 10 priority actions to realise up to 20 % energy savings by 2020. Recent and proposed measures to implement the Action Plan include an amendment to the Energy Star Regulation (2007) and 2008–2009 proposals for revisions of the framework energy labelling Directive and Directive on car labelling , introduction of energy labelling scheme for tyres and a recast of the Directive on the energy performance of buildings,
- **CO_2 and cars:** Communication (February 2007) setting out strategy for reducing emissions and Regulation proposal ([17]) (December 2007) to set target for average CO_2 emissions from new cars

([21]) Brussels European Council, 8/9 March 2007, Presidency Conclusions - 7224/1/07, 02.05.2007.

([22]) Limiting Global Climate Change to 2 degrees Celsius: the way ahead for 2020 and beyond - COM(2007) 2 final, 10.1.2007.

([23]) An energy policy for Europe - COM(2007) 1 final, 10.1.2007.

([24]) Directive proposal amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading system of the Community - COM(2008) 16 final, 23.1.2008.

([25]) Decision proposal on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020 - COM(2008) 17 final, 23.1.2008.

([26]) Directive proposal on the promotion of the use of energy from renewable sources - COM(2008) 19 final, 23.1.2008.

([27]) 'Supporting Early Demonstration of Sustainable Power Generation from Fossil Fuels' - COM(2008) 13 final, 23.1.2008.

([28]) Directive proposal on the geological storage of carbon dioxide and amending Council Directives 85/337/EEC, 96/61/EC, Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC and Regulation (EC) No 1013/2006 - COM(2008) 18 final, 23.1.2008.

at 130 g CO_2/km by 2012 relying on improvements in vehicle motor technology to set standards for CO_2 emissions from cars;

- **Transport fuels**: legislative proposal (January 2007) to revise the fuel quality Directive which includes targets for reducing GHG emissions associated with the production of petrol and diesel;
- **Promotion of clean and energy efficient vehicles**: legislative proposal ([29]) (December 2007) requiring the inclusion of CO_2 emissions, operational lifetime costs of energy consumption, and pollutant emissions as award criteria in the public procurement of road transport vehicles from 2012;
- **Light duty vehicles**: Consultation (September 2008) initiated on proposal aiming at improving the fuel efficiency of light duty vehicles;
- **Energy taxation:** Review of the Energy Taxation Directive which will ensure that it is better in line with EU climate change and energy policies.

([29]) Revised Directive proposal on the promotion of clean and energy efficient road transport vehicles - COM(2007) 817 final, 19.12.2007.

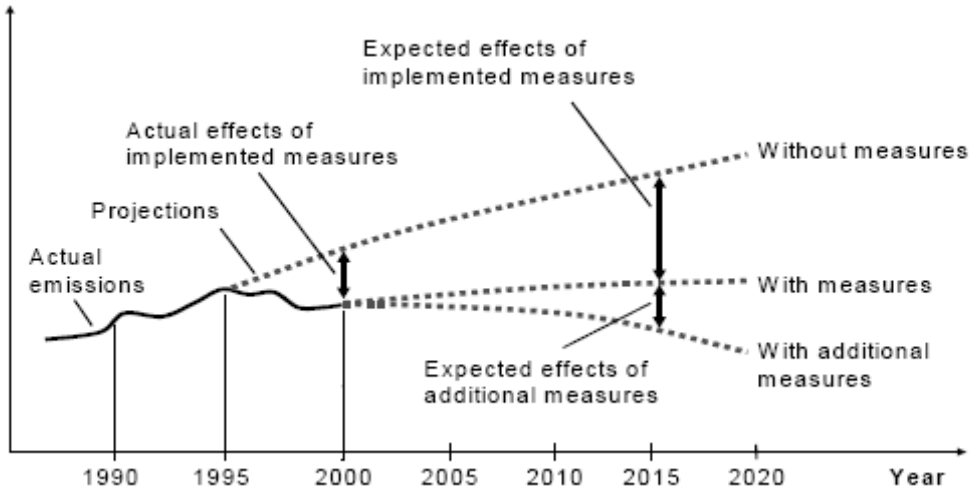
A 2.2 Main savings from existing and additional domestic policies and measures in the EU-15

A 2.2.1 Reporting of policies and measures by Member States and quantitative estimates.

Under the EU Monitoring Mechanism, Member States are required to provide information every two years on the policies and measures (PAMs) included in their 'with existing measures' projections (WEM) and in their 'with additional measures' projections (WAM), with quantitative estimates of the effect of policies and measures on emissions by sources and removals by sinks of greenhouse gases between the base year and subsequent years, including 2005, 2010 and 2015 ([30]) (Figure 88).

These estimates relate to absolute savings and are equivalent to emission reductions compared to a hypothetical scenario where no measure would have been implemented ('without measures') and emissions would have been influenced by other factors, such as macro-economic parameters. Therefore, the quantified savings referred to in the present section should be interpreted with care, as they differ from the projected emission reductions relative to base-year emissions – although they derive from the same policies and measures.

Figure 88 Types of scenarios, policies and measures and estimated effects.



Note: This figure relies on the assumption that the latest GHG inventory data are from 2000.
Source: UNFCCC guidelines for national communications.

The type of policies and measures can be either EU level CCPMs or specific national PAMs. In some cases, this distinction is clear from the information reported by the Member States, but in general, total effects of PAMs are aggregated at a sector level and are not available at this level of detail.

([30]) Article 3(2) of Decision No 280/2004/EC of the European Parliament and of the Council of 11 February 2004 concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol.

For additional information on methodological issues relating to the calculation of PAMs and 'without measures' projections, please refer to Annex 5, The reporting scheme.

A 2.2.2 Savings from PAMs as estimated by EU-15 Member States

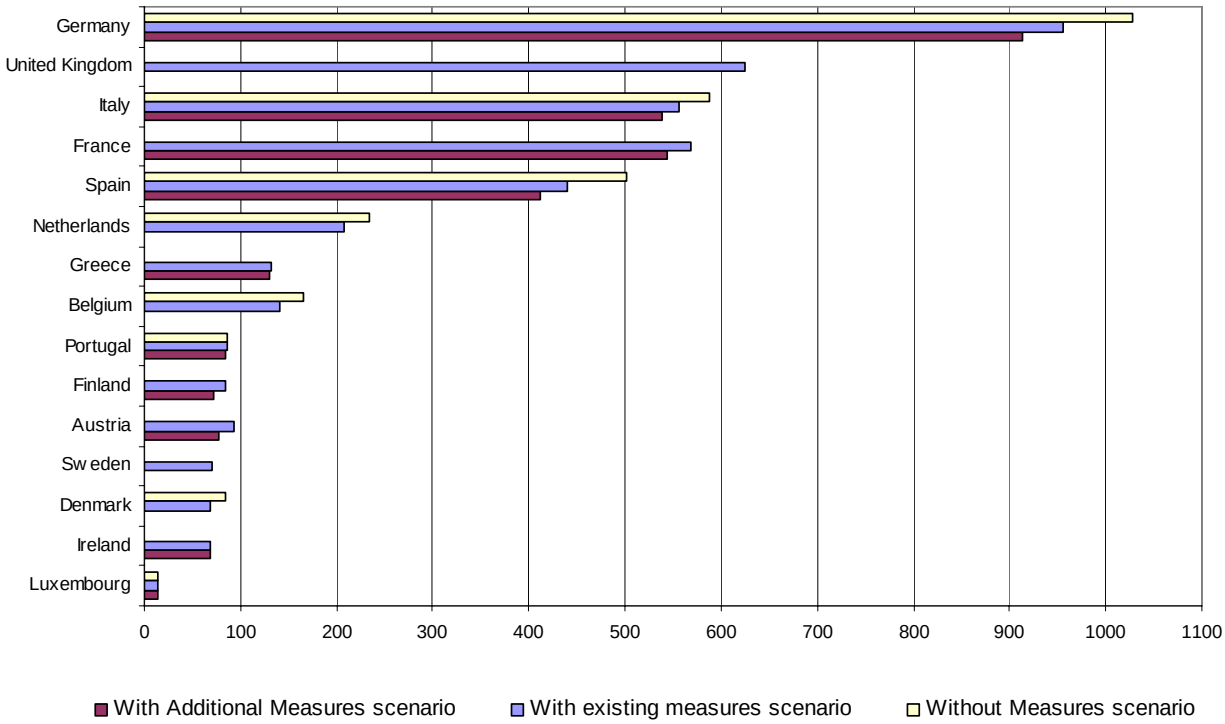
- EU-15 emission savings in 2010 from existing and additional policies and measures are projected to total to 377 Mt CO_2-eq. (compared to a scenario without measures).
- Additional planned measures are projected to bring a total reduction of 142Mt CO_2-eq. (38 % of the total projected reduction).
- The greatest absolute savings are projected to occur in Germany, Italy, the Netherlands and Spain.
- The large decrease in total projected savings in the EU-15 compared to 2007 estimates (according to which 727 Mt CO_2-eq. would be saved by 2010) is mainly due to a change in the method used for estimating savings.

Projected emission savings from policies and measures by 2010 in the EU-15 are projected to total to 377 Mt CO_2-eq. (Figure 89). 38 % of the total saving (142 Mt CO_2-eq.) is projected to come from measures not implemented or adopted as yet ('additional measures'). The greatest absolute savings are projected to occur in Germany, Spain, Italy and the Netherlands, mostly after the implementation of additional measures (Figure 90).

In 2007, 727 Mt CO_2-eq. emission savings from policies and measures in the EU-15 by 2010 were reported, with 23 % of the savings coming from the implementation of additional PAMs. In 2007, the largest savings were reported by Italy, Germany and the United Kingdom. For several Member States, the total savings presented in this year's report have reduced compared to the 2007 report, due to a change of calculation method (shift from a bottom-up calculation of PAM savings to a top-down calculation based on total projections). Savings projected by the United Kingdom have decreased by 90 Mt since last year as the United Kingdom does not report a 'without measures' or 'with additional measures' projection. Significant reductions in projected savings have also occurred in Italy, Greece and the Netherlands, with revised estimates being lower by 107 Mt CO_2-eq., 37 Mt CO_2-eq. and 37 Mt CO_2-eq. respectively compared to 2007. The only significant increase in savings compared to last year comes from Spain (32 Mt CO_2-eq. as a 'with additional measures' projection has been provided this year).

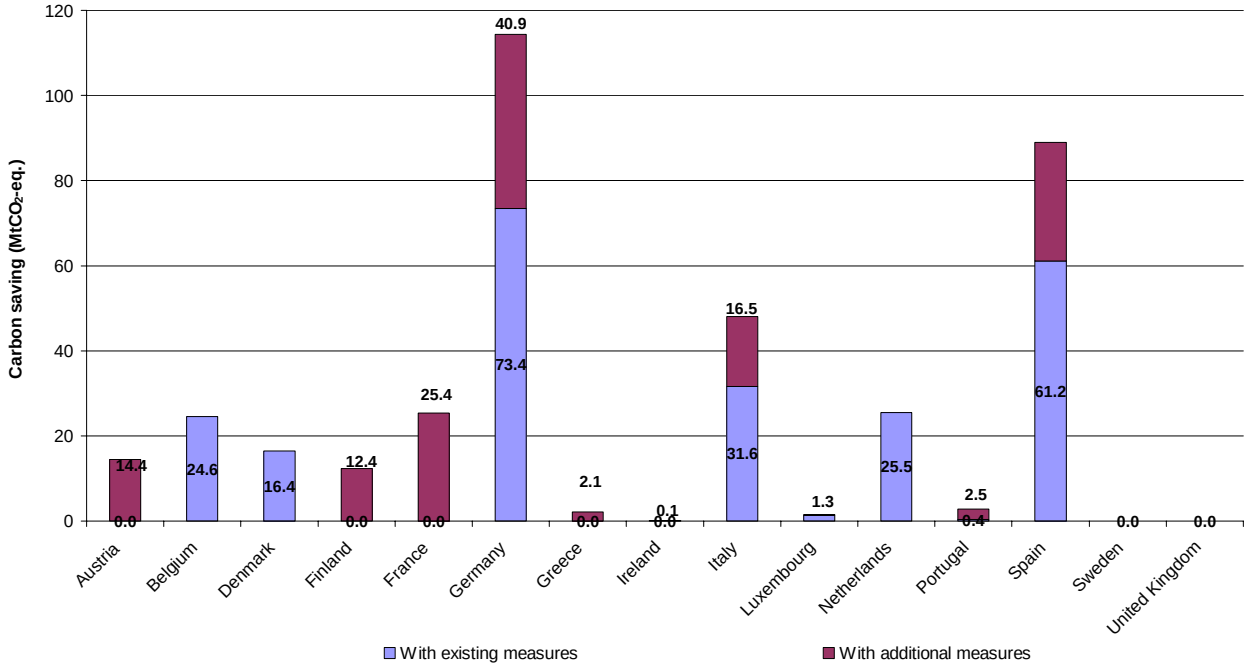
Figure 89 displays EU-15 2010 projections under 'with measures' scenarios, and where they exist, 'with additional measures' and 'without measures' scenarios. All EU-15 Member States present the mandatory 'with measures' scenario, but in 2008 only eight presented an optional 'without measures' scenario and ten presented an optional 'with additional measures' scenario. Figure 90 shows the results of the top-down calculation of the effect of policies and measures. No estimations are possible for Sweden and the United Kingdom by the top-down approach as they only provided a 'with measures' scenario.

Figure 89 EU-15 contribution of policies and measures to projections in 2010



Source: See Sources of Information (Chapter 7). Details on individual Member States can be found in Table 4 of the Country Profiles (Annex 8).

Figure 90 EU-15 Projected annual greenhouse gas emission savings from policies and measures in 2010



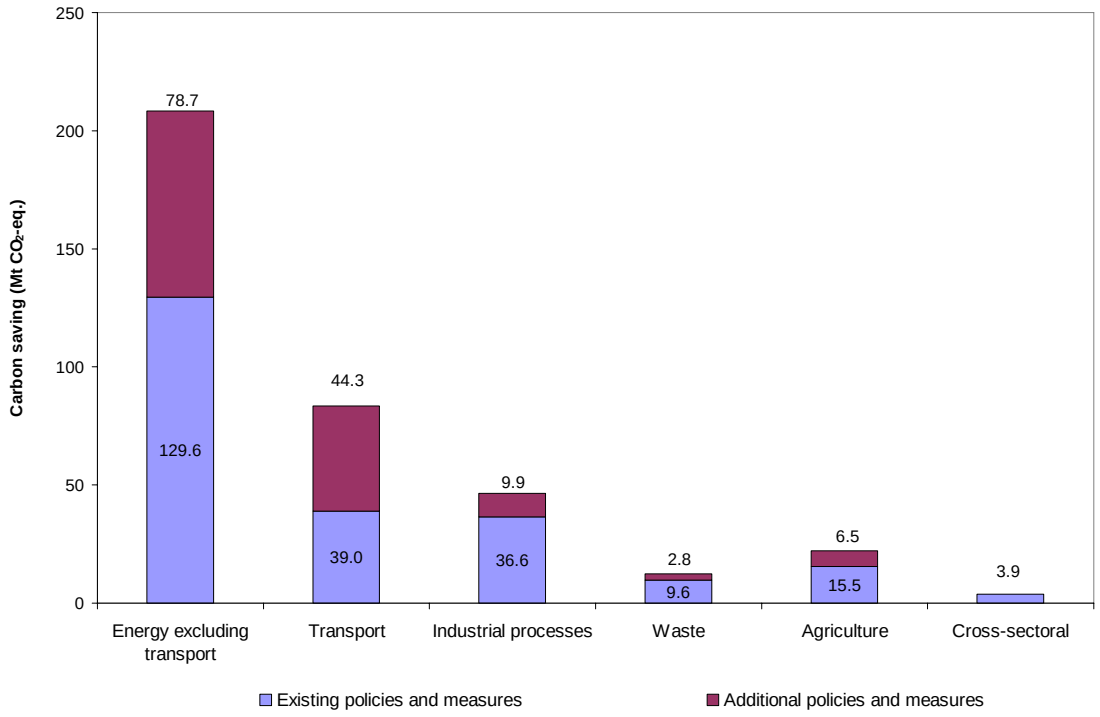
Source: See Sources of Information (Chapter 7). Details on individual Member States can be found in Table 4 of the Country Profiles (Annex 8).

A 2.2.3 Savings at sectoral level in the EU-15

- Policies and measures in the energy sector (all energy-related emissions except transport) are projected to deliver the majority of greenhouse gas emission savings (Figure 91). The majority of these measures are targeted at moving to cleaner and more efficient energy production and making energy use more efficient.
- Transport measures are expected to deliver the second highest savings, although these dropped significantly compared to 2007 projected savings.
- Calculated projected savings from all sectors have decreased by 48 % compared to reported savings potentials in 2007, largely due to a change in methodology for collecting data on policy savings.

Figure 91 provides an overview of the estimated effects of domestic policies and measures on total EU-15 greenhouse gas emissions in each of the main sectors. Not all Member States have provided a sectoral breakdown of their latest projections. Total EU-15 savings from additional policies and measures are calculated to be 142 Mt CO_2-eq. through deduction of the 'with measures' and 'with additional measures' projections. Total 'with measures' savings (234 Mt CO_2-eq.) is very likely to be an underestimate of savings from policies and measures (Figure 91). Indeed only eight EU-15 Member States provided a 'without measures' projection to enable the top-down calculation of the effect of policies. Calculated projected savings from all sectors have decreased by 48 % compared to reported savings potentials in 2007.

Figure 91 EU-15 Projected annual greenhouse gas emission savings by sector in 2010



Note: Projected savings from policies and measures in 2010 are estimated by comparison with a hypothetical reference case in which no measures were implemented since the base year.

Source: See Sources of Information (Chapter 7). Details on individual Member States can be found in Table 4 of the Country Profiles (Annex 8).

Policies and measures in the energy sector (all energy-related emissions except transport) account for 55 % of the total savings from implemented domestic measures and 55 % of the planned domestic measures savings for the EU-15 as a whole (compared to 56 % and 47 % respectively in 2007). 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 closely by the effect of measures on industrial processes and those in the agriculture sector. 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 17 % and 31 % of the total savings from implemented and planned policies and measures respectively. This is slightly greater than 2007, where the share of savings, particularly from planned transport policies, was less significant at 18 % and 29 % of the total projected savings. Most projected savings from implemented transport policies can be attributed to Germany and Spain. France, Italy and the United Kingdom show significant decreases compared to 2007, largely due to the change in methodology.

In 2007, the vast majority of projected savings from industrial processes came from measures in Austria, France, Spain and Italy. In 2008, the only significant reductions come from Germany and Spain. Finally, savings from measures in the waste sector are expected to be small over the period from 2008–2012. Projected savings from the waste sector have decreased by 75 % compared to reported savings potentials in 2007, largely due to the change in methodology for estimating policy savings and the fact that France and Germany did not show reductions in the sector this year. In fact, Germany did not provide a sectoral breakdown of projections for the waste sector.

Comparing the results between 2008 and 2007 findings reveals that:

- Reported emissions savings from existing policies and measures have fallen by 58 % compared to 2007 and reported emissions savings from additional policies and measures have fallen by 14 % compared to 2007;
- the savings from the energy sector (excluding transport) have decreased by 185 Mt for existing policies and measures, and increased by 1 Mt for additional policies and measures compared to 2007;
- savings in the transport sector rose by 2 Mt for existing policies and decreased by 8 Mt for planned policies between 2006 and 2007; however, between 2007 and 2008, savings for existing policies decreased by 61 Mt for existing policies and by 4 Mt for planned policies;
- projected savings in the industrial processes, waste and agriculture sectors have substantially decreased (by 67 Mt in total), as have cross-sectoral savings (by 64 Mt) as expected savings from measures such as EU ETS have not been captured in the top down methodology for the Netherlands or the United Kingdom in 2008.

A 2.3 Main savings from existing and additional domestic policies and measures in the EU-12

A 2.3.1 Savings from PAMs as estimated by EU-12 Member States

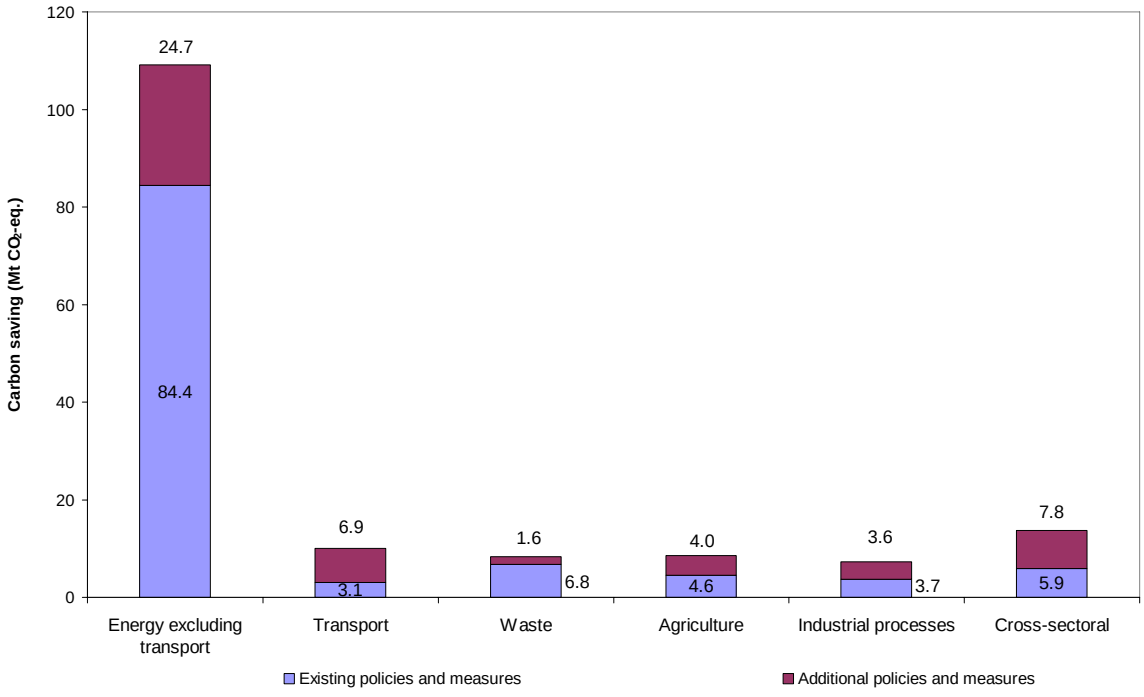
- EU-12 emission savings in 2010 from policies and measures are projected to total 157 Mt CO_2-eq. with 31 % (49 Mt CO_2-eq.) of this saving projected to come from additional measures.
- The greatest absolute savings are projected to occur in Poland, Romania and Bulgaria (as in 2007).

EU-12 Member States are also required to provide information on the policies and measures (PAM) included in their 'with measures' and 'with additional measures' projections, with quantitative estimates of the effect of PAMs on emissions by sources and removals by sinks of greenhouse gases between the base year and subsequent years, including 2005, 2010 and 2015 ([30]).

Figure 92 illustrates expected emission savings from existing and planned PAMs for each of the EU-12 Member States. EU-12 emission savings in 2010 from PAMs are projected to total 157 Mt CO_2-eq. with 31 % (49 Mt CO_2-eq.) of this saving projected to come from measures not yet implemented or adopted ('additional measures'). The greatest absolute savings are projected to occur in Poland, Romania and Bulgaria.

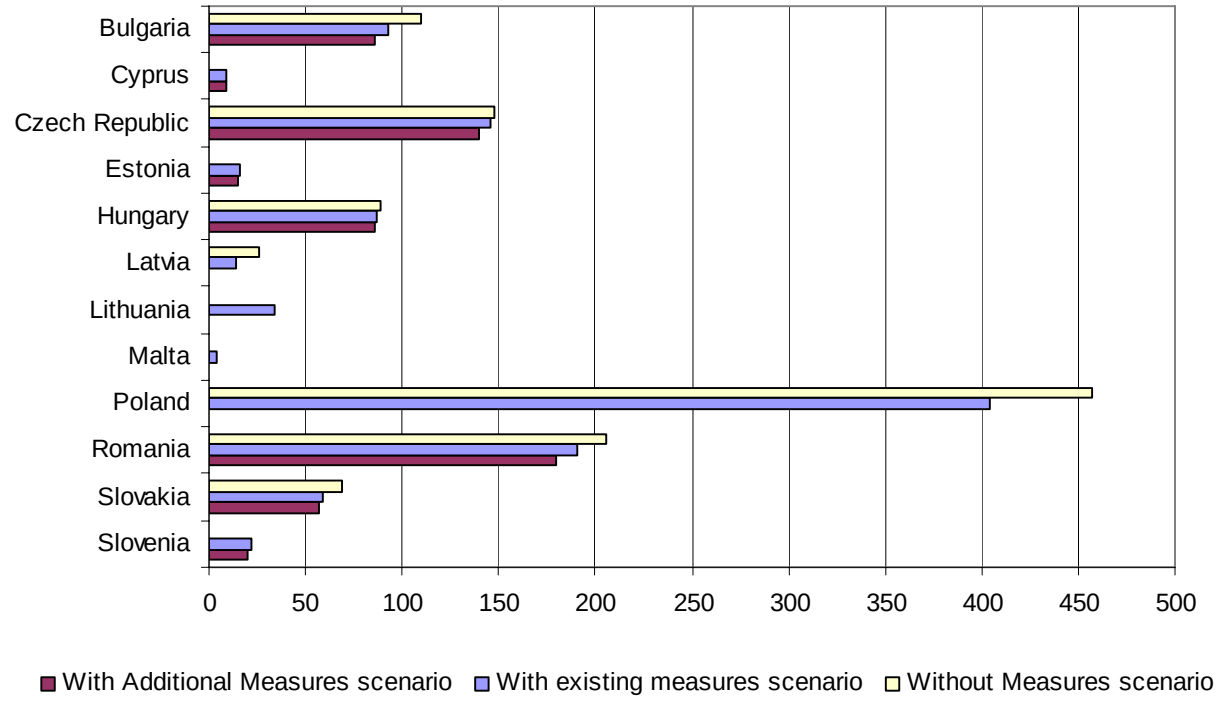
Figure 93 displays 2010 projections under 'with measures', 'with additional measures' (where one exists) and 'without measures' scenarios.

Figure 92 EU-12 Projected annual greenhouse gas emission savings from policies and measures in 2010



Source: See Sources of Information (Chapter 7). Details on individual Member States can be found in Table 4 of the Country Profiles (Annex 8).

Figure 93 Contribution of policies and measures in EU-12 to projections in 2010



Source: See Sources of Information (Chapter 7). Details on individual Member States can be found in Table 4 of the Country Profiles (Annex 8).

A 2.3.2 Savings at sectoral level in the EU-12

- Policies and measures in the energy sector (including transport) are projected to provide by far the biggest savings in the EU-12, with 81 % of savings from existing measures coming from energy policies.

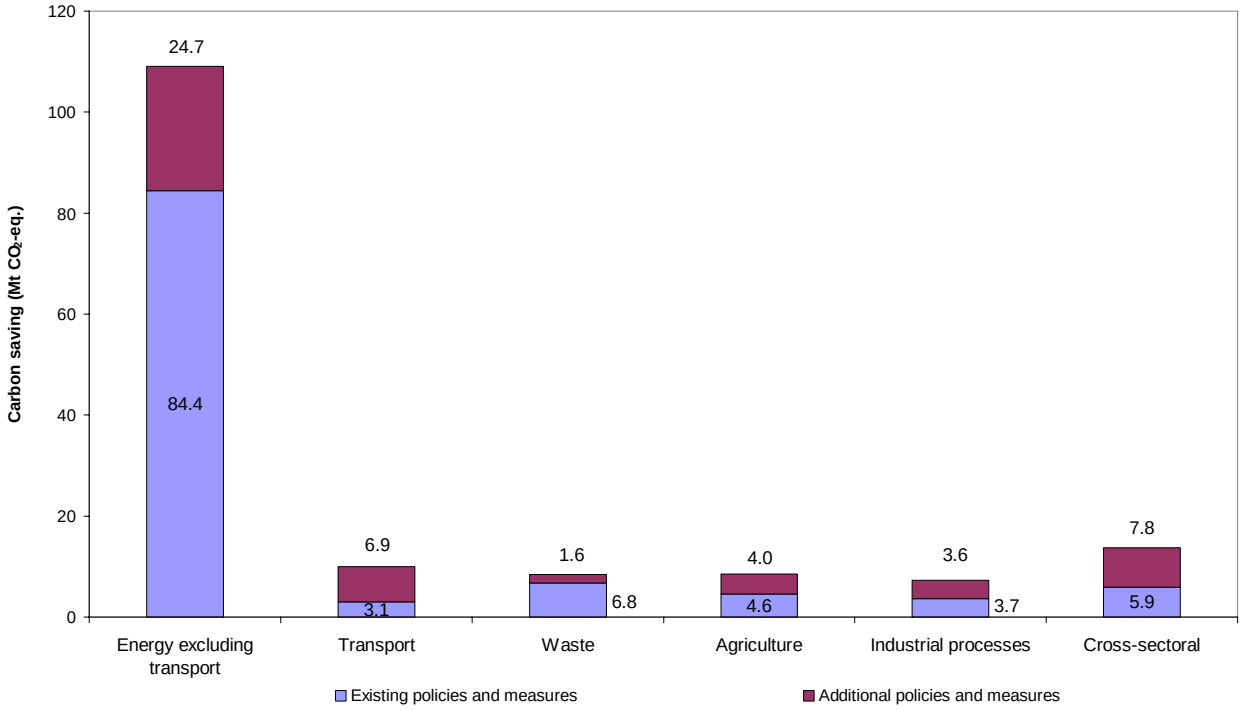
Figure 94 provides an overview of the estimated effects of domestic policies and measures on total EU-12 greenhouse gas emissions in each of the main sectors. In the majority of cases, reporting was split by the CRF sectors: energy, waste, agriculture and industrial process. Seven of the EU-12 provided a Transport projection. For the remaining five, it is therefore assumed that energy projections also include transport energy.

Not all Member States have provided a sectoral breakdown of their latest projections or quantified the savings by sector from all policies and measures. Total EU-12 savings from additional PAMs are calculated to be 49 Mt CO_2-eq. through deduction of the 'with measures' and 'with additional measures' projections and this concurs with Figure 94. Total 'with measures' savings displayed in Figure 94 (108 Mt CO_2-eq.) may be an underestimate of savings from PAMs. Calculated projected savings from all sectors for the EU-12 as a whole have increased by 23 Mt CO_2-eq. compared to reported savings potentials in 2007 for the EU-12. Eight of the twelve Member States provided a 'without measures' projection in 2008 to enable calculation of the effected of existing measures for those Member States.

In 2007, the total savings presented for the EU-12 were more than five times less than those in the EU-15. In 2008, total savings presented for the EU-12 are just 2.6 times less than those in the EU-15. This is due a switch in methodology to use projections data to calculate the effect of policies which has significantly reduced savings presented for the EU-15.

Policies and measures acting on the energy sector (including transport) provide by far the biggest savings, with 81 % of savings from existing measures coming from energy policies. Savings in each of the remaining sectors are low, with agriculture, waste and industrial processes each contributing a saving of 9 Mt or below.

Figure 94 EU-12 projected greenhouse gas emission savings by sector in 2010



Note: Projected savings from policies and measures in 2010 are estimated by comparison with a hypothetical reference case in which no measures were implemented since the base year. Seven of the EU-12 provided a Transport projection. For the remaining five, it is therefore assumed that energy projections also include transport energy.

Source: See Sources of Information (Chapter 7). Details on individual Member States can be found in Table 4 of the Country Profiles (Annex 8).

A 3 Use of Kyoto mechanisms

- For the EU-15, the projected use of Kyoto mechanisms amounts to 126.5 Mt CO_2-eq. per year of the commitment period.
- This represents approximately 28 % of the total required emission reduction for the EU-15 under the Kyoto Protocol, or 3 percentage points of the EU-15 Kyoto target of – 8 %.
- The intended acquisition of these units through JI, CDM or international emissions trading represents an investment of EUR 1 997 million for the whole five-year commitment period.

A 3.1 Flexible mechanisms under the Kyoto protocol (Kyoto mechanisms)

In addition to domestic measures, Member States are allowed to make use of the flexible mechanisms under the Kyoto Protocol (Kyoto mechanisms) to achieve their EU Kyoto or burden sharing targets by contributing to and/or benefiting from emission reductions taking place abroad.

The Kyoto Protocol defines three 'flexibility mechanisms' to lower the overall costs of achieving its emissions targets. These mechanisms enable Parties to access cost-effective opportunities to reduce emissions, or to remove carbon from the atmosphere, in other countries. While the cost of limiting emissions varies considerably from region to region, the effect for the atmosphere of limiting emissions is the same, irrespective of where the action is taken. This system aims to be economically cost-effective, while addressing concerns about environmental integrity and equity. The three Kyoto mechanisms are (see more detailed description below):

- the clean development mechanism (CDM),
- joint implementation (JI),
- emission trading ([31]).

Domestic actions (as opposed to use of the mechanisms) must constitute a 'significant element' of the efforts made by each Member State to meet its target under the Kyoto Protocol. Although no quantified proportion that is to be met through domestic action was set, Member States must demonstrate that their use of the mechanisms is 'supplemental to domestic action' to achieve their targets.

A 3.1.1 Joint implementation

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.

([31]) This type of emissions trading relates to trading of emissions between countries and should not be confused with the EU emission trading scheme (EU ETS), which concerns trading of emissions between installations.

A 3.1.2 Clean development mechanism

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 current first commitment period (2008–2012). 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 under development.

A 3.1.3 Emissions trading

Article 17 of the Kyoto Protocol allows countries that achieve 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 overall costs of compliance.

A 3.2 Projected emission reductions through Kyoto mechanisms

Thirteen Member States updated or confirmed information on their intended use of the Kyoto mechanisms in 2008 through a questionnaire under the EC mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol (Council Decision 280/2004/EC). For the remaining Member States previously provided information through the questionnaire or the use of Kyoto mechanisms as indicated the second national allocation plant under the ETS Directive (2003/87/EC) was used.

Eleven Member States have decided to use the Kyoto mechanisms (Table 3). With the exception of Slovenia, all of the countries belong to the EU 15. The contribution of Kyoto mechanisms by these countries is considered for the closure of the gaps between greenhouse gas projections and 2010 targets. For the EU-15, the use of Kyoto mechanisms amounts to 126.5 Mt CO_2-eq. per year of the commitment period. This amount corresponds to approx. 28 % of the total required emission reduction for the EU-15 of 345 Mt CO_2-eq. per year during the first commitment period or 3 percentage points of the EU-15 Kyoto target of – 8 %. In Slovenia, the exact amount of units to be bought depends on the actual development of greenhouse gas emissions, especially in the transport sector.

Table 3 Planned use of Kyoto mechanisms by EU Member States

Member State	Planned use of Kyoto mechanisms	Type of Kyoto mechanisms (ET, CDM, JI)	Achievement of Kyoto target planned through domestic action only	Projected emission reduction 2008-12 through the use of Kyoto mechanisms [Mt CO2 equivalent per year]	Budget [Mio €]
Austria	Yes	JI, CDM, ET	No	9.0	531
Belgium	Yes	JI, CDM, ET	No	7.0	104
Bulgaria	No	-	Yes	-	-
Cyprus	No	-	Not applicable ([a])	-	-
Czech Repub	No	-	Yes	-	-
Denmark	Yes	JI, CDM, ET	No	4.2	152
Estonia	No	-	Yes	-	-
Finland	Yes	JI, CDM, ET	No	1.4	121
France	No	-	Yes	-	-
Germany	No	-	Yes	-	23
Greece	No	-	Yes	-	-
Hungary	No	-	Yes	-	-
Ireland	Yes	JI, CDM, ET	No	3.6([b])	290
Italy	Yes	JI, CDM, ET	No	20.7	79
Latvia	No	-	Yes	-	-
Lithuania	No	-	Yes	-	-
Luxembourg	Yes	JI, CDM, ET	No	3.6 to 4.3([c])	400
Malta	No	-	Not applicable ([a])	-	-
Netherlands	Yes	CDM, JI, ET	No	13.0	505
Poland	No	-	Yes	-	
Portugal	Yes	JI, CDM, ET	No	5.8	354
Romania	No	-	Yes	-	-
Slovakia	No	-	Yes	-	-
Slovenia	Yes	JI, CDM, ET	No	< 0.6([b])	
Spain	Yes	JI, CDM, ET	No	57.8	384
Sweden	No	(JI, CDM)	Yes	(1.3)([d])	9
United Kingdo	No	-	Yes	-	-
EU15	**Yes**	**JI, CDM, ET**	**No**	**126.5**	**2951**

Notes: [a] Cyprus and Malta are non-Annex I Parties to the Kyoto Protocol and do not have an emissions target for the period 2008–2012.
[b] The value depends on the actual development of emissions, especially in the transport sector.
[c] The range results from different projection scenarios ('pessimistic' or 'optimistic') with respect to the transport sector, which represented about 55 % of Luxembourg's total greenhouse gas emissions in 2006 (excl. LULUCF)
[d] Sweden intends to achieve its Kyoto target without the use of flexible mechanisms but has made the necessary preparations to use them if necessary. Sweden intends to acquire 1.3 Mt CO_2-eq/yr through the Swedish CDM and JI programme. This figure has not been considered in the target assessment for Sweden and the EU-15.
The exchange rate US$ per Euro was assumed to be 1.5.

Source: Questionnaires submitted under the EC greenhouse gas Monitoring Mechanism; European Commission Decisions on the second national allocation plans under the EU ETS; Second national allocation plans by countries.

A 3.3 Allocated budgets

Twelve Member States allocated resources for the use of Kyoto mechanisms. Out of these only Germany and Sweden do not intend to use the units for meeting their Kyoto targets. The German government decided to support prototype funds to assist the establishment of a carbon market. Sweden has not yet made a final decision on the use of Kyoto mechanisms but projects to achieve its target through domestic action alone. Austria, Luxembourg, the Netherlands, Portugal and Spain allocated the largest budgets (EUR 399, EUR 531, EUR 505, EUR 354 and EUR 384 million, respectively, for the five-year commitment period). In Slovenia, the budget has not yet been decided because the quantity of allowances to be bought is still unknown.

Together the twelve countries decided to invest EUR 2 951 million for the acquisition of allowances through JI, CDM or international emissions trading for the whole five-year commitment period.

A 3.4 Type of projects

Table 4 gives an overview on the type and size of CDM and JI projects. It is based on the UNEP/Risoe CDM/JI pipeline, which includes all projects that have reached the public commenting period during project development. Overall 3 458 projects are expected to deliver 2 822 Mt CO_2-eq. until the end of the first commitment period under the Kyoto Protocol. The largest share of CERS and ERUs will be generated from projects reducing non-CO_2 gases. This is mainly due to:

- high global warming potential ([32]) for non-CO_2 gases (CH_4: 21, N_2O: 310; HFC-23: 11 700),
- point sources with large emissions, and
- low abatement costs.

Twenty-one projects for the destruction of HFC-23, a by-product of HCFC-22 production, are expected to generate 18 % of the overall emission allowances from project-based mechanisms. The second largest source for emission reductions are 867 hydro projects, which contribute with 14 % to the overall quantity of emission allowances, followed by 71 projects abating N_2O and contributing 10 % to overall emissions allowances. The use or flaring of methane from coal beds and mines, fugitive emissions from oil and gas installations and landfills contribute with another 21 % of the overall expected quantity of emission reductions. Projects targeting energy efficiency in own generation, fossil fuel switch, biomass energy and renewable energy from wind reduce emissions of CO_2 and have a share between 6-9 % each.

([32]) The global warming potential is used to convert emissions of different greenhouse gases with different warming effects into the unit CO_2 equivalent, which is the global warming effect of one tonne of carbon dioxide.

Table 4 Overview on CDM and JI projects by project type

	All CDM projects		All JI projects		CDM & JI			
	Number of projects	Reduction until 2012	Number of projects	Reduction until 2012	Number of projects	Reduction until 2012	Share	units/project
Type	Projects	[Mt CO_2 eq]	Projects	[Mt CO_2 eq]	Projects	[Mt CO_2 eq]	[%]	
Afforestation	4	1.9	0	0.0	4	1.9	0%	0.5
Agriculture	172	43.5	0	0.0	172	43.5	2%	0.3
Biogas	221	54.0	1	0.7	222	54.7	2%	0.2
Biomass energy	528	172.3	13	4.9	541	177.2	6%	0.3
Cement	35	34.9	1	1.0	36	36.0	1%	1.0
CO_2 capture	1	0.0	1	1.1	2	1.1	0%	0.6
Coal bed/mine metha	51	121.7	13	46.6	64	168.3	6%	2.6
Energy distribution	4	1.1	3	1.4	7	2.5	0%	0.4
EE households	9	1.4	0	0.0	9	1.4	0%	0.2
EE industry	149	30.1	8	15.8	157	45.9	2%	0.3
EE own generation	293	247.5	1	7.8	294	255.3	9%	0.9
EE service	6	0.3	0	0.0	6	0.3	0%	0.1
EE supply side	32	23.9	11	9.1	43	32.9	1%	0.8
Fossil fuel switch	114	185.2	8	9.5	122	194.7	7%	1.6
Fugitive	26	60.4	30	86.9	56	147.4	5%	2.6
Geothermal	12	13.6	0	0.0	12	13.6	0%	1.1
HFCs	19	501.2	2	5.8	21	507.0	18%	24.1
Hydro	861	381.4	6	1.7	867	383.1	14%	0.4
Landfill gas	267	249.7	12	9.5	279	259.2	9%	0.9
N_2O	59	254.5	12	40.8	71	295.3	10%	4.2
PFCs	2	0.6	1	1.2	3	1.8	0%	0.6
Reforestation	14	5.0	0	0.0	14	5.0	0%	0.4
Solar	17	2.2	0	0.0	17	2.2	0%	0.1
Tidal	1	1.1	0	0.0	1	1.1	0%	1.1
Transport	6	3.5	0	0.0	6	3.5	0%	0.6
Wind	421	181.1	11	5.9	432	187.0	7%	0.4
Total	**3 324**	**2 571.9**	**134**	**249.7**	**3 458**	**2 821.7**	**100%**	**0.8**

Notes: EE: energy efficiency

The table includes all projects that have reached the validation stage (CDM) or the determination stage (JI). Not all of these projects will be realised and the actual reduction of greenhouse gases might differ from the expected reduction included in the project description.

Source: UNEP Risoe CDM/JI Pipeline Analysis and Database, May 2008.

Twelve project types have average emission reductions of less than 500 kt CO_2-eq. until the end of 2012 (see Table 5); a total of 2 448 projects (71 %) belong to these sectors and are expected to deliver 905 Mt CO_2-eq. (32 %). Five project types have average emission reductions above 1.5 Mt CO_2-eq. until the end of 2012; 334 (10 %) installations belong to these project types and are expected to deliver 1 313 Mt CO_2-eq. (47 %) of all project based credits.

Table 5 Number of projects and total amount of emission allowances by average project size

Average emission allowances per project	Number of projects	Share in total number of projects	Total emission allowances	Share of total emission allowances
less than 500 kt CO2 eq.	2 448	71%	905	32%
between 500 kt CO2 eq. and 1.5 Mt CO2 eq.	676	20%	604	21%
more than 1.5 Mt CO2 eq.	334	10%	1 313	47%
Total	3 458	100 %	2 822	100 %

Notes: The table includes all projects that have reached the validation stage (CDM) or the determination stage (JI). Not all of these projects will be realised and the actual reduction of greenhouse gases might differ from the expected reduction included in the project description.

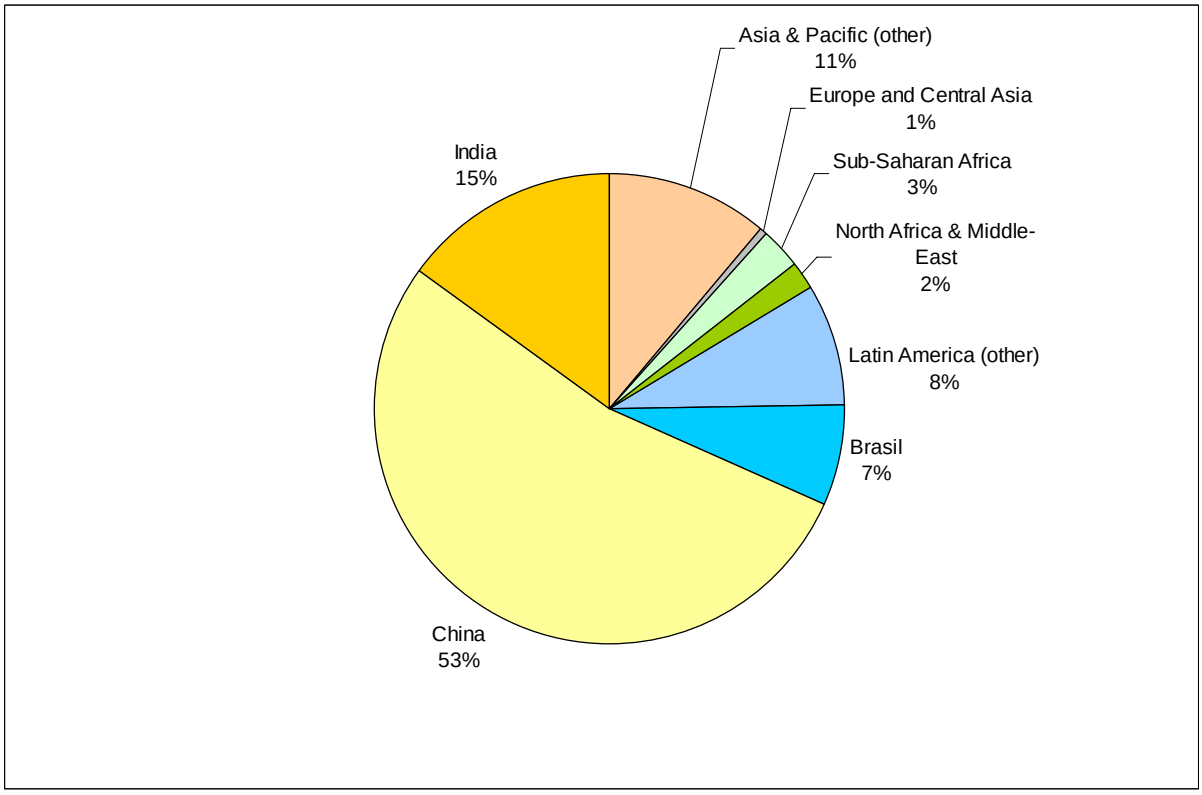
Source: UNEP Risoe CDM/JI Pipeline Analysis and Database, May 2008

A 3.5 Host regions for CDM projects

The Clean Development Mechanism does not only intend to help Annex I Parties in achieving their reduction obligations but also to support sustainable development in non-Annex I Parties. Projects in the large advanced developing countries Brazil, China and India together generate 75 % of the total CERs (Figure 95). Sub-Saharan Africa only hosts 1 % of all projects generating 3 % of total CERs. The main reason for this uneven distribution is that the largest and most cost efficient projects are those which reduce emissions of industrial gases, especially HFC-23 and N_2O. Most of the least developed countries do not have industrial installations emitting these gases and are therefore not able to profit from the CDM as much as advanced developing countries.

This relationship is also reflected if population size is taken into account. Projects in Sub-Saharan Africa will generate less than 0.1 CERs/capita until 2012, in China and Brazil about 1 CER/capita (Table 6). These values show that the CDM can only be one building block of a sustainable development strategy of a country. Assuming a CER price of EUR 10 and that the expected CERs are generated for a five-year period, the CDM leads to a transfer of funds in the order of EUR 0.20 per year and person in Sub-Saharan Africa and EUR 2.00 in China.

Figure 95 Host regions for CDM projects by share of expected CERs until 2012



Source: UNEP Risoe CDM/JI Pipeline Analysis and Database, May 2008

Table 6 Overview on CDM projects by region

Total in CDM Pipeline	Number of projects Projects	Share [%]	Reduction until 2012 [kt CO_2 eq]	Share [%]	Population million	Reduction until 2012 [t CO_2 eq per capita]
Latin America	689	21%	389 605	15%	559	0.70
Brasil	*277*	*8%*	*175 684*	*7%*	*192*	*0.92*
Asia & Pacific	2 494	75%	2 046 014	80%	3 529	0.58
China	*1 173*	*35%*	*1 377 502*	*54%*	*1 330*	*1.04*
India	*914*	*27%*	*380 454*	*15%*	*1 148*	*0.33*
Europe and Central Asia	36	1%	18 027	1%	149	0.12
Sub-Saharan Africa	46	1%	65 835	3%	752	0.09
North Africa & Middle-East	59	2%	52 462	2%	278	0.19
Total	**3 324**	**100%**	**2 571 944**	**100%**	**5 266**	**0.49**

Source: UNEP Risoe CDM/JI Pipeline Analysis and Database, May 2008; CIA online world fact book, May 2008

A 3.6 Host regions for JI projects

ERUs expected to be generated in JI projects until 2012 are by and large hosted by Russia and the Ukraine (89 %) within 98 projects (73 % of all JI projects). Table 7 depicts the distribution of JI projects and ERUs among host countries.

Within the European Union, the distribution of ERUs among host regions is more balanced (see Figure 96). The largest share of EU-hosted ERUs will be allocated to Poland (29 % of EU-hosted ERUs) within 7 projects. Bulgaria has a larger number of projects (7) but accounts for a smaller share of ERUs (11 %). Germany is the only EU-15 member state that hosts JI projects but to a relatively small extent (17 % of EU-generated ERUs).

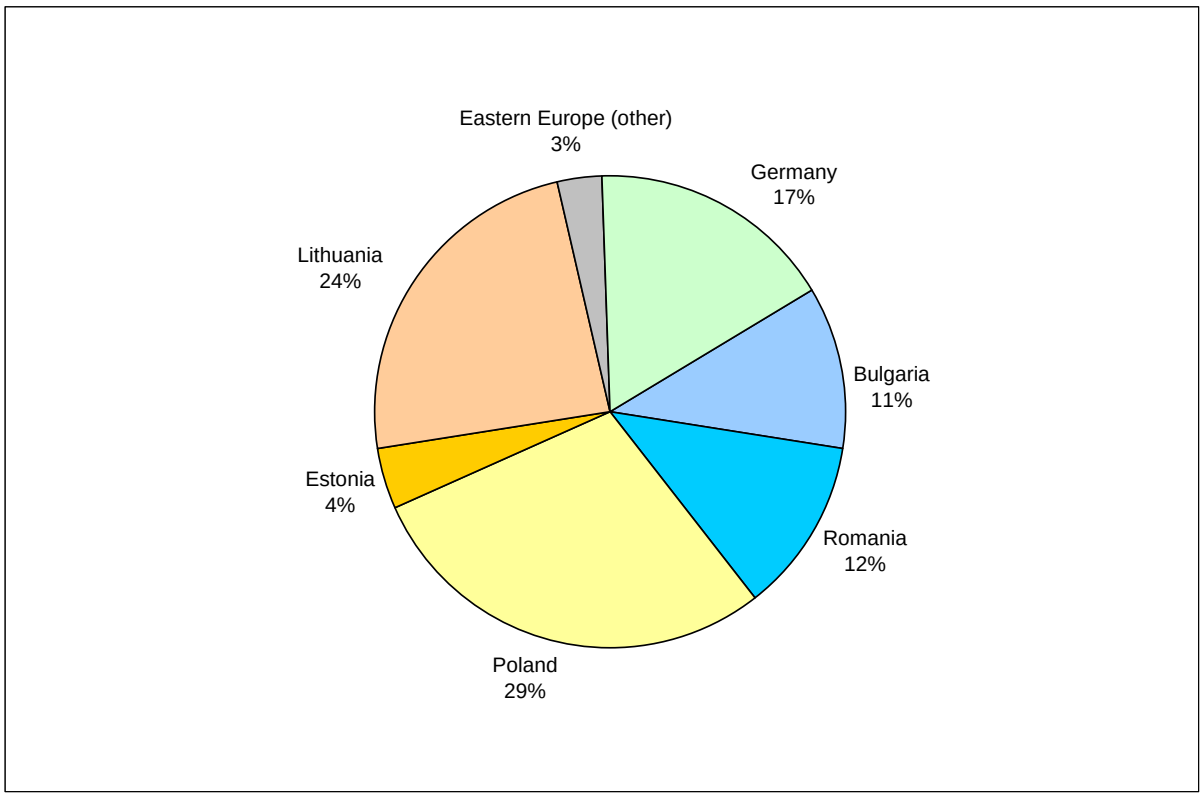
On a per-capita basis, ERUs expected to be generated until 2012 in Russia and the Ukraine are still more than twice as high (at 1.2 ERUs/cap) as it is the case for, for example, Bulgaria (0.4 ERUs/cap). Only Lithuania and Estonia, two of the smaller countries in terms of population, are expected to host a higher per-capita level of ERUs (1.8 ERU/cap for Lithuania, followed by Estonia at 0.85 ERUs/capita the smallest country with a population of only a little more than 1 million people).

Table 7 Overview on JI projects by region

Total in JI Pipeline	Number of projects Projects	Share [%]	Reduction until 2012 [kt CO_2 eq]	Share [%]	Population million	Reduction until 2012 [t CO_2 eq per capita]
Russia & Ukraine	98	73%	222 670	89%	187	1.19
Eastern Europe	34	25%	22 480	9%	101	0.22
Bulgaria	*9*	*7%*	*3012*	*1%*	*7*	*0.41*
Czech Republic	*1*	*1%*	*167*	*0%*	*10*	*0.02*
Romania	*3*	*2%*	*3243*	*1%*	*22*	*0.15*
Poland	*7*	*5%*	*7818*	*3%*	*39*	*0.20*
Hungary	*2*	*1%*	*603*	*0%*	*10*	*0.06*
Estonia	*3*	*2%*	*1115*	*0%*	*1*	*0.85*
Latvia	*1*	*1%*	*27*	*0%*	*2*	*0.01*
Lithuania	*7*	*5%*	*6432*	*3%*	*4*	*1.80*
Slovakia	*1*	*1%*	*63*	*0%*	*5*	*0.01*
Others	2	1%	4 579	2%	82	0.06
Germany	*2*	*1%*	*4 579*	*2%*	*82*	*0.06*
Total	**134**	**100%**	**249 729**	**100%**	**5 266**	**0.41**

Source: UNEP Risoe CDM/JI Pipeline Analysis and Database, May 2008; CIA online world fact book, May 2008

Figure 96 EU host regions for JI projects by share of expected ERUs until 2012



Source: UNEP Risoe CDM/JI Pipeline Analysis and Database, May 2008

A 4 Accounting of carbon sinks

- Activities under Art. 3.3 and 3.4 in EU-15 Member States are projected to reduce emissions by 57.5 Mt CO_2 per year of the commitment period and by 5.9 Mt CO_2 per year of the commitment period in EU-12 Member States.
- This is equivalent to 17 % of the EU-15 reduction commitment of 341 Mt CO_2 per year of the commitment period compared to base-year emissions, or 1.3 % percentage points of the EU-15 Kyoto target of – 8 %.

A 4.1 Carbon sinks under the Kyoto Protocol

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),
- voluntary activities under Article 3.4 (forest management, cropland management, grazing land management and revegetation).

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 Marrakech Accords (2001).

A 4.1.1 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.

A 4.1.2 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 Marrakech Accords, activities under this Article were defined as forest management, cropland management, grazing-land management and revegetation. The extent to which Parties can account for emissions and removals from forest management is limited by a capping system.

A 4.2 Information from Member States on the use of carbon sinks

Member States are asked to voluntarily submit a questionnaire on their projected estimates of annual net carbon stock changes under Article 3.3 and 3.4 during the first commitment period of the Kyoto Protocol to the Commission. In 2008, ten Member States submitted updated estimates while information for ten additional countries had been submitted in the previous years (Table 8). Seven Member States have never submitted the voluntary questionnaire.

Finland and Sweden expect additional emissions from activities under Article 3.3 (afforestation, reforestation and deforestation) during the commitment period. Czech Republic, Denmark, France, Greece, Ireland, Italy, the Netherlands, Poland, Portugal, Slovak Republic, Slovenia, Spain and United Kingdom estimate net sequestration effects from these activities.

All EU Member States that are Annex I Parties under the Kyoto Protocol have submitted their initial report under the Kyoto Protocol, in which they report on which activities under Art. 3.4 they elected:

- eight Member States decided not to elect any activities under Art. 3.4,
- 17 Member States elected forest management,
- three Member States elected cropland management,
- two Member States elected grazing-land management.
- one Member State elected revegetation.

A 4.3 Findings from the review of the initial report under the Kyoto Protocol

As part of their national system for the estimation of anthropogenic GHG emissions by sources and removals by sinks Parties to the Kyoto Protocol need to demonstrate that they are capable to comply with the monitoring and reporting requirements for the elected activities under Article 3.4. Specifically, Parties need to be able to monitor the human induced carbon stock changes since 1990 for the elected activities and land areas. These land areas need to be individually identified and emissions/removals need to be reported for all future commitment periods once an activity is elected.

During the review of the initial report under the Kyoto Protocol, the expert review teams (ERT) identified the need to further improve the reporting system in eight out of the 17 Member States which elected one or more activities under Article 3.4. The ERT criticised the insufficient capabilities to identify land areas in Greece, Hungary, Latvia and Romania; in Italy and Spain the legal, procedural and institutional arrangements including the land use classification were seen as insufficient. The ERT also identified the lack of an accounting system in the French overseas territory Guyana and the lack of a methodology to apply national data to the IPCC good practice guidance for LULUCF. Romania was reminded that it needs to account for revegetation in the base year as well as during the commitment period. With the exception of Greece, none of identified issues led to questions of implementation but the Member States were recommended to address the points in their next inventory submission.

A 4.4 Use of sinks for achieving the EU Kyoto target

So far, a total net sequestration of about 23.9 Mt CO_2 per year of the commitment period from afforestation and reforestation activities (under Article 3.3 of the Kyoto Protocol) has been identified by EU-15 Member States and an additional sequestration of 0.4 Mt CO_2 per year by Slovenia.

The use of activities under Article 3.4 is projected to contribute another 25.7 Mt CO_2 per year of the commitment period in the EU-15; in addition; Czech Republic, Poland and Slovenia expect a removal of 5.5 Mt CO_2 per year of the commitment period. These figures take the maximum allowance for forest management into account but do not include Spain due to the lack of detailed data.

Together with the Spanish aggregate all activities under Art. 3.3 and 3.4 in EU-15 Member States are projected to reduce emissions by 57.5 Mt CO_2 per year of the commitment period; Czech Republic, Poland and Slovenia expect an additional reduction of 5.9 Mt CO_2 per year of the commitment period. For EU-15, this is equivalent to 17 % of the EU-15 reduction commitment of 341 Mt CO_2 per year of the commitment period compared to base-year emissions.

Table 8 Projected net carbon stock changes under Articles 3.3 and 3.4 for the first commitment period of the Kyoto Protocol

	Article 3.3	Article 3.4			Total
	Net carbon stock change during 2008–2012 [Mt CO_2 per year]	Election of activities[a]	Net carbon stock change during 2008–2012 [Mt CO_2 per year]	Maximum allowance for forest management [Mt CO_2 per year]	Accountable effect of Art. 3.3 and 3.4 [Mt CO_2 per year]
Austria	– 0.7	None	n.a.	n.a.	– 0.7
Belgium	No estimates available	None	n.a.	n.a.	n.e.
Bulgaria	Not reported	None	n.a.	n.a.	n.e.
Cyprus	Not reported	n.a.	n.a.	n.a.	n.e.
Czech Republic	Probably small sink	FM	Likely larger than max. allowance	– 1.17	– 1.2
Denmark	– 0.262	FM, CM, GM	FM: – 0.18 CM: – 1.82	– 0.18	– 2.3
Estonia	No estimates available	None	n.a.	n.a.	n.e.
Finland	+ 1.9 to + 2.4	FM	– 2.5 to – 3.0	– 0.59	– 0.6
France	– 0.84	FM	– 67.63	– 3.23	– 4.1
Germany	No estimates available	FM	– 7.3	– 4.55	– 4.5
Greece	– 0.90	FM	– 2 to – 4	– 0.33	– 1.2
Hungary	Not reported	FM	Not reported	– 1.06	n.e.
Ireland	– 2.07	None	n.a.	n.a.	– 2.1
Italy	– 15.1	FM	– 10.2	– 10.19	– 25.3
Latvia	Not reported	FM	Not reported	– 1.25	n.e.
Lithuania	No estimates available	FM	No estimates available	– 1.03	n.e.
Luxembourg	Not reported	None	n.a.	n.a.	n.e.
Malta	Not reported	n.a.	n.a.	n.a.	n.e.
Netherlands	– 0.11	None	n.a.	n.a.	– 0.1
Poland	Net sink	FM	Likely larger than max. allowance	– 3.01	– 3.0
Portugal	– 3.36	FM, CM, GM	FM: – 0.8 CM & GM: – 0.5	– 0.81	– 4.7
Romania	Not reported	FM, Revegetation	Not reported	– 4.03	n.e.
Slovak Republic	Net sink	None	n.a.	n.a.	n.e.
Slovenia	– 0.36	FM	– 1.32	– 1.32	– 1.7

Spain[c]	Not estimated separately	FM, CM	Not estimated separately	– 2.46	– 5.8
Sweden	Probably small net debit	FM	Likely larger than max. allowance	– 2.13	– 2.1
United Kingdom	– 2.68	FM	– 1.69	– 1.36	– 4.0
EU-15[d]	**– 23.87**	**– 25.68**			**– 57.5**
EU-27	**– 24.23**	**– 31.17**			**– 63.4**

Notes: Consistent with the reporting of emission inventories a negative sign '-' is used for removals and a positive sign '+' for emissions; n.a.: not applicable; n.e.: not estimated.
[a] FM: forest management; CM: cropland management; GM: grazing-land management.
[b] In addition to accounting for forest management up to the maximum allowance Parties may account for removals from forest management to compensate net emissions under Art. 3.3. In Finland, removals from forest management are projected to exceed the sum of emissions under Art. 3.3. and the maximum allowance for forest management.
[c] Spain only estimated the aggregated reductions of Articles 3.3 and 3.4 together.
[d] The individual sums for Art. 3.3 and 3.4 do not include the Spanish estimate.

Source: Questionnaires submitted by EU Member States; The European Community's initial report under the Kyoto Protocol (EEA Technical report No 10/2006); Initial reports under the Kyoto Protocol of Greece and Romania; Decisions 16/CMP.1 and 8/CMP.2 of the Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol.

A 5 The reporting scheme

A 5.1 Greenhouse gas inventories (1990–2006)

For the preparation of this report, EU-27 greenhouse gas inventories as compiled under the EU monitoring mechanism and submitted by the European Commission to the UNFCCC (May 2008) have been used (EEA, 2008a). All Member States reported data for 2006. Data availability has improved over previous years. Table 9 shows data gaps for the EU-27 Member States by May 2008. For the first time, all EU-15 Member States reported complete inventories in time. The reporting of greenhouse gas inventories has improved significantly as data from six Member States (CY, EE, LT. LU, MT, and PL) were missing in 2006.

Table 9 Gaps in reporting for the EU-27 Member States

Member State	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6
Cyprus					1990–2006	1990–2006
Estonia					1990–2006	
Malta				1990–2006	1990–2006	1990–2006

Member States where gap filling has to be applied have the opportunity to provide feedback and incorporate the estimates in their national submissions. The following general approaches and country-specific methods for gap filling were used (see EEA, 2008a).

Estimates at the beginning or at the end of a time series

Fuel combustion related GHG emissions (CO_2, CH_4, N_2O of sector 1A):

The percentage change from Eurostat CO_2 emission estimates was used for extrapolation, where available

If there were no Eurostat CO_2 emission estimates available linear trend extrapolation was used.

Other sectors:

Linear trend extrapolation was used, where no striking dips or jumps in the time series were identified. In general the trend extrapolation was made on basis of the time series 2000-2004.

Previous year values were used where striking dips or jumps in the time series were identified.

Estimates for years within a time series

Linear interpolation between the years available was used

Estimates if no time series is available (only relevant for fluorinated gases):

HFCs:

Emissions were estimated for 2F1 'Refrigeration and air conditioning equipment' on basis of average per capita emissions of either a set of similar countries (if available) or on basis of one single country (if a set of similar countries was not available). Population data was used from Eurostat.

PFCs:

It was checked if aluminum production occurs in the relevant countries, which was not the case. For other PFC emissions no estimates were prepared because of lack of data.

SF6:

Emissions were estimated for 2F7 'Electrical equipment' on basis of average emissions per electricity consumption of either a set of similar countries (if available) or on basis of one single country (if a set of similar countries was not available). Data on electricity consumption was used from Eurostat.

Malta

HFC

Emissions estimated on basis of average per capita emissions of ES, GR, IT and PT for 2F1 'Refrigeration and air conditioning equipment' for 1990-2006

SF_6

Emissions estimated on basis of average emissions per electricity consumption of ES, GR, IT and PT for 2F8 'Electrical equipment' for 1990-2005 and extrapolated to 2006

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.

In order to support the evaluation of progress towards fulfilling the Kyoto targets, the EU Member States are required to report to the European Commission information on indicators as outlined in Council Decision 280/2004/EC (Art. 3(1)(j)) and Commission Decision 2005/166/EC (Annex II). The Member State submissions are checked for completeness, consistency with CRF data, recalculations, consistency of time series and are compared across countries. Table 10 shows submission data and availability of information on indicators for the EU-27 Member States. Two Member States did not report any indicators (Greece and Malta) and one Member State (Romania) only reported priority Indicators. Only Finland, Italy and Lithuania reported all indicators. Concerning Inconsistency with CRF data the main problems were reporting under the wrong source category and confusion of CO_2 and CO_2 equivalents. The difference between data reported in different years can be either due to recalculations (e.g. improvement of methodology) or it can be due to mistakes in the reporting. Thus, Member States were questioned for reasons for all high recalculations. The highest recalculations were found for indicators concerning energy transformation and industry.

Table 10 Reporting on indicators under the EC greenhouse gas Monitoring Mechanism

Member State	Priority Indicators	Additional Priority Indicators	Supplementary Priority Indicators
Austria	all (1990-2006)	all (1990-2006)	all except N° 8 (1990-2006)
Belgium	all (2005- 2006)	all (2005- 2006)	
Bulgaria	all except N° 3 (2006)	all (2006)	N° 4, 5, 6, 9, 10,11,12,14,15
Czech Republic	all (2005-2006)	N° 1,2,3,5 (2005-2006)	all except N° 8,9,10,11 (2005-2006)
Cyprus	N° 1,2,6 (1995-2006), N° 4,5,7 (1990-206)	N° 1(2003-2005), N° 3, 4,5, 6 (1990-2006)	N° 4, 5, 6, 9, 11,12, 14, 15 (1990-2006), N° 10 (2003-2006)
Denmark	all (2004-2006)	all (2004-2006)	all except N° 13 (2004-2006)
Estonia	N° 1, 2, 4, 6 (1993-2006), N° 5 1994-2006, N° 7 (1990-2006)	N° 2,3,4 (1995-2006), N° 6 (1990-2006)	N° 3, 5, 6 (1995-2006), N° 4, 11, 12, 13, 14, 15 (1990-2006)
Finland	all (1990-2006)	all (1990-2006)	all (1990-2006)
France	all (1990-2006)	all (1990-2006)	N° 1, 2, 3, 4, 5, 6, 7, 8, 11, 12,13,14,15 (1990-2006); 9 and 10 for (2000-2005)
Germany	N° 1, 2 (1991-2006), N° 3, 7 (1990-2006), N° 4, 6 (1991- 2005), N° 5 (1993, 2002)	N° 1, 5, 6 (1990-2006), N° 2, 3, 4 (1991-2005)	N° 1, 2, 3, 4, 9, 10, 11, 12,13, 14,15 (1990-2006), N° 7 (1993, 1998, 2002), N° 5 and 6 for (1991-2005)
Greece			
Hungary	N° 1,2 (1991-2006), N° 4,6 (1995-2006), N° 3,7 (2003-2006), N° 5 (1990,2000,2003-2006)	N° 1,5,6 (2003-2006); N° 2,3,4 (1995-2006)	N° 9,10,11,12,14,15 (2003-2006), N° 5,6 (1995-2006), N° 3 (2003-2004), N° 7,13 (2004-2005)
Ireland	N° 1, 2, 3, 5, 7 (1990-2006), N° 4 (1997-2006), N° 6 (1995-2006)	N° 1 (1990-2006), N° 3 (1995-2006)	N° 1, 2, 4, 7, 9, 11, 12, 14,15 (1990-2006), N° 5, 6 (1995-2006)
Italy	all (1990-2006)	all (1990-2006)	all (1990-2006)
Latvia	N° 1, 2, 4, 6 (1995-2006) N° 5, 7 (1990-2006)	N° 5, 6 (1990-2006), N° 2, 3, 4 (1995-2005)	N° 1, 4, 7, 9, 11, 12, 14, 15 (1990-2006), N° 5, 6 (1995-2005)
Lithuania	all (2004-2006)	all (2004-2006)	all (2004-2006)
Luxembourg	N° 1, 2, 4, 6 (1995-2006) N° 7 (1990-2006), N° 5 (1995-2005)	N° 2, 3 (1995-2006), N° 5 (1990-2006)	N° 4, 9, 11, 13 (1990-2006), N° 5, 6 1995-2006), N° 12,14,15 (1995-2005)
Malta			
Netherlands	N° 1, 2, 3, 4, 5, 6 (1990-2006), N° 7 (1995-2006)	N° 1, 2, 3, 5 (1990-2006)	N° 1, 2, 3, 4, 12, 13, 14, 15 (1990-2006), N° 9, 10 (1995-2006)
Poland	N° 5 (2006)	N° 1, 5, 6 (2006)	N° 4, 9, 10, 11, 12,13,14,15 (2006)
Portugal	N° 1, 2, 3, 5 (1990-2006), N° 4, 6, 7 (1990-2005)	N° 1, 6, 5 (1990-2006), N° 2, 3, 4 (1990-2005)	N° 1, 2, 3, 4, 7, 12, 13, 14, 15 (1990-2006), N° 5, 6, 9, 10, 11 (1990-2005)
Romania	all (2006)		
Slovakia	N° 1, 2 (1994-2006), N° 4 (1997-2006), N° 3, 7 (1990-2006), N° 6 (1995-2006), N° 5 (1991, 1996, 1998-2006)	N° 1, 5, 6 (1990-2006), N° 2, 3, 4 (1995-2006)	N° 1, 2, 3, 9, 12, 13, 14, 15 (1990-2006), N° 4 (1993-2006), N° 5, 6 (1995-2006), N° 7 (1999-2006)
Slovenia	N° 3 (1990-2006), N° 1, 2, 4, 6 (1995-2006), N° 5, 7 (2003-2006)	N° 1, 2, 13 (1990-2006); N° 2, 3 (1995-2006), N° 4, 6 (2003-2006)	N° 1, 2, 13 (1990-2006), N° 4, 9, 10, 11, 12, 14, 15 (2003-2006), N° 5, 6 (1995-2006)
Spain	N° 1, 2, 4, 6 (1995-2006), N° 3, 5 (1990-2006), N° 7 (1990-2005)	N° 1 (1990-2006), N° 2, 3, 4 (1995-2006)	N° 1, 2, 4, 13 (1990-2006), N° 5, 6 (1995-2006), N° 9, 10, 12, 14, 15 (1990-2005)
Sweden	all (2006)	all (2006)	
United Kingdom	all (1990-2006)	N° 1, 2, 3 (1990-2006)	N° 1, 2, 3, 4, 12, 14, 15 (1990-2006), N° 5, 6 (1992-2006)

A 5.2 Greenhouse gas emission projections (2010)

By March 15th 2007, Member States were required to report information on policies and projections under the Monitoring Mechanism (Decision No 280/2004/EC and by Commission Decision 2005/166/EC), this information required every second year. In 2007 eight Member States submitted on time. By the end of May 2007, 19 EU Member States and one EEA member country (Norway) had submitted information. Since then, 13 Member States and Norway have submitted new or updated information on policies and projections. The quality of reporting for Member States is of a variable quality in terms of level of detail provided. Difficulties occurred with submissions because of incomplete projections, inconsistencies in data, for example the base year not being consistent with projections or incomplete sectoral or gas breakdowns. As a result, data gaps occurred and Member States were asked to complete or correct their data in the draft country profile sent for review. Data from 2006 for Estonia and data from the Maltese national allocation plan (under the EU ETS) is used as no new data on projections is available. Information presented for non-EU EEA member countries is generally from the last submitted UNFCCC national communication.

Beside projections, policies and measures Member States are required to report on uncertainty analysis, parameters and indicators. The reporting of indicators got better, but uncertainty and parameters are still weak points.

In 2007 for the first time, a template for reporting was developed and Member States were encouraged to use it. The use of the template should guarantee that Member States submit all required information and data in a consistent format, which allows the easier assessment of the submissions and compilation of report at hand. Nine of the EU-27 Member States made use of the template.

Table 11 Reporting of new information in 2008 for EU-27 Member States

Country	New policies and measures reported in 2008?	New projections reported in 2008?
Austria	No	No
Belgium	No	No
Bulgaria	No	No
Cyprus	Yes	Yes
Czech Republic	Yes	No
Denmark	No	No
Estonia	No	No
Finland	No	No
France	No	No
Germany	No	No
Greece	Yes	Yes
Hungary	Yes	No
Ireland	No	No
Italy	Yes	Yes
Latvia	Yes	Yes
Lithuania	No	No
Luxembourg	Yes	Yes
Malta	No	No
Netherlands	No	No
Poland	Yes	No
Portugal	Yes	Yes

Country	New policies and measures reported in 2008?	New projections reported in 2008?
Romania	No	No
Slovakia	No	No
Slovenia	Yes	No
Spain	Yes	Yes
Sweden	No	No
United Kingdom	No	No

Note: New information provided in '2008' refers to official submissions between 31 May 2007 and 31 May 2008.

Every second year EU-27 Member States are required to report to the European Commission information on indicators for projections to monitor and evaluate progress with policies and measures as outlined in Commission Decision 2005/166/EC (Annex III). In 2008 no reporting was required, but several Member States sent missing information and updates. Table 12 below shows availability of information on indicators for the EU-27 Member States.

Table 12 Reporting on indicators for projections by EU-27 Member States

Member State	Numerator and denominator reported	Year
Austria	N°1,2,3,4,5,8,9,10	2005,2010,2015, 2020
Belgium	N°1,2,4,5,6,7,8,9,10	2005,2010,2015, 2020
Cyprus	N°1	2005,2010,2015, 2020
Czech Republic	Full set	2005,2010,2015, 2020
Denmark	Full set	2005,2010,2015, 2020
Finland	N°1,4,7	2005,2010,2015, 2020
Germany	N°1,2,3,4,5,6,7	Not all required years
Greece	Full set (indicator only)	2005,2010,2015, 2020
Ireland	Full set	2005,2010,2015, 2020
Italy	N°1,2,3,4,5,6,8,9,10	2005,2010,2015, 2020
Hungary	N°1,2,4,7	2010,2015,2020
Lithuania	Full set	2005,2010,2015, 2020
Luxembourg	N°1	2005,2010,2015, 2020
Netherlands	Full set	2005,2010,2015, 2020
Portugal	N°1,2,4,5,6,7,9,	Not all required years
Poland	N°1,7,8,9,10	2005,2010,2015, 2020
Slovakia	Full set	2005,2010,2015, 2020
Slovenia	Full set	2005,2010,2015, 2020
Spain	N°1,2,3,7,8,9,10	2005,2010,2015, 2020
Sweden	N°1,2,4,5,7,8,9,10	2005,2010,2015, 2020
United Kingdom	N°1,2,3,4,8,9,10	2005,2010,2015, 2020

In 2008, 7 countries provided indicators for projections. Consequently, 21 EU Member States submitted indicators for projections under the reporting requirement March 15th 2007. The indicators are used in the Chapter on Sectoral Trends in the Annex.

A 5.3 Methodological issues

A 5.3.1 Greenhouse gas emissions reporting categories

The sector categories used in this report are consistent with the reporting guidelines provided by the IPCC ([33]). This nomenclature is used by all countries for reporting national greenhouse gas emissions to the UNFCCC.

Table 13 Main greenhouse gas source categories

Sector	Corresponding IPCC sector or source category and description
Energy supply and use excluding transport	IPCC sector 1 'Energy', except 1.A.3. 'Transport'. It 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.
Transport	IPCC source category 1.A.3 'Transport'. It includes mainly road transport, but also rail and domestic aviation and navigation. It does not include international aviation and navigation.
Agriculture	IPCC sector 4 'Agriculture'. It includes mainly enteric fermentation and soils (it does not include energy-related emissions from agriculture).
Industrial processes	IPCC sector 2 'Industrial processes'. It 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).
Waste	IPCC sector 6 'Waste'. It includes mainly emissions from landfills. It does not include waste incineration used for electricity and heat production, which is included in the energy sector.
Solvents and other products	IPCC sector 3 'Solvent and other product use' and IPCC sector 7 'Other'. Due to the low share of this sector, no detailed analysis of emissions from this sector is provided.

A 5.3.2 Adjustment on projections reported by countries

Greenhouse gas emission projections reported by countries are always related to historic emissions for a specific year chosen by them. This 'reference year' can be any year for which past inventory data is available (1990, 1991, 1992, etc. up to 2006), or the base year under the Kyoto Protocol. However, emission data reported for this reference year, along with projections, does not always match with the data used in this report for the assessment of historic trends (1990-2006 emissions from the latest 2008 Greenhouse gas inventories and base-year emissions as fixed after UNFCCC review of initial reports under the Kyoto Protocol).

Therefore, to ensure consistency between projected emissions reported by countries and past emission trends reported in 2008, projected emissions have been subject to an adjustment, based on the reference year chosen and the emissions reported along with projections for this reference year. The adjustment ensures that the relative progress between the reference year and the year for which projections are reported remains constant. The adjustment formula used is:

$$\text{Projection}_{\text{adjusted}} = \text{Projection}_{\text{submission}} \times \frac{\text{Emissions reference year}_{\text{GHG inventory}}}{\text{Emissions reference year}_{\text{submission}}}$$

Where:

Projection $_{\text{adjusted}}$ = as used in this report and reported in Chapter 11.

Projection $_{\text{submission}}$ = as reported by the country in its most recent submission under the Monitoring Mechanism Decision or the UNFCCC.

([33]) The different GHG source categories are classified according to a specific IPCC nomenclature. See *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*: www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm

Emissions reference year $_{\text{submission}}$ = as reported with projections under the Monitoring Mechanism Decision or the UNFCCC.

Emissions reference year $_{\text{GHG inventory}}$ = as reported in:

- the review report of the initial report under the Kyoto Protocol if the reference year selected is the Kyoto base year;
- the 2008 greenhouse gas inventory submitted to UNFCCC, if the reference year selected is not the Kyoto base year.

The list of reference years used by countries and corresponding adjustment factors is provided in Table 14.

Table 14 Reference year used by countries for projections and adjustment factors

Country	Reference year consistent with reported projections	Adjustment factor
Austria	1990	1.003
Belgium	2000	0.991
Bulgaria	2000	1.046
Croatia	1990	1.026
Cyprus	1990	0.882
Czech Republic	2004	0.998
Denmark	Kyoto base year (1990/1995)	1.000
Estonia	2000	0.840
Finland	1990	1.000
France	1990	0.999
Germany	Kyoto base year (1990/1995)	1.000
Greece	1990	1.000
Hungary	2001	1.002
Iceland	1990	1.039
Ireland	Kyoto base year (1990/1995)	0.998
Italy	1990	0.999
Latvia	1990	1.001
Liechtenstein	1990	0.917
Lithuania	1990	1.027
Luxembourg	1990	1.045
Malta	2005	1.620
Netherlands	Kyoto base year (1990/1995)	0.999
Norway	1990	1.002
Poland	Kyoto base year (1988/1995)	0.960
Portugal	Kyoto base year (1990/1995)	0.986
Romania	2004	0.991
Slovakia	1990	1.009
Slovenia	1986	1.007
Spain	2005	1.001
Sweden	Kyoto base year (1990/1995)	0.998
Switzerland	1990	1.006
Turkey	2003	1.000
United Kingdom	Kyoto base year (1990/1995)	1.001

A 5.3.3 Gap filling procedures for projections

Gap filling is necessary, as several data sets are required to assess the progress of a Member State as well as the progress of the EU.
These data include:

- total 'with existing measure' scenario and 'with additional measure' scenario emission projection value;
- sectoral and gas breakdown for reference year and scenarios;
- 2020 projection value.

A complete sectoral and gas breakdown for projections was missing for Italy, Luxembourg, Malta, Hungary and France. Full gas breakdowns were not provided by Austria, Greece (for WAM), Italy, Malta, Luxembourg and Hungary. Energy and transport disaggregations were not provided by Bulgaria, Estonia, Cyprus, Malta, Italy and Hungary. Proportions from the latest inventory (2006) were applied to total projection figures to determine proxy shares, except for Greece's WAM breakdown, where the WEM shares were applied. Malta provided projections for CO2 emissions from 2 power plants only. Therefore Malta's projection was scaled by applying the percentage difference between emissions for 2005 (from the 2008 inventory) for the same 2 power plants and emissions for all sectors and gases.

All EU Member States reported total projections so gap filling was not necessary for EU-27 total projections for 2010.
This year's report also contains an assessment of the situation in 2020. As only 24 out of the EU-27 Member States provided projections for 2020, the following gap filling procedure was applied. The projected trend of the aggregated Member States available (EU-24) is applied to the missing countries. That means the 2006–2020 percent variation for the available EU countries is applied to the countries with a gap to obtain a complete EU-27 projection for 2010.

A 5.3.4 Calculating savings from national policies and measures

Throughout this report, projected savings from policies and measures in 2010 are estimated by comparison with a hypothetical reference case in which no measures were implemented since the starting year chosen by each country for its 'without measures' projection (where a 'without measures' projection is provided). This year is usually between 1990 and 2000.

Where possible, projected emission reductions from policies are calculated from the latest Member State (sectoral) projections. Hence, the 'with additional measures' projection is subtracted from the 'with existing measures' projection to reveal the effect of 'planned' policies and measures. Likewise, the 'with existing measures' projection is subtracted from the 'without measures' projection to reveal the effect of 'existing' policies and measures. Many Member States do not provide a 'without measures' projection and, as a result, the reported effects of existing measures is very likely to be an underestimate. However, this data is consistent with projections reported and takes account for any interaction effects between policies and measures.

A 5.3.5 Calculating savings from CCPMs

Data used to illustrate savings from individual CCPMs in this report is taken from the Database on Policies and Measures in Europe (www.oeko.de/service/pam/sector.php). Data includes savings projected by Member States for existing 'with measures' ('implemented/adopted') and 'with additional measures' (planned) in 2010, by comparison with a hypothetical reference case in which no measures were implemented since starting year chosen by each country for its 'without

measures' projection (where a 'without measures' projection is provided). This year is usually between 1990 and 2000. Data used in this report are for CCPMs only and therefore do not include quantification of the effect of purely national policies. The database provides detail on PAM status, split by 'implemented/adopted' and 'planned' status. These categories do not necessarily correspond to the PAMs included in Member States' 'with measures/additional measures' projections and the estimated savings from planned measures do not necessarily correspond to the difference between the 'with measures' and 'with additional measures' projections. Since a large proportion of PAMs have not been quantified, this is why hypothetical 'without measures' projections cannot be derived.

A 5.3.6 Calculating a 'without measures' projection scenario

'Without measures' projections are extracted from Member States' latest submissions in order to illustrate the effect of implemented 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 greenhouse gas 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
CITL	Community Independent Transaction Log
CLRTAP	Convention on Long-range Transboundary Air Pollution
CO_2	carbon dioxide
COP	Conference of the Parties
CRF	common reporting format
DNA	Designated National Authority
DTI	distance-to-target indicator
ECCP	European climate change programme
EEA	European Environment Agency
ERU	emission reduction unit caused by JI projects
ERT	Expert Review Team
ETC/ACC	European Topic Centre on Air and Climate Change
ETS	Emission Trading Scheme
EU-12	Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovak Republic, Slovenia
EU-15	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom
EUA	European Union Allowance
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 greenhouse gas emissions between industrialised countries and countries in transition
KAMA	Korean Automobile Manufacturers Association
KP	Kyoto Protocol
LUCLUF	Land-use, 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
MoU	Memorandum of Understanding
MS	Member States
Mt	Mega (million) tonnes
NAP	National Allocation Plan
N_2O	nitrous oxide
PAM	policies and measures
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
WAM	with additional measures
WEM	with existing measures
WOM	without measure