EEA report | No 9/2009

Greenhouse gas emission trends and projections in Europe 2009

Tracking progress towards Kyoto targets

Annex: Additional information on greenhouse gas emission trends and projections

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List of figures and tables

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. Emissions are presented by main emitting source, for Energy Use (CRF category 1A2 + 1A4 + 1A5), Energy Supply (CRF category 1A1 + 1B), Transport (CRF category 1A3), Industrial Processes (CRF sector 2), Agriculture (CRF sector 4), Waste (CRF sector 6), and Solvents and Other (CRF sector 3+7). The emissions from international bunkers (aviation and navigation) are included in the respective domestic (1A3a and 1A3d) source categories. The total greenhouse gas emissions referred to in this chapter include emissions from international bunkers.

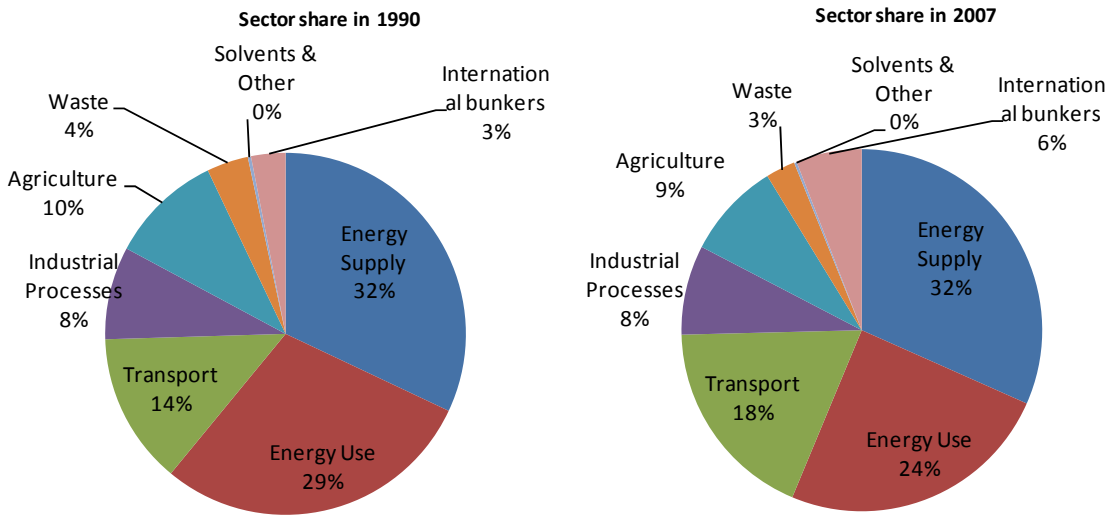
Past trend (1990–2007)

- Approximately 80% of total greenhouse gas emissions (5 360 Mt in 2007) in the EU-27 are due to the supply and use of energy (including fuel consumption from transport with international bunkers) (Figure 1.1). CO_2 emissions from public electricity and heat production represent approximately a quarter of all EU-27 greenhouse gas emissions, while CO_2 emissions from road transportation represent almost 17 % (Figure 1.3).
- The share of transport in total emissions increased from 14 % in 1990 to 18 % in 2007 and the share of energy use decreased from 29 % in 1990 to 24 % in 2007 in the EU-27 (Figure 1.1).
- Agriculture was the main CH_4 and N_2O emitter and accounts for 9 % of total greenhouse gas emissions in 2007 (Figure 1.1 and
- Figure 1.2) for EU-27 and EU-15.
- EU-27 and EU-15 greenhouse gas emissions increased notably in the transport and international bunkers sectors between 1990 and 2007. Removals from land use and land use change (LULUCF) also increased during this time.
- A comparison of past sectoral trends between EU-15 and EU-27 shows that the relative changes differ most for energy supply and agriculture (Figure 1.4). Economic and agricultural restructuring in the EU-12 in the 1990s is the main reason for higher emission reductions in the EU-27.

Projected trend

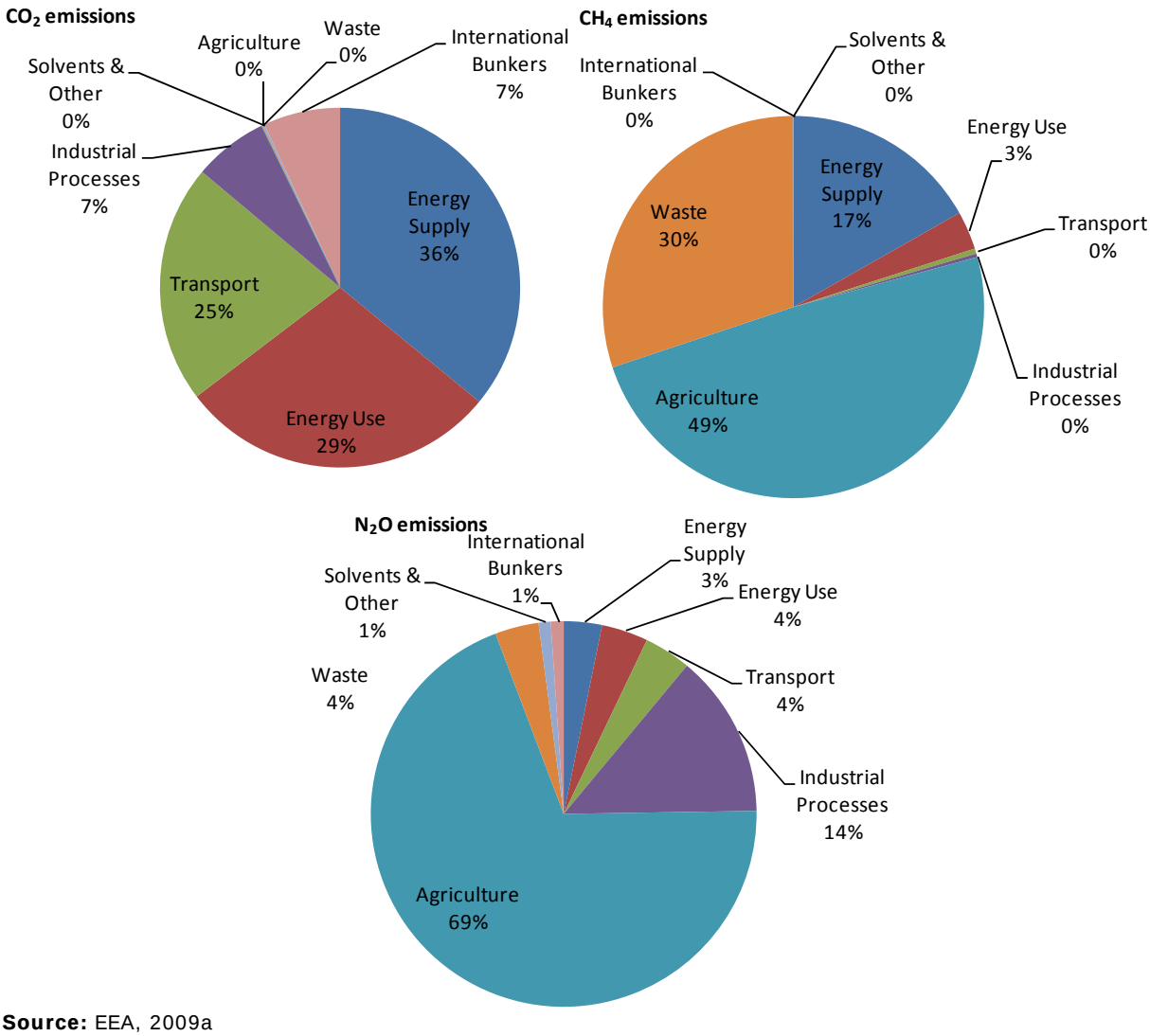
- Transport emissions in the EU-27 are projected to decrease 1 % below 2007 levels if additional measures are implemented. The highest absolute decrease is expected by Spain (-21 Mt CO_2-eq.)
- Emissions in the EU-27 are expected to decrease between 2007 and 2010 in all sectors except for 'energy use' and 'solvents and other' if additional measures are implemented.
- The increase in emissions from energy use is projected to more than halve when additional measures are implemented, for EU-15 and EU-27.
- The highest absolute decrease is expected from the energy supply sector.
- The projected changes for EU-15 and EU-27 are very similar. The highest relative differences occur for energy supply and waste, where higher relative emission decreases are projected for the EU-15 (
- Figure 1.5).
- The effect of additional measures is highest for the energy supply sector, for EU-15 as well as EU-27.

Figure 1.1 Sector shares of total greenhouse gases in 1990 and 2007 in the EU-27



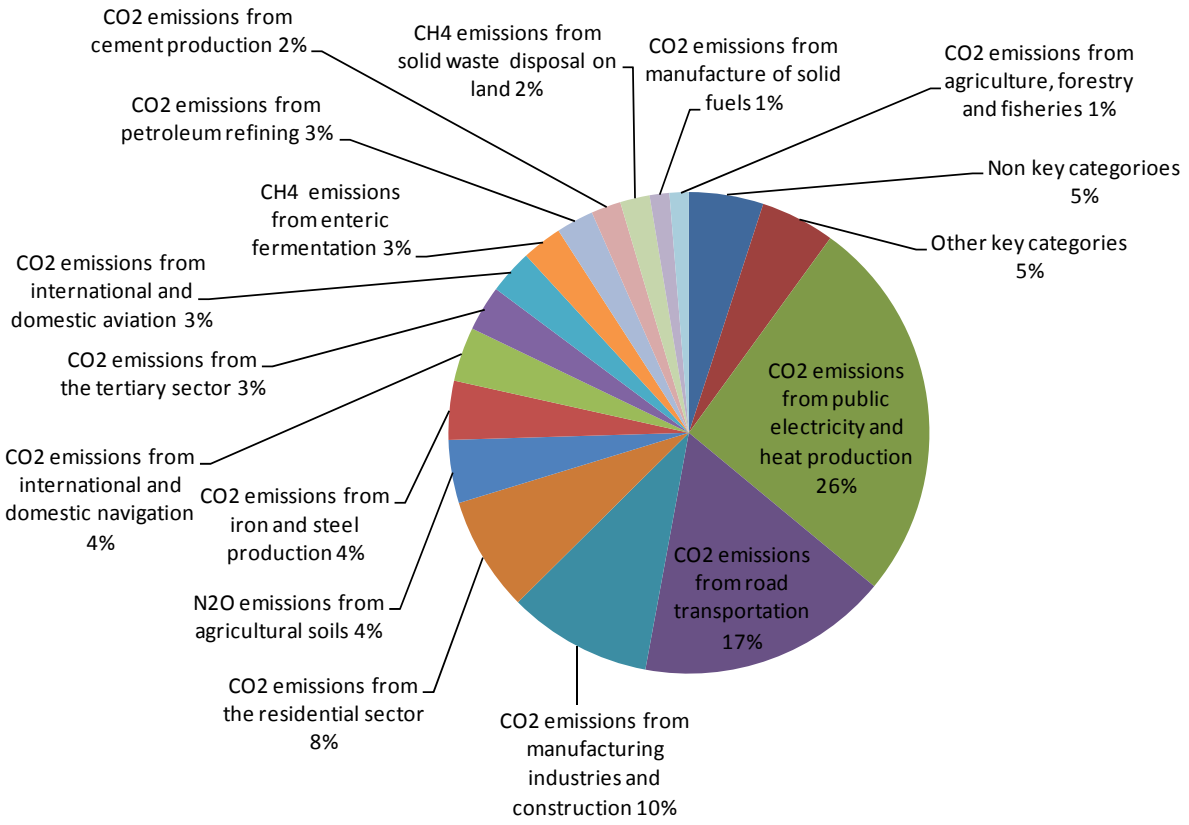
Source: EEA, 2009a.

Figure 1.2 Sector shares of total, CO_2, CH_4 and N_2O emissions in 2007 in the EU-27



Source: EEA, 2009a

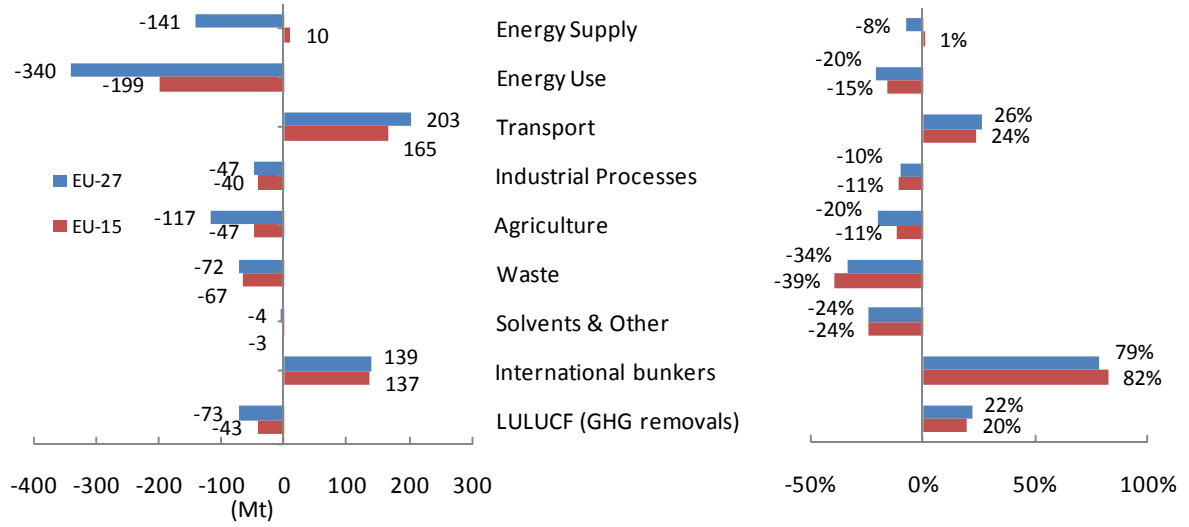
Figure 1.3 Share of key sources in the EU-27 in 2007



Note: The most important key sources of greenhouse gas emissions presented here account for 90 % of total emissions (excluding emissions and removals from LULUCF) in 2007 based on a 2007 emission level analysis. A more detailed key source analysis regarding trends and level of emission sources is available in the EC inventory report 2009. Emissions from international bunkers are included in 'international and domestic aviation' and 'international and domestic navigation'.

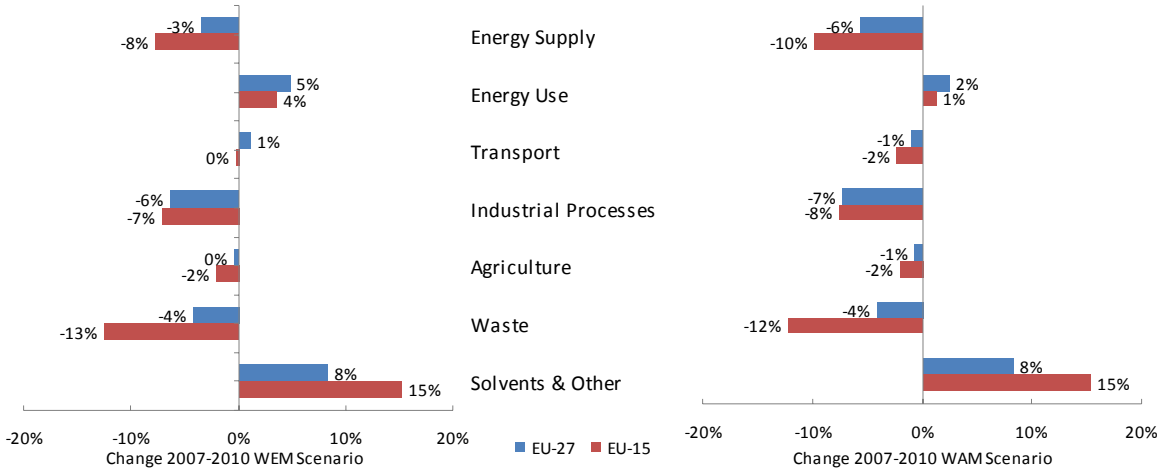
Source: EEA, 2009a

Figure 1.4 Changes 1990–2007 in EU-27 greenhouse gas emissions by sector



Source: EEA, 2009a

Figure 1.5 Projected changes 2007–2010 in EU-27 greenhouse gas emissions by sector



Note: Some Member States did not report projections for all sectors and scenarios. Therefore, the information on the total EU-27 projections is based on gap-filling and should be interpreted with care. As projected data for international bunkers was only available for eleven Member States (Denmark, Germany, Greece, Netherlands, Spain, Sweden, the United Kingdom, the Czech Republic (aviation only), Estonia, Lithuania), data for the EU-15 and the EU-27 cannot be shown in this graph.

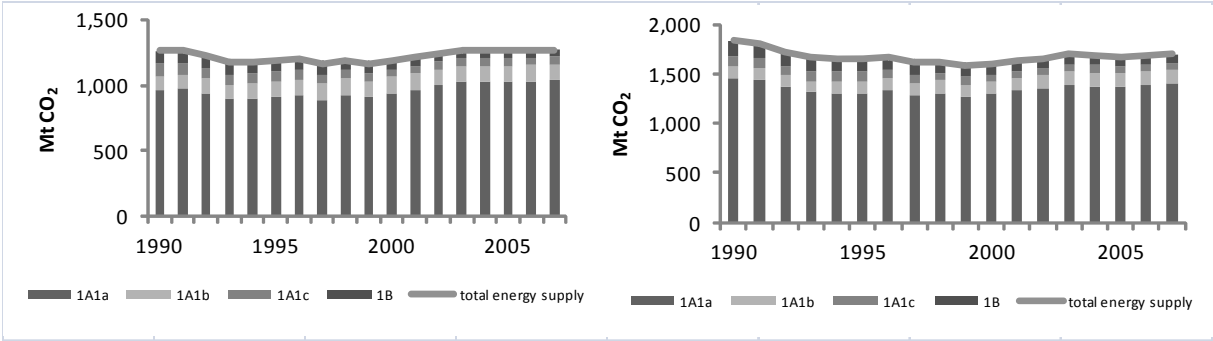
Source: EEA, 2009a; EEA based on Member State greenhouse gas inventories and projections

1.1 Energy supply (energy industries)

***Definition (IPCC sector 1A1+1B)**: emissions from fuels combusted by the fuel extraction or energy-producing industries and resultant fugitive emissions*

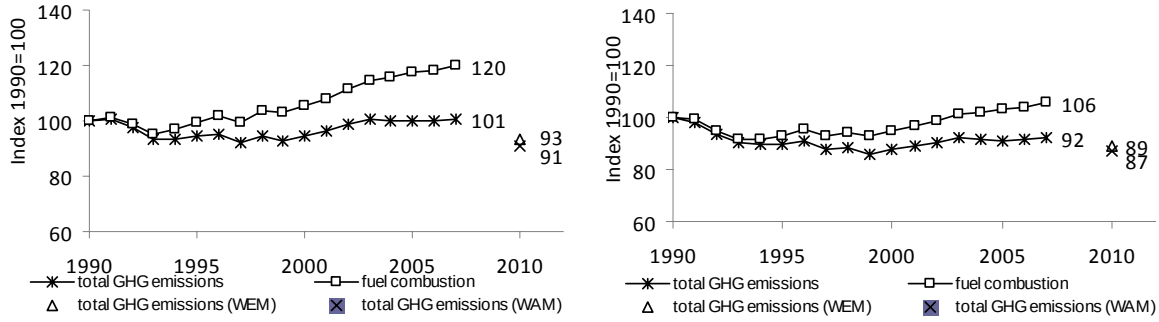
GHG emission from 1A1+1B	Share in 1990 total GHG	Share in 2007 total GHG	Change 1990-2007	Change 2000-2007
EU-15	28.6%	29.1%	0.8%	6.5%
EU-27	32.0%	31.7%	-7.7%	5.5%

Figure 1.6 Trend in absolute EU-15 (left) and EU-27 (right) total greenhouse gas emissions from energy supply (contribution of sub-categories)



Source: EEA, 2009a

Figure 1.7 Trend of EU-15 (left) and EU-27 (right) total greenhouse gas emissions from energy supply compared with fuel combustion in energy industries



Source: EEA, 2009a; EEA based on Member State greenhouse gas inventories and projections

- Total EU-15 greenhouse gas emissions from energy supply were 1 % above 1990 levels in 2007 whereas fuel combustion increased by 20 % during the same time. Highest absolute reductions were achieved in Germany and the United Kingdom.
- In the EU-27 emissions were 8 % below 1990 emissions in 2007. This reduction was achieved despite increased fuel combustion of 6 %.
- The decoupling of fuel combustion and greenhouse gas emissions in the EU-15 and the EU-27 is caused by fuel switching (e.g. from coal to gas) and efficiency improvements.

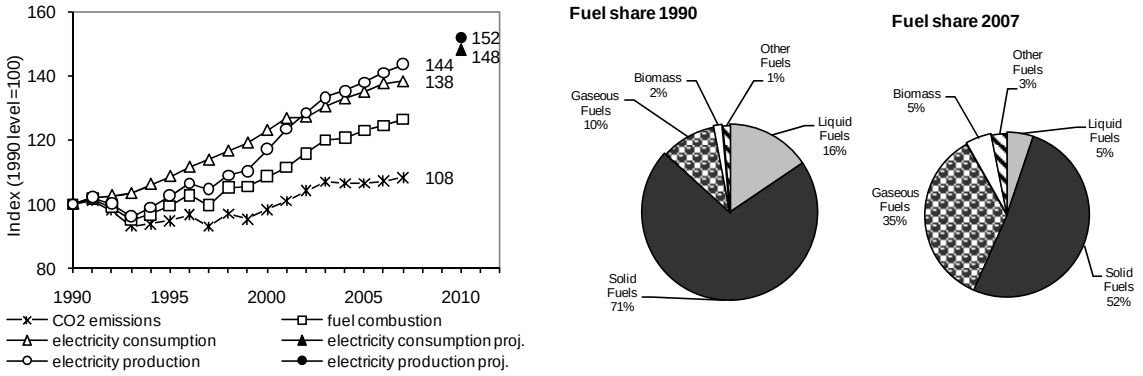
- Greenhouse gas emissions in the EU-15 and EU-27 are expected to be below 2007 levels in 2010. Germany, Spain and the United Kingdom project (WAM) that they will contribute most to the EU-15 emission reductions between 2007 and 2010.

1.1.1 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).*

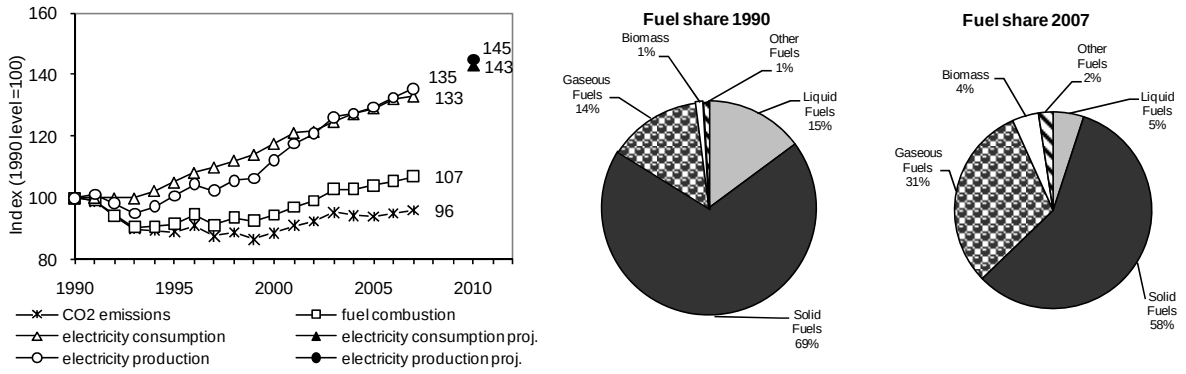
CO_2 emission from 1A1a	Share in 1990 total GHG	Share in 2007 total GHG	Change 1990-2007	Change 2000-2007
EU-15	21.6%	23.6%	8.4%	10.2%
EU-27	25.3%	26.0%	-4.0%	8.2%

Figure 1.8 CO_2 emissions from public electricity and heat production compared with fuel combustion, electricity production, electricity consumption and change in fuel share for the EU-15



Source: EEA, 2009a; Eurostat; PRIMES 2008 (projected data for electricity consumption and production).

Figure 1.9 CO_2 emissions from public electricity and heat production compared with fuel combustion, electricity production, electricity consumption and change in fuel share for the EU-27



Source: EEA, 2009a; Eurostat; PRIMES 2008(projected data for electricity consumption and production).

Reasons for decoupling of CO_2 emissions and electricity and heat production:

- Fuel switching (from coal to gas)
- Efficiency improvements.

The effect on greenhouse gas emissions through energy production by nuclear power was of minor importance (share of nuclear power in 1990 33 % and in 2007 29 %, Eurostat), and the increased use of renewable energy sources caused no significant change (share of RES in electricity generation in Europe rose from 13 % in 1990 to 17 % in 2007).

Additional information to Table 1.1:

- 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 2007 (from 13 % to 50 %, EEA, 2009a).
- In Luxembourg, a complete shift from coal to gas has occurred (EEA, 2009a).

Table 1.1 Change of CO_2 emissions, fuel combustion, electricity consumption and production (in thermal power plants) between 1990 and 2007 for the EU-27 Member States

Relative Change (1990-2007)	CO2 emissions	Fuel Combustion	Electricity Production	Electricity Consumption
Austria	-4.2%	30.2%	15.0%	36.1%
Belgium	-7.0%	25.7%	47.7%	42.9%
Bulgaria	-18.0%	-31.8%	8.4%	-22.9%
Cyprus	122.6%	120.6%	142.5%	149.4%
Czech Republic	9.2%	12.2%	22.9%	18.7%
Denmark	-8.9%	14.3%	19.6%	18.9%
Estonia	-53.1%	-52.3%	-30.3%	-0.4%
Finland	66.1%	96.7%	111.0%	46.0%
France	-0.9%	12.4%	42.6%	41.1%
Germany	2.9%	11.3%	26.4%	18.8%
Greece	34.9%	50.1%	78.7%	93.9%
Hungary	-10.8%	4.7%	81.7%	6.8%
Ireland	28.1%	48.6%	75.8%	117.9%
Italy	12.8%	28.7%	57.1%	44.3%
Latvia	-68.7%	-58.7%	-6.1%	-20.4%
Lithuania	-72.6%	-65.6%	-76.9%	-26.4%
Luxembourg	4.6%	276.2%	-	62.6%
Malta	49.5%	62.6%	108.7%	103.4%
Netherlands	31.9%	48.2%	42.0%	45.3%
Poland	-23.6%	-21.4%	18.5%	18.8%
Portugal	22.9%	38.3%	48.4%	108.3%
Romania	-50.5%	-54.5%	-21.6%	-25.0%
Slovakia	-51.2%	-48.7%	-42.7%	5.0%
Slovenia	9.6%	12.3%	49.4%	35.5%
Spain	66.9%	98.8%	128.9%	106.7%
Sweden	4.5%	101.7%	225.9%	10.4%
United Kingdom	-13.2%	9.8%	20.1%	24.6%

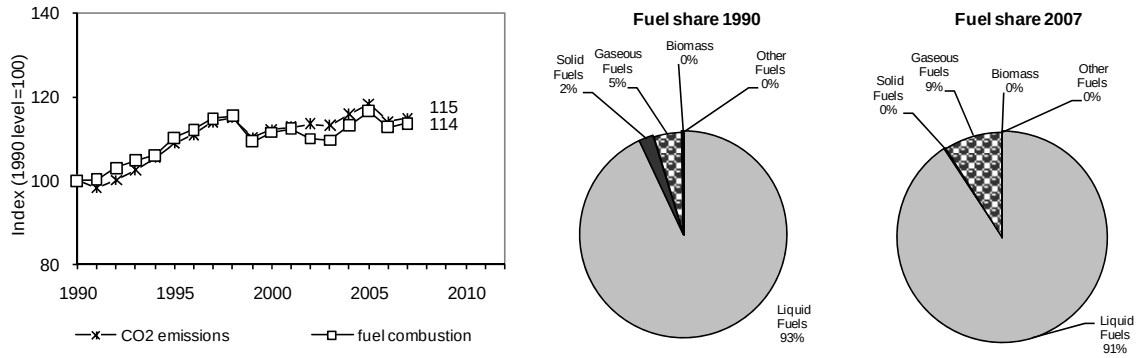
Note: Grey marked cells label negative values.
Source: EEA, 2008a; Eurostat.

1.1.2 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.*

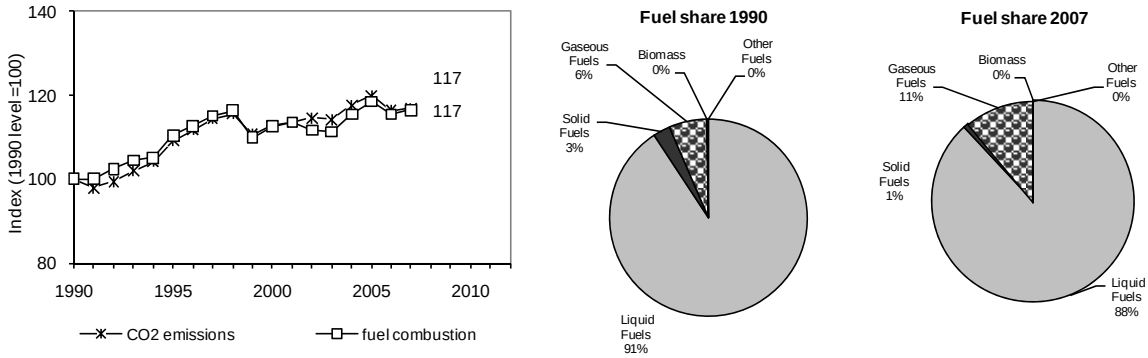
CO_2 emission from 1A1b	Share in 1990 total GHG	Share in 2007 total GHG	Change 1990-2007	Change 2000-2007
EU-15	2.4%	2.8%	14.8%	2.4%
EU-27	2.0%	2.5%	16.9%	3.7%

Figure 1.10 CO_2 emissions from petroleum refining compared with fuel combustion, and change in fuel share for the EU-15



Source: EEA, 2009a.

Figure 1.11 CO_2 emissions from petroleum refining compared with fuel combustion, and change in fuel share for the EU-27



Source: EEA, 2009a.

Reasons for the increasing emission trend include:

- No decoupling between emissions and activity has occurred since the fuel mix, still largely dominated by liquid fuels, did not change significantly
- The emission decrease between 2005 and 2006 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.

Table 1.2 Change of CO_2 emissions and fuel combustion between 1990 and 2007 for the EU-27 Member States

Relative Change (1990-2007)	CO2 emissions	Fuel Combustion
Austria	19.8%	1.0%
Belgium	7.2%	23.6%
Bulgaria	-83.4%	-78.8%
Cyprus	-	-
Czech Republic	-22.3%	-18.8%
Denmark	8.1%	9.5%
Estonia	56.3%	56.3%
Finland	22.0%	31.8%
France	14.6%	10.3%
Germany	10.0%	12.6%
Greece	61.8%	74.5%
Hungary	10.9%	12.9%
Ireland	97.9%	104.0%
Italy	58.3%	40.9%
Latvia	-	-
Lithuania	-3.5%	-6.6%
Luxembourg	-	-
Malta	-	-
Netherlands	-3.6%	-2.0%
Poland	179.2%	252.4%
Portugal	37.4%	33.6%
Romania	-	-
Slovakia	22.6%	27.2%
Slovenia	-99.8%	-99.9%
Spain	17.8%	29.2%
Sweden	8.0%	9.6%
United Kingdom	-17.9%	-20.7%

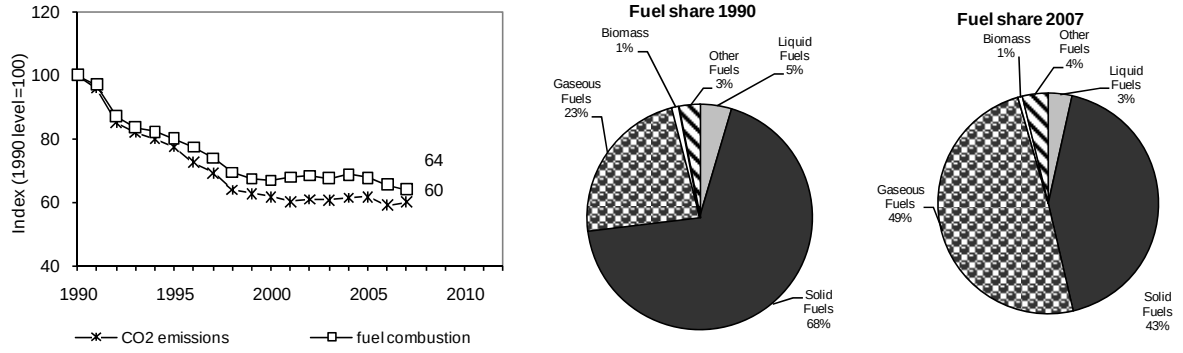
Note: Romania reports emissions under 'Public electricity and heat production'.
The following Member States reported that CO_2 emissions from petroleum refining were not occurring: Latvia, Luxembourg and Malta (1990 and 2007) and Cyprus (2007).
Grey marked cells label negative values.
Source: EEA, 2009a.

1.1.3 CO_2 emissions from the manufacture of solid fuels and other

***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.*

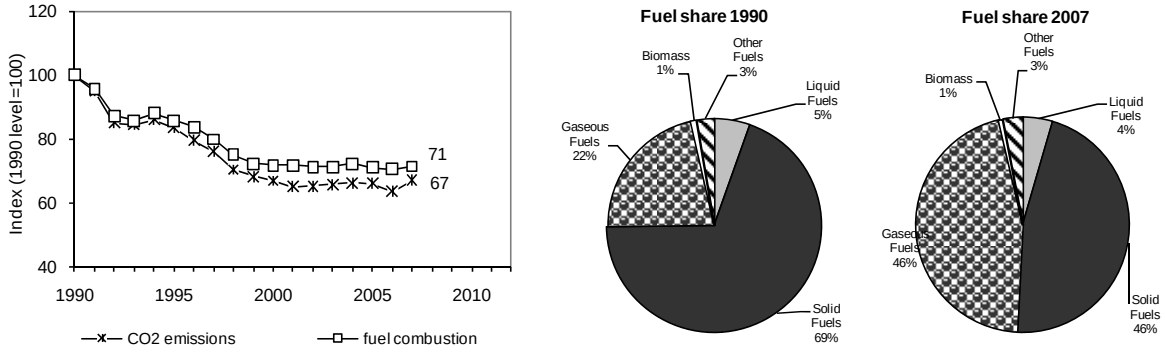
CO_2 emission from 1A1c	Share in 1990 total GHG	Share in 2007 total GHG	Change 1990-2007	Change 2000-2007
EU-15	2.2%	1.3%	-40.0%	-2.6%
EU-27	1.8%	1.3%	-33.1%	0.1%

Figure 1.12 CO_2 emissions from manufacturing of solid fuels compared with fuel combustion, and change in fuel share for the EU-15



Source: EEA, 2009a

Figure 1.13 CO_2 emissions from manufacturing of solid fuels compared with fuel combustion, and change in fuel share for the EU-27



Source: EEA, 2009a

Reasons for the decreasing emission trend include:

- Between 1990 and 2007, 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. In the EU-27 the decreasing trend in CO_2 emissions stopped in 2000. Emissions have been stable since, at a level 30 % below 1990 levels.
- Fuel switching from solid to gaseous fuels led to further reductions in CO_2 emissions.

Table 1.3 Change of CO_2 emissions and fuel combustion from manufacturing of solid fuels between 1990 and 2007 for EU-27 Member States

Relative Change (1990-2007)	CO2 emissions	Fuel Combustion
Austria	22.9%	23.0%
Belgium	-84.4%	-63.1%
Bulgaria	25.1%	29.0%
Cyprus	-	-
Czech Republic	-44.6%	-27.9%
Denmark	199.7%	201.2%
Estonia	-	-
Finland	1.4%	51.9%
France	-25.2%	-43.4%
Germany	-69.8%	-67.6%
Greece	-14.7%	-14.9%
Hungary	-	-
Ireland	13.5%	14.7%
Italy	5.3%	-14.0%
Latvia	-76.9%	-42.8%
Lithuania	-20.1%	-8.4%
Luxembourg	-	-
Malta	-	-
Netherlands	44.6%	13.5%
Poland	57.9%	44.3%
Portugal	-	-
Romania	-	-
Slovakia	13824.0%	6432.0%
Slovenia	-98.0%	-98.0%
Spain	-8.9%	12.3%
Sweden	-9.1%	8.2%
United Kingdom	26.4%	51.6%

Note: Romania reports emissions under 'Public electricity and heat production'; Hungary includes emissions under 'Chemical industry' (1990). The following Member States reported that CO_2 emissions from the manufacture of solid fuels and other energy industries were not occurring: Cyprus, Estonia, Luxembourg and Malta (1990 and 2007) and Portugal (2007).

Grey marked cells label negative values.

Source: EEA, 2009a.

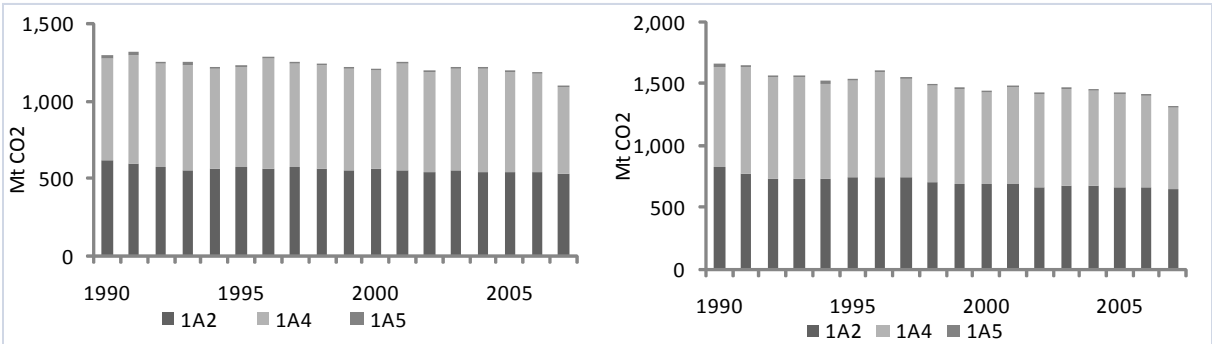
1.2 Energy use

***Definition (IPCC sector 1A2+1A4+1A5)**: Emissions from combustion of fuels in industry including combustion for the generation of electricity and heat and emission from combustion activities in commercial and institutional buildings in households, in agriculture, forestry, or fishing and all remaining emissions from non-specified fuel combustion.*

GHG emission from 1A2+1A4+1A5	Share in 1990 total GHG	Share in 2007 total GHG	Change 1990-2007	Change 2000-2007
EU-15	29.5%	25.3%	-15.3%	-8.8%
EU-27	28.9%	24.6%	-20.5%	-8.6%

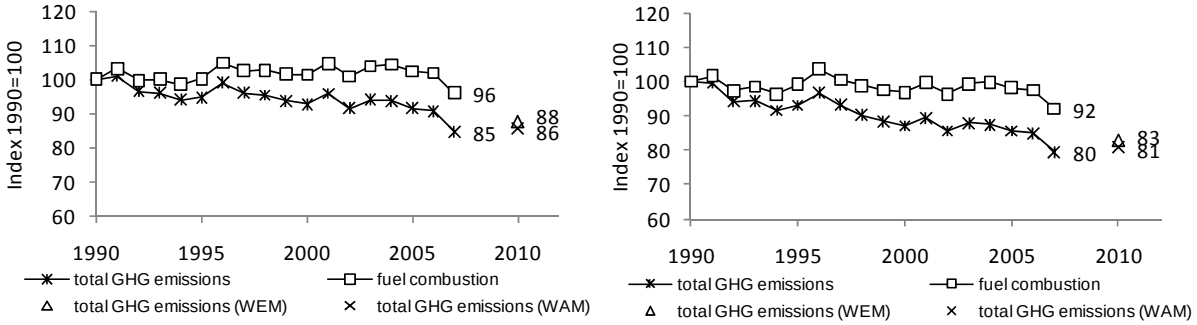
Note: Emissions from 2C1 are not included in chapter A 1.2 Energy use but A 1.4 Industrial processes

Figure 1.14 Trend in absolute EU-15 (left) and EU-27 (right) total greenhouse gas emissions from energy use (contribution of sub-categories)



Source: EEA, 2009a

Figure 1.15 Trend of EU-15 (left) and EU-27 (right) total greenhouse gas emissions from energy use compared with fuel combustion



Source: EEA, 2009a; EEA based on Member State greenhouse gas inventories and projections

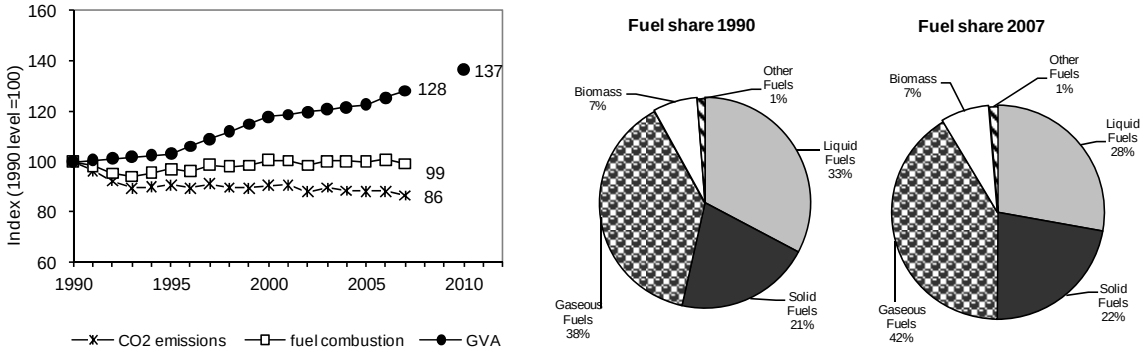
- Total EU-15 greenhouse gas emissions from energy use were 15 % below 1990 levels in 2007. Changes in the trend of fuel combustion were reflected in the trend of greenhouse gas emissions. Fuel combustion, however, decreased only by 4 % between 1990 and 2007. Highest absolute reductions were achieved in Germany and the United Kingdom.
- In the EU-27 emissions were 20 % below 1990 emissions in 2007. Changes in the trend of fuel combustion were reflected in the trend of greenhouse gas emissions. Fuel combustion, however, decreased only by 8 % between 1990 and 2007.
- Greenhouse gas emissions in the EU-15 and EU-27 are expected to be above 2007 levels in 2010. The highest absolute increase within the EU-15 is expected for Germany. France, Italy and the United Kingdom expect the highest reductions between 2007 and 2010 within the EU-15.

1.2.1 CO_2 emissions from manufacturing industries and construction excluding iron and steel production

***Definition (IPCC sector 1A2-1A2a)**: Emissions from combustion of fuels in industry (excluding iron and steel) including combustion for the generation of electricity and heat. Emissions from autoproducers should be assigned to the sector where they were generated.*

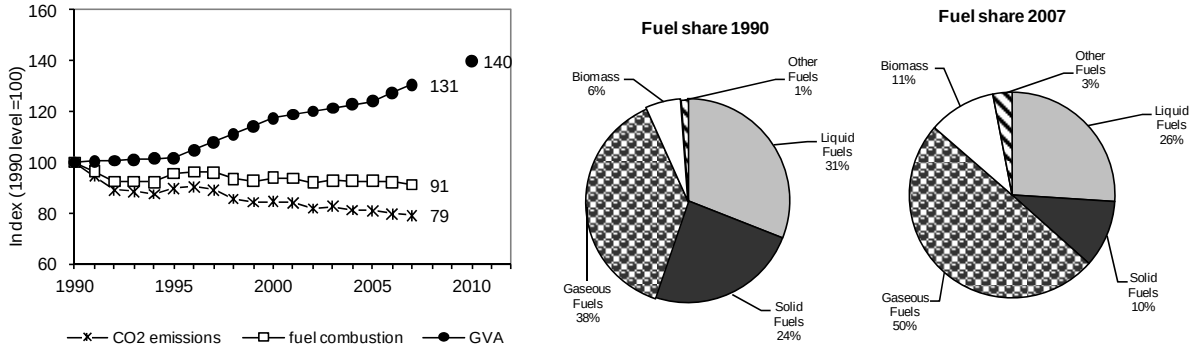
CO_2 emission from 1A2-1A2a	Share in 1990 total GHG	Share in 2007 total GHG	Change 1990-2007	Change 2000-2007
EU-15	11.2%	9.8%	-13.5%	-4.6%
EU-27	11.4%	9.7%	-20.9%	-6.4%

Figure 1.16 CO_2 emissions from manufacturing industries and construction excluding iron and steel production compared with fuel combustion and gross value added and change in fuel share for the EU-15



Source: EEA, 2009a; EEA based on Member State greenhouse gas inventories, PRIMES 2008 (historical and projected data for GVA)

Figure 1.17 CO_2 emissions from manufacturing industries and construction excluding iron and steel production compared with fuel combustion and gross value added and change in fuel share for the EU-27



Source: EEA, 2009a; EEA based on Member State greenhouse gas inventories, PRIMES 2008 (historical and projected data for GVA)

- The sub-categories contributing most to emissions from manufacturing industries are iron and steel (treated in the next section), emissions from the chemical industry (1A2c) and emissions from remaining industries (1A2f). This category is used by a number of Member States (e.g. the United Kingdom, Romania), when they cannot allocate the emissions to specific industries.
- The decrease in emissions is partly due to the fuel shift from solid to gaseous fuels. The decrease observed on the trend for the EU-27 emissions is even higher and amounts to 21 %.
- Gross value added (GVA) is decoupled from emissions and fuel combustion, for the EU-27 and EU-15, as GVA increased while emissions and fuel combustion decreased.

Table 1.4 Change of CO_2 emissions and fuel combustion between 1990 and 2007 for the EU-27 Member States

Relative Change (1990-2007)	CO2 emissions	Fuel Combustion
Austria	22.0%	46.5%
Belgium	-6.2%	12.2%
Bulgaria	-55.3%	-49.2%
Cyprus	-	-
Czech Republic	-	-
Denmark	5.1%	10.1%
Estonia	-50.9%	-49.8%
Finland	-26.8%	13.5%
France	-8.7%	0.7%
Germany	-41.3%	-24.7%
Greece	3.8%	13.0%
Hungary	-49.6%	-27.6%
Ireland	60.4%	66.8%
Italy	-9.6%	-4.9%
Latvia	-72.7%	-61.4%
Lithuania	-	-
Luxembourg	37.9%	56.0%
Malta	-	-
Netherlands	-19.0%	-20.3%
Poland	-2.7%	21.2%
Portugal	22.5%	38.4%
Romania	-	-
Slovakia	-61.1%	-57.4%
Slovenia	-20.9%	-15.6%
Spain	60.3%	77.3%
Sweden	-12.0%	-4.0%
United Kingdom	-19.6%	-12.0%

Source: EEA, 2009a

1.2.2 CO_2 emission from 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.*

CO_2 emissions from iron and steel production are split between:

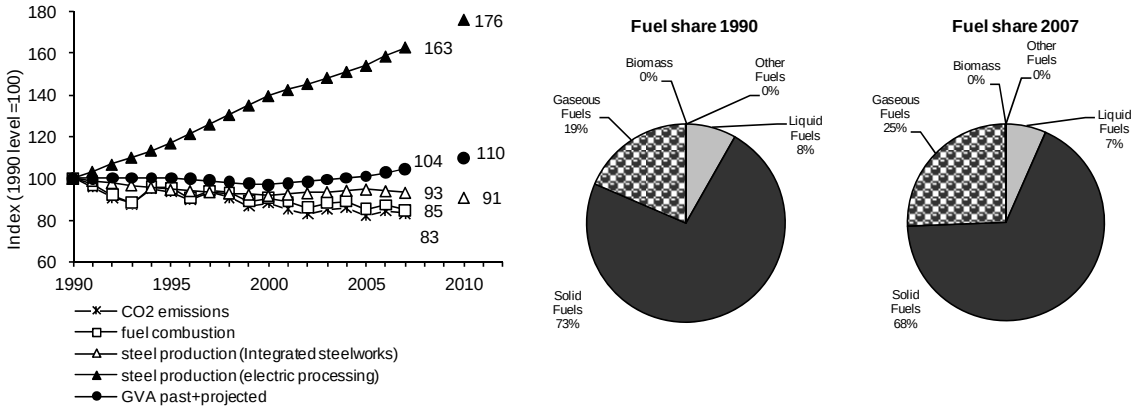
- Process-related emissions, accounted for in the CRF Sector 2 'Industry' (2C1),
- Combustion-related emissions, accounted for in the CRF Sector 1 'Energy' (1A2a).

As the boundary between process and combustion related emissions is not uniformly interpreted in individual Member States, this chapter deals with both types of emissions together.

CO_2 emission from 2C1	Share in 1990 total GHG	Share in 2007 total GHG	Change 1990-2007	Change 2000-2007
EU-15	1.6%	1.6%	-4.5%	6.2%
EU-27	1.8%	1.8%	-8.8%	14.0%
CO_2 emission from 1A2a	Share in 1990 total GHG	Share in 2007 total GHG	Change 1990-2007	Change 2000-2007
EU-15	2.7%	2.1%	-24.1%	-12.8%
EU-27	2.7%	2.2%	-25.0%	-11.1%
Total iron and steel industry				
EU-15	4.4%	3.7%	-16.7%	-5.5%
EU-27	4.5%	3.9%	-18.4%	-1.2%

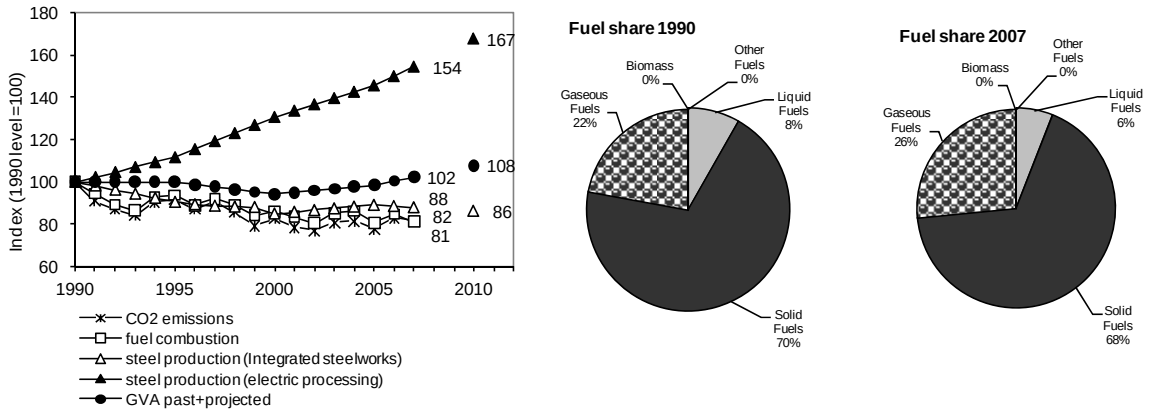
Note: In the overview emissions from 2C1 are not included in chapter 'A 1.2 Energy use' but 'A 1.4 Industrial processes'

Figure 1.18 CO_2 emissions from iron and steel industry compared with fuel combustion, steel production and gross value added and change in fuel share for the EU-15



Source: EEA, 2009a, PRIMES 2007 (historical and projected data for steel production and GVA)

Figure 1.19 CO_2 emissions from iron and steel industry compared with fuel combustion, steel production and gross value added and change in fuel share for the EU-27



Source: EEA, 2009a, PRIMES 2007 (historical and projected data for steel production and GVA)

- Reasons for decreasing emissions:
  - The share of electric processing in steel production increased, while the share of integrated steelworks has been decreasing. Emissions depend partly on the method of processing (integrated steelworks or electric processing), where electric processing generates less direct emissions.
  - The switch from solid to gaseous fuels contributed to the reduction of energy-related CO_2 emissions in iron and steel production. Between 1990 and 2007 the use of solid fuels decreased by 22 %, whereas gaseous fuels increased by 17 % in the EU-15. In the EU-15 the share of solid fuels was 68 % in 2007; in 1990 it was 73 %.
- Emissions and gross value added have been decoupling since the late 1990s.
- Since 2001, CO_2 emissions from iron and steel production have been relatively stable while steel production from electric processing has been steadily increasing and 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.

Table 1.5 Change of CO_2 emissions, fuel combustion and gross value added between 1990 and 2007 for the EU-27 Member States

Relative Change (1990-2007)	CO2 emissions	Fuel Combustion	GVA	
Austria	37.9%	30.1%	56.3%	56.3%
Belgium	-38.1%	-32.5%	-	-
Bulgaria	-23.6%	-39.3%	-	-
Cyprus	-	-	-	-
Czech Republic	-6.2%	-	171.4%	171.4%
Denmark	-4.4%	10.6%	20.3%	20.3%
Estonia	-53.3%	-44.8%	-	-
Finland	33.0%	19.9%	122.0%	122.0%
France	-20.4%	-15.9%	-	-
Germany	-14.4%	-15.8%	-	-
Greece	-24.1%	-44.8%	-	-
Hungary	-44.7%	-49.3%	-	-
Ireland	-98.6%	-98.1%	-	-
Italy	-21.6%	-8.9%	43.9%	43.9%
Latvia	-22.7%	-19.8%	-	-
Lithuania	-	-	-	-
Luxembourg	-85.2%	-64.0%	-	-
Malta	-15.2%	-11.6%	-	-
Netherlands	-5.4%	-1.8%	38.8%	38.8%
Poland	-27.8%	-56.6%	-	-
Portugal	-61.5%	-11.8%	-	-
Romania	-18.0%	-	-	-
Slovakia	-25.7%	-38.1%	-	-
Slovenia	-48.3%	-50.1%	-	-
Spain	-14.1%	12.4%	-	-
Sweden	18.3%	16.6%	-	-
United Kingdom	-19.8%	-32.9%	-	-

Note: Cyprus reports emissions under 1A2a for 1990 as not occurring and for 2007 as not applicable, and Lithuania as not occurring for 1990 and 2007.

Grey marked cells label negative values.

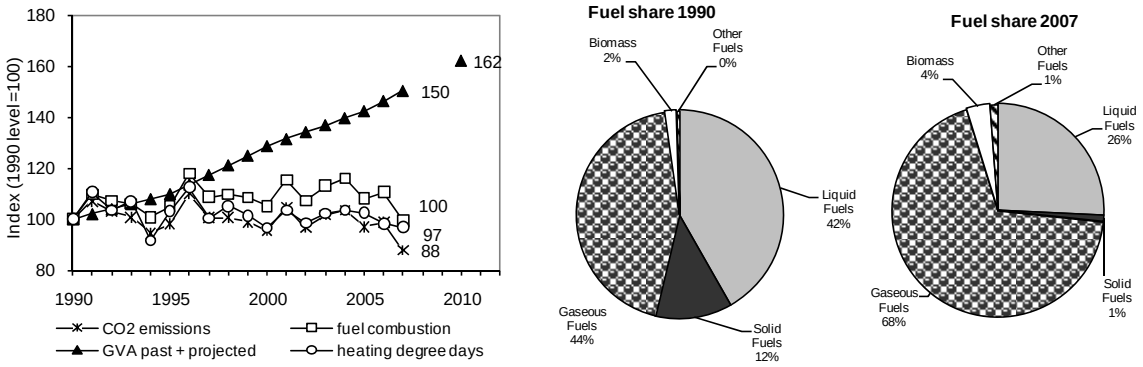
Source: EEA, 2009a, Eurostat

1.2.3 CO_2 emissions from energy use in services

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

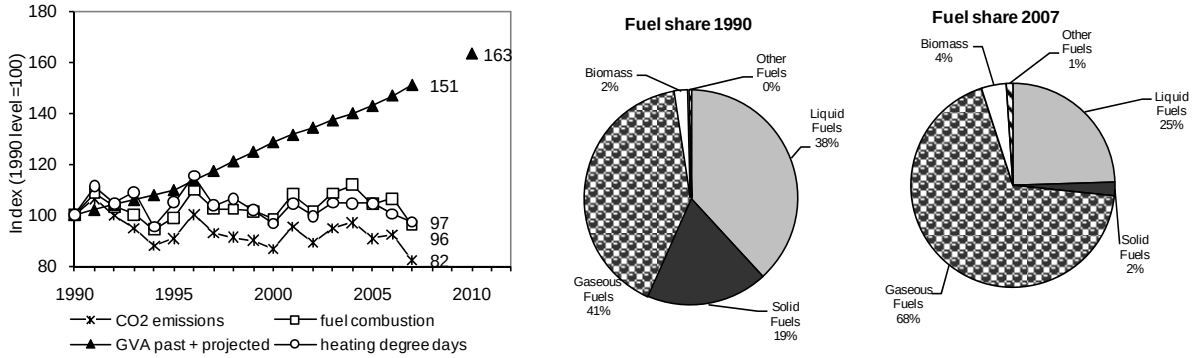
CO_2 emission from 1A4a	Share in 1990 total GHG	Share in 2007 total GHG	Change 1990-2007	Change 2000-2007
EU-15	3.7%	3.3%	-12.2%	-7.8%
EU-27	3.5%	3.1%	-17.8%	-5.0%

Figure 1.20 CO_2 emissions from energy use in services compared with fuel combustion, heating degree days and gross value added, and change in fuel share for the EU-15



Source: EEA, 2009a, Eurostat, PRIMES 2008 (historical and projected data for GVA)

Figure 1.21 CO_2 emissions from energy use in services compared with fuel combustion, heating degree days and gross value added, and change in fuel share for the EU-27



Source: EEA, 2009a, Eurostat, PRIMES 2008 (historical and projected data for GVA)

- CO_2 emissions follow very closely the annual variations of heating degree days (Figure 1.20). 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 also depend on other factors, such as the number of commercial and institutional buildings and the type of fuel used.

- The large reduction in emissions between 2006 and 2007 (11 % in EU-15 and EU-27) can be explained by increased taxes on fuels in 2007 (especially the value added tax in Germany), filling of stocks in 2006, and warmer weather.
- In all Member States that reported increasing emissions except Estonia, emissions increased less than fuel combustion, which indicates that fuel switching has occurred.
- In the EU-15, the share of solid fuels in total fuel consumption decreased from 12 % in 1990 to 1 % in 2007 and the share of liquid fuels declined from 42 % to 26 %, while the share of gaseous fuels increased from 44 % to 68 %. This fuel shift is the main reason why emissions from services have remained relatively stable between 1990 and 2007, 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.

Table 1.6 Change of CO_2 emissions, fuel combustion, heating degree days and gross value added from services between 1990 and 2007 for EU-27 Member States

Relative Change (1990-2007)	CO2 emissions	Fuel Combustion	Heating degree days	Gross Value Added
Austria	-26.4%	-5.3%	-8.6%	49.8%
Belgium	28.7%	37.5%	-8.9%	-
Bulgaria	87.6%	118.2%	-4.4%	-
Cyprus	211.4%	217.3%	-9.4%	-
Czech Republic	-66.9%	-52.8%	-4.6%	-
Denmark	-43.7%	-28.5%	-2.7%	46.5%
Estonia	30.5%	22.6%	-0.8%	-
Finland	-43.4%	-35.6%	-4.6%	36.1%
France	-1.6%	4.3%	-3.3%	42.7%
Germany	-43.9%	-31.5%	-5.1%	-
Greece	184.8%	201.2%	-8.1%	-
Hungary	-0.6%	13.7%	-4.9%	-
Ireland	11.6%	20.5%	-9.9%	-
Italy	38.4%	49.6%	-9.0%	30.8%
Latvia	-80.8%	-62.0%	2.0%	109.9%
Lithuania	-86.7%	-83.9%	2.9%	-
Luxembourg	0.9%	6.4%	-10.4%	-
Malta	-16.3%	-28.1%	-23.9%	-
Netherlands	36.4%	38.7%	-6.3%	65.7%
Poland	-34.4%	-6.6%	0.6%	-
Portugal	220.2%	240.8%	-1.1%	-
Romania	149.7%	182.8%	-2.9%	-
Slovakia	-79.1%	-71.8%	-5.0%	-
Slovenia	-4.3%	-18.7%	-5.7%	82.9%
Spain	119.7%	138.0%	-1.2%	61.8%
Sweden	-67.0%	-57.4%	0.5%	41.0%
United Kingdom	-19.2%	-11.2%	-1.2%	77.4%

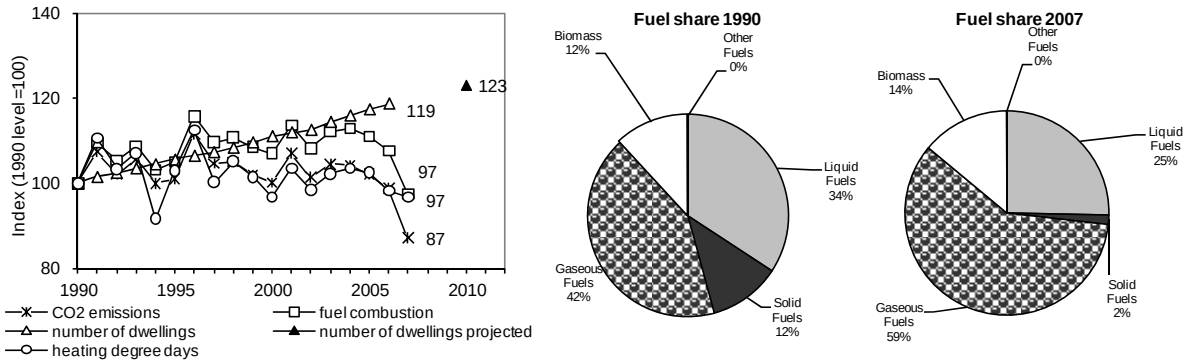
Note: Grey marked cells label negative values.
Source: EEA, 2009a

1.2.4 CO_2 emissions from energy use in households

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

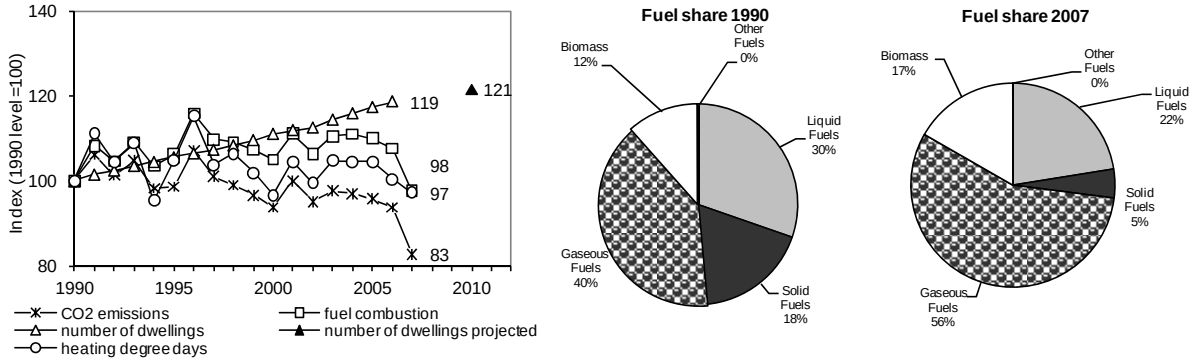
CO_2 emission from 1A4b	Share in 1990 total GHG	Share in 2007 total GHG	Change 1990-2007	Change 2000-2007
EU-15	9.2%	8.1%	-12.9%	-13.0%
EU-27	8.7%	7.7%	-17.3%	-11.6%

Figure 1.22 CO_2 emissions from households compared with fuel combustion, number of dwellings and heating degree days, and change in fuel share for the EU-15



Source: EEA, 2008a, PRIMES 2008 (projected data for number of dwellings), Odyssee (2007), Eurostat

Figure 1.23 CO_2 emissions from households compared with fuel combustion, number of dwellings and heating degree days, and change in fuel share for the EU-27



Source: EEA, 2009a, PRIMES 2008 (historical and projected data for number of dwellings), Odyssee (2007), Eurostat

- Indirect emissions from electricity consumption are not included, as these are reported under the category 'energy industries'.
- The strong decrease in emissions between 2006 and 2007 was mainly caused by Germany where a tax increase in 2007 encouraged the filling of stocks in 2006. The warmer weather and increased fossil fuel prices in Europe contributed further to this decrease.

- 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 households. This decoupling can 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: in the EU-15 the respective shares of solid fuels and gaseous fuels changed from 12 % and 42 % in 1990, to 2% and 59 % in 2007. The use of liquid fuels also decreased by 28% between 1990 and 2007.
- A main reason for the absolute reductions in CO_2 emissions observed in Denmark, Finland and Sweden between 1990 and 2007 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 switching in particular in eastern German households, solar thermal energy production and biomass district heating were largely responsible for long term CO_2 reduction from households.

Table 1.7 Change of CO_2 emissions, fuel combustion, number of dwellings and heating degree days between 1990 and 2007 for EU-27 Member States

Relative Change (1990-2007)	CO2 emissions	Fuel Combustion	Heating degree days
Austria	-22.2%	-4.7%	-8.6%
Belgium	-7.0%	-2.1%	-8.9%
Bulgaria	-77.2%	-35.7%	-4.4%
Cyprus	-6.6%	0.1%	-9.4%
Czech Republic	-65.4%	-34.9%	-4.6%
Denmark	-33.4%	5.4%	-2.7%
Estonia	-86.7%	-14.9%	-0.8%
Finland	-33.6%	-11.6%	-4.6%
France	2.4%	0.4%	-3.3%
Germany	-33.6%	-16.5%	-5.1%
Greece	84.0%	70.6%	-8.1%
Hungary	-45.9%	-26.3%	-4.9%
Ireland	-3.5%	16.7%	-9.9%
Italy	-5.0%	7.2%	-9.0%
Latvia	-64.2%	4.2%	2.0%
Lithuania	-72.2%	-32.4%	2.9%
Luxembourg	-1.4%	4.3%	-10.4%
Malta	14.1%	15.0%	-23.9%
Netherlands	-17.8%	-17.3%	-6.3%
Poland	-7.1%	10.1%	0.6%
Portugal	27.3%	3.2%	-1.1%
Romania	16.3%	112.0%	-2.9%
Slovakia	-62.1%	-16.5%	-5.0%
Slovenia	32.5%	24.4%	-5.7%
Spain	42.0%	33.9%	-1.2%
Sweden	-77.2%	-43.4%	0.5%
United Kingdom	-3.2%	2.8%	-1.2%

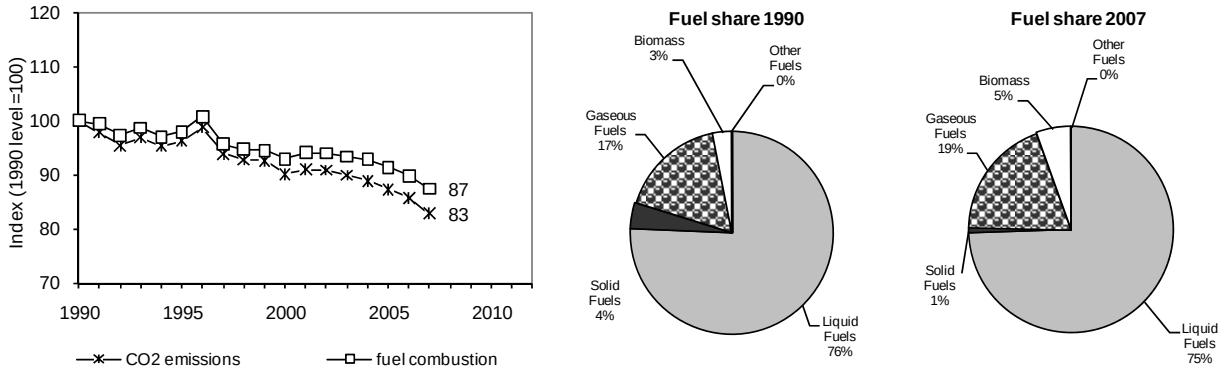
Note: Grey marked cells label negative values.
Source: EEA, 2009a, Eurostat

1.2.5 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.*

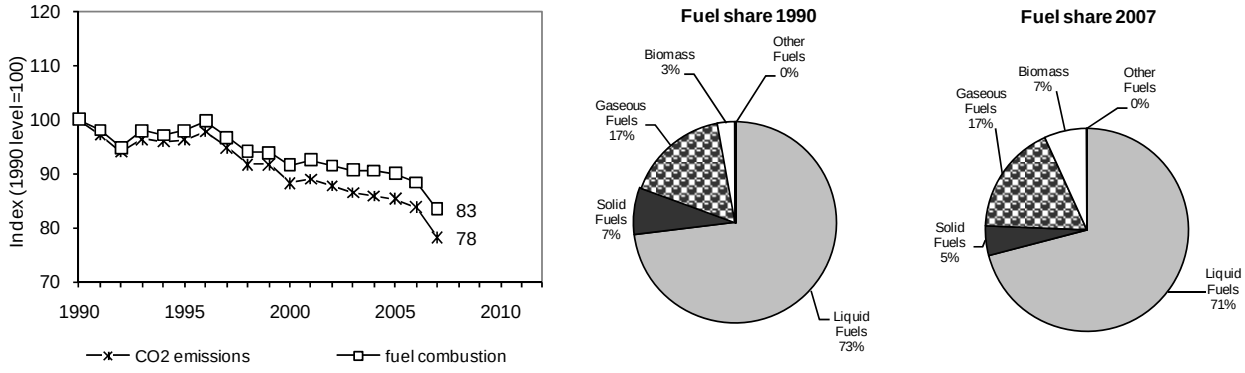
CO_2 emission from 1A4c	Share in 1990 total GHG	Share in 2007 total GHG	Change 1990-2007	Change 2000-2007
EU-15	1.6%	1.3%	-17.2%	-8.0%
EU-27	1.6%	1.3%	-21.8%	-11.4%

Figure 1.24 CO_2 emissions from agriculture, forestry and fisheries compared with fuel combustion, and change in fuel share for the EU-15



Source: EEA, 2009a

Figure 1.25 CO_2 emissions from agriculture, forestry and fisheries compared with fuel combustion, and change in fuel share for the EU-27



Source: EEA, 2009a

- Between 1990 and 2007, CO_2 emissions and the amount of fuel combusted have decreased in most countries. Changes in CO_2 emissions and fuel combustion were tightly coupled in the EU-15 and the EU-27.
- Changes in CO_2 emissions and fuel combustion were also tightly coupled for individual Member States, except in Austria, Poland, Portugal and Sweden.

Table 1.8 Change of CO_2 emissions and fuel combustion between 1990 and 2007 for EU-27 Member States

Relative Change (1990-2007)	CO2 emissions	Fuel Combustion
Austria	-26.6%	6.1%
Belgium	-15.7%	-10.3%
Bulgaria	-52.8%	-44.0%
Cyprus	83.9%	84.2%
Czech Republic	-89.9%	-84.9%
Denmark	-20.2%	-19.2%
Estonia	-21.3%	-30.0%
Finland	-12.0%	-14.1%
France	-17.5%	-15.6%
Germany	-47.5%	-39.8%
Greece	-12.3%	-11.1%
Hungary	-63.3%	-60.0%
Ireland	17.3%	20.5%
Italy	-6.2%	3.6%
Latvia	-75.9%	-76.6%
Lithuania	-84.4%	-81.1%
Luxembourg	219.3%	170.8%
Malta	-	-
Netherlands	-22.1%	-21.4%
Poland	37.5%	63.4%
Portugal	-55.7%	-39.7%
Romania	-87.9%	-84.6%
Slovakia	99.9%	107.4%
Slovenia	-30.6%	-30.7%
Spain	17.8%	17.1%
Sweden	6.9%	32.2%
United Kingdom	-19.7%	-17.4%

Note: Malta reports emissions as not estimated and not occurring.
Grey marked cells label negative values.
Source: EEA, 2009a

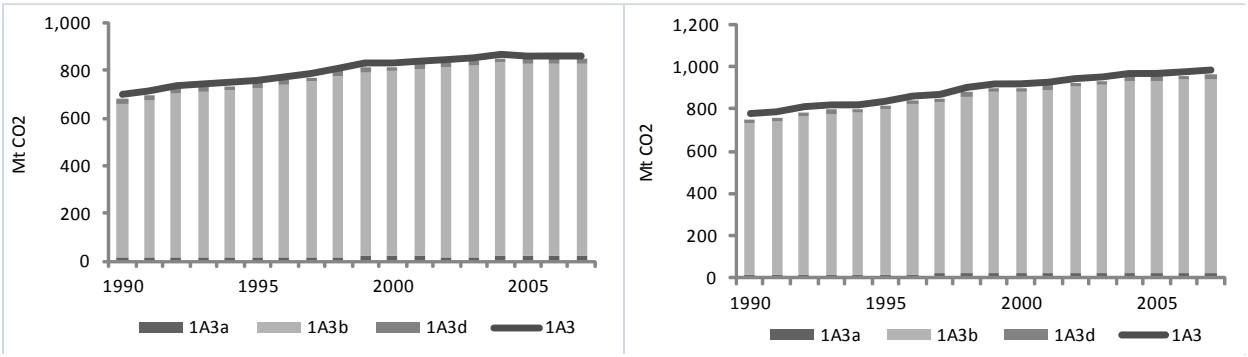
1.3 Transport

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

GHG emission from 1A3	Share in 1990 total GHG	Share in 2007 total GHG	Change 1990-2007	Change 2000-2007
EU-15	15.9%	19.8%	23.7%	4.0%
EU-27	13.6%	18.3%	26.0%	7.1%

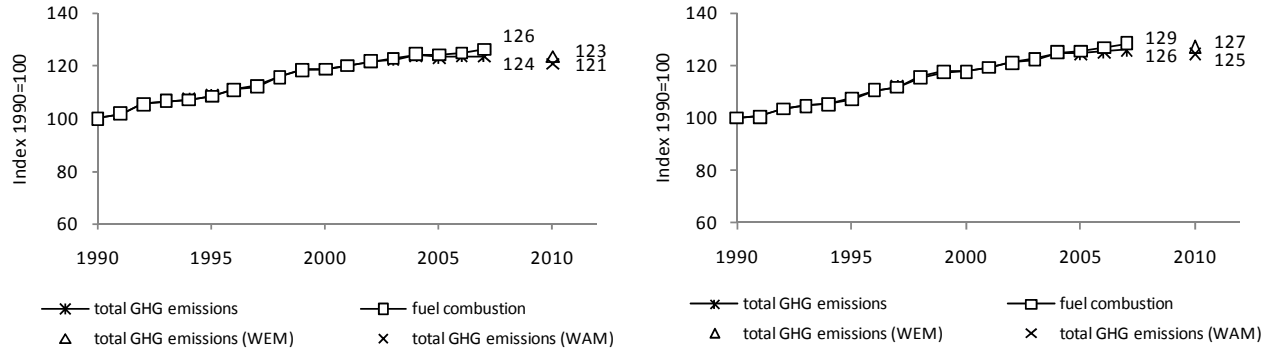
Note: Emissions from international bunkers are not included in transport emissions in the table above. Including emissions from international bunkers transport emissions would give a share of 27 % in the EU-15 and 24 % in the EU-27 in 2007.

Figure 1.26 Trend in absolute EU-15 (left) and EU-27 (right) total greenhouse gas emissions from transport (contribution of sub-categories)



Note: The sector 1A3 also covers emissions from 1A3c Railways that are not represented in the stacked bars. Emissions from international bunkers are not included in these graphs.
Source: EEA, 2009a

Figure 1.27 Trend of EU-15 (left) and EU-27 (right) total greenhouse gas emissions from transport compared with fuel combustion



Source: EEA, 2009a; EEA based on Member State greenhouse gas inventories and projections. Emissions from international bunkers are not included in these graphs.

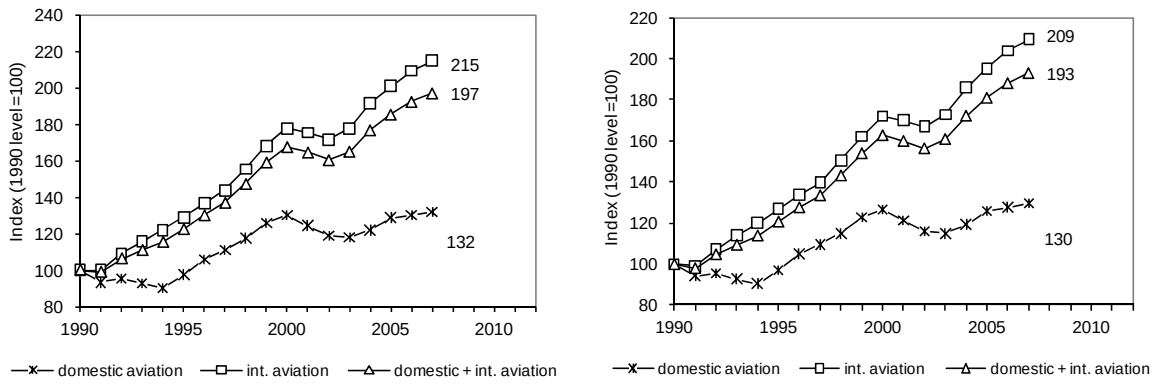
- Total EU-15 greenhouse gas emissions from transport were 24 % above 1990 levels in 2007. The trend of greenhouse gas emissions followed closely the trend of fuel combustion. Highest absolute increases occurred in France, Italy and Spain. Germany was the only EU-15 Member State that achieved a reduction. Including emissions from international bunkers the emissions would have increased to 35 % above 1990 levels.
- In the EU-27 emissions were 26 % above 1990 emissions in 2007. The trend of greenhouse gas emissions followed closely the trend of fuel combustion. Including emissions from international bunkers the emissions would have increased to 36 % above 1990 levels.
- Greenhouse gas emissions in the EU-15 and EU-27 are expected to be slightly below 2007 levels in 2010 (WAM). Within the EU-15 the highest absolute decrease is expected by Spain (-21 Mt $CO_{2\text{-equivalent}}$).

1.3.1 CO_2 emissions from domestic and international aviation

Definition (IPCC sector 1A3a + international aviation)*: Emissions from international civil aviation and domestic air transport (commercial, private, agricultural, etc.), including take-offs and landings. Use of fuel at airports for ground transport which is reported under 1 A 3 e Other Transportation is excluded.*

CO2 emission from 1A3a + intl. Aviation	Share in 1990 total GHG	Share in 2007 total GHG	Change 1990-2007	Change 2000-2007
EU-15	1.8%	3.5%	97.3%	17.7%
EU-27	1.4%	3.0%	92.9%	18.6%

Figure 1.28 CO_2 emissions from domestic and international aviation in the EU-15 (left) and the EU-27 (right)



Source: EEA, 2009a

- The total increase is dominated by international aviation, in EU-15 and EU-27.
- In the EU-27 and the EU-15 the share of domestic CO_2 emission decreased from 21 % in 1990 to 14% in 2007, same for EU-15.
- Only Bulgaria and Lithuania report decreasing emission from aviation. Seven Member States experienced a decrease in emissions from domestic aviation only.

Table 1.9 Change of total greenhouse gas emissions from domestic and international aviation between 1990 and 2007 for EU-27 Member States

Relative Change (1990-2007)	total GHG domestic aviation	total GHG int. aviation	total GHG domestic + int. aviation
Austria	130.3%	145.5%	145.0%
Belgium	24.5%	22.5%	22.5%
Bulgaria	-58.0%	-40.9%	-45.4%
Cyprus	-	18.0%	-
Czech Republic	-78.5%	76.4%	47.4%
Denmark	-56.0%	55.6%	42.1%
Estonia	-77.1%	40.7%	34.9%
Finland	-20.5%	64.3%	41.1%
France	7.4%	100.2%	69.6%
Germany	-23.0%	123.3%	92.8%
Greece	88.0%	19.3%	34.7%
Hungary	-	51.2%	-
Ireland	106.7%	182.6%	178.7%
Italy	50.5%	150.3%	122.6%
Latvia	2750.2%	11.4%	12.2%
Lithuania	510.1%	-51.4%	-50.4%
Luxembourg	154.4%	230.5%	230.4%
Malta	-	-	-
Netherlands	0.0%	144.4%	143.1%
Poland	45.5%	126.2%	119.1%
Portugal	65.6%	71.7%	70.9%
Romania	118.8%	148.1%	144.4%
Slovakia	74.6%	86.0%	84.8%
Slovenia	56.7%	22.7%	23.2%
Spain	83.6%	202.9%	138.1%
Sweden	-10.2%	64.3%	39.6%
United Kingdom	70.3%	122.7%	119.1%

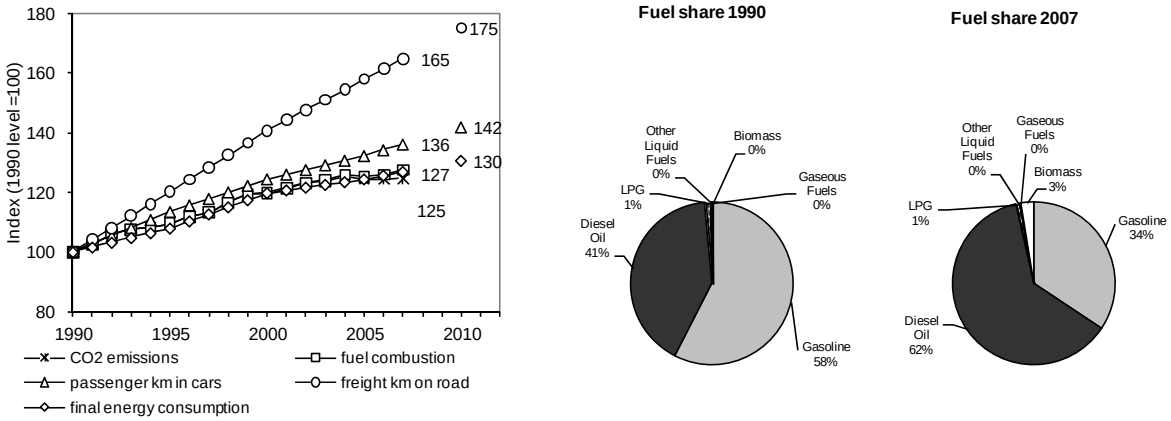
Note: Grey marked cells label negative values.
Source: EEA, 2009a

1.3.2 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.*

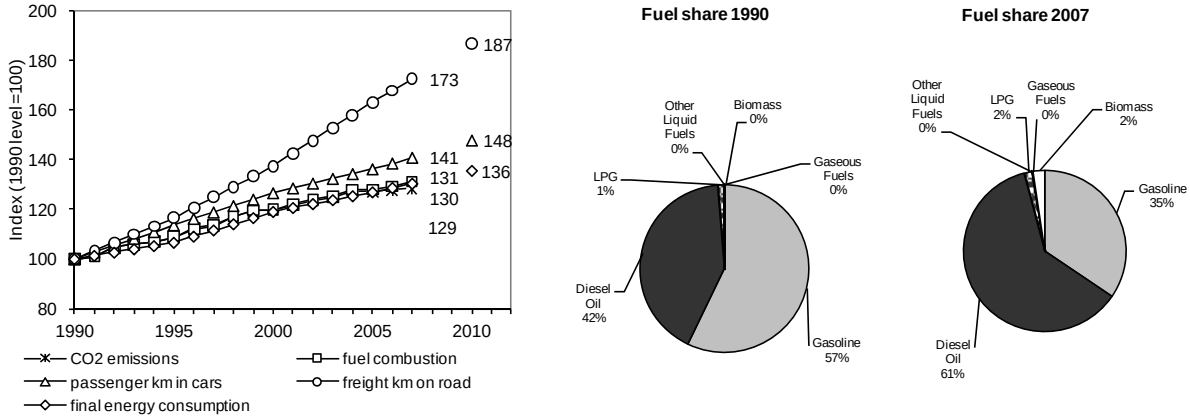
CO2 emission from 1A3b	Share in 1990 total GHG	Share in 2007 total GHG	Change 1990-2007	Change 2000-2007
EU-15	14.5%	18.2%	24.6%	4.1%
EU-27	12.3%	16.9%	28.5%	7.5%

Figure 1.29 CO_2 emissions from road transport compared with fuel combustion, passenger and freight transport, final energy consumption, and change in fuel share for the EU-15



Source: EEA, 2009a, PRIMES 2008 (historical and projected data for freight km on road and final energy consumption)

Figure 1.30 CO_2 emissions from road transport compared with fuel combustion, passenger and freight transport, final energy consumption, and change in fuel share for the EU-27



Source: EEA, 2009a, PRIMES 2008 (historical and projected data for freight km on road and final energy consumption)

- Road transport represented 92 % in 1990 and 94 % in 2007 of total transport CO_2 emissions (international aviation excluded).
- CO_2 emissions from road transport increased by 25 % between 1990 and 2007, after emissions stabilised in the EU-15 in 2003.
- Final energy demand for transport, fuel combustion and CO_2 emissions show a very similar increasing trend. The stronger increase in passenger transport (36 %) and especially freight transport (65 %) show that emissions have started to decouple from kilometres driven.
- N_2O emissions increased by 20% or more in all Member States except Hungary, Lithuania and the United Kingdom. The increase in N_2O emissions is mainly due to the introduction of catalytic converters in road vehicles.

Table 1.10 Change of CO_2 and N_2O emissions from road transport, fuel combustion, passenger and freight transport and final energy consumption between 1990 and 2007 for EU-27 Member States

Relative Change (1990-2007)	CO2 emissions	Fuel Combustion	Freight km on roads	Final energy consumption	N2O emissions
Austria	74.4%	87.4%	-	75.2%	50.8%
Belgium	26.2%	24.1%	85.3%	26.7%	137.9%
Bulgaria	-3.8%	-3.7%	-	20.2%	22.3%
Cyprus	188.2%	194.8%	-	70.9%	221.0%
Czech Republic	200.9%	192.0%	-	156.7%	921.9%
Denmark	42.3%	42.3%	26.2%	42.7%	31.1%
Estonia	3.6%	1.8%	-	2.6%	217.9%
Finland	13.7%	13.6%	-	13.6%	303.2%
France	15.0%	18.0%	95.3%	17.5%	46.1%
Germany	-4.2%	3.4%	110.7%	1.6%	77.1%
Greece	68.2%	70.9%	74.1%	73.3%	84.9%
Hungary	63.7%	61.9%	-	64.7%	-5.2%
Ireland	192.6%	191.4%	269.4%	199.6%	235.7%
Italy	27.1%	27.0%	-	28.3%	42.6%
Latvia	51.1%	45.3%	-	45.5%	173.1%
Lithuania	-8.7%	-3.7%	-	-5.0%	8.6%
Luxembourg	145.5%	147.4%	-	151.2%	197.0%
Malta	52.0%	51.9%	-	3.4%	52.4%
Netherlands	35.3%	37.5%	35.9%	44.4%	61.8%
Poland	70.4%	78.7%	-	133.3%	402.9%
Portugal	96.4%	99.6%	66.3%	101.3%	326.7%
Romania	85.9%	84.7%	-	13.9%	81.5%
Slovakia	41.6%	45.2%	-	43.5%	154.7%
Slovenia	97.2%	98.5%	-	93.7%	445.2%
Spain	94.0%	96.7%	96.0%	89.8%	319.7%
Sweden	14.8%	22.0%	-	22.5%	27.7%
United Kingdom	11.0%	9.6%	21.2%	10.9%	6.2%

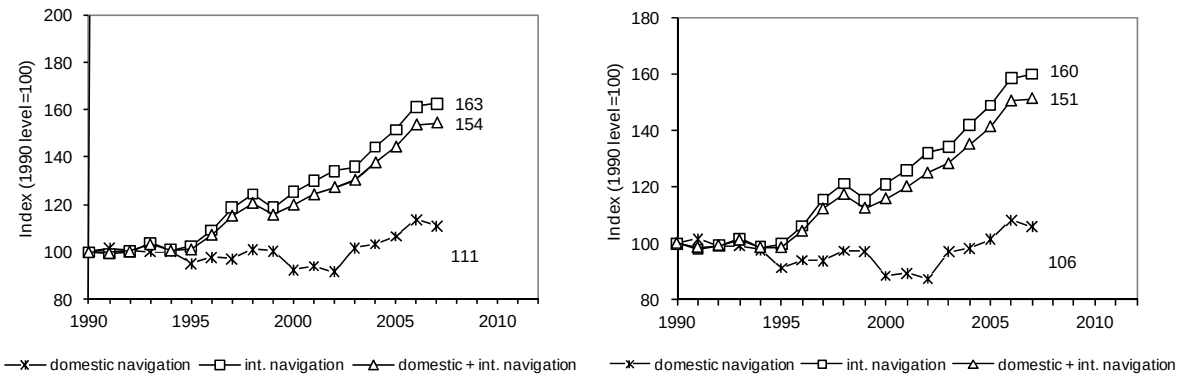
Note: 2007 data for passenger transport are not available at Eurostat. Grey marked cells label negative values.
Source: EEA, 2009a, Eurostat

1.3.3 CO_2 emissions from domestic and international navigation

Definition (IPCC sector 1A3d + international navigation)*: Emissions from fuels used to propel water-borne vessels, including hovercraft and hydrofoils. Comprises emissions from fuels burned by sea-going ships of all flags that are engaged in international transport and emissions from fuel used for navigation of all vessels not engaged in international transport, except fishing (which should be reported under 1 A 4 c iii).. These emissions are as far as possible excluded from national totals and reported separately.*

CO2 emission from 1A3d+ intl. Navigation	Share in 1990 total GHG	Share in 2007 total GHG	Change 1990-2007	Change 2000-2007
EU-15	2.8%	4.3%	54.4%	28.7%
EU-27	2.3%	3.6%	51.2%	30.6%

Figure 1.31 Total greenhouse gas emissions from domestic and international navigation for the EU-15 (left) and the EU-27 (right)



Source: EEA, 2009a

- Total emissions from navigation are mainly influenced by international transportation, especially after 1995.
- The share of CO_2 emissions from domestic navigation in total navigation emissions decreased from 16 % in 1990 to 11 % in 2007 in the EU-27 and EU-15.
- Between 2006 and 2007, CO_2 emissions from domestic navigation decreased while international navigation increased, in the EU-27 and EU-15.

Table 1.11 Change of total greenhouse gas emissions from domestic and international navigation between 1990 and 2007 for EU-27 Member States

Relative Change (1990-2007)	total GHG domestic navigation	total GHG int. navigation	total GHG dom.+ int. navigation
Austria	31.4%	-	31.4%
Belgium	19.2%	128.7%	125.6%
Bulgaria	-	-81.0%	-82.2%
Cyprus	-	216.8%	216.8%
Czech Republic	-72.0%	-	-72.0%
Denmark	-36.4%	15.3%	5.6%
Estonia	-90.6%	35.2%	-27.9%
Finland	32.2%	-19.2%	-9.3%
France	77.1%	17.4%	27.9%
Germany	-74.1%	24.4%	4.2%
Greece	15.8%	24.7%	23.1%
Hungary	-89.4%	-	-89.4%
Ireland	-95.1%	528.5%	156.1%
Italy	-8.3%	76.7%	29.7%
Latvia	-69.7%	-62.3%	-62.4%
Lithuania	15.3%	8.0%	8.4%
Luxembourg	94.8%	83.2%	92.2%
Malta	124.8%	-	32375.0%
Netherlands	49.6%	49.6%	49.6%
Poland	-94.8%	-41.5%	-48.4%
Portugal	-19.8%	27.3%	19.8%
Romania	-52.1%	-75.5%	-71.4%
Slovakia	-	-50.1%	-50.1%
Slovenia	-	-	-
Spain	117.4%	132.9%	131.1%
Sweden	-17.5%	232.9%	184.1%
United Kingdom	19.9%	3.5%	9.7%

Note: Bulgaria reported total greenhouse gas emissions for domestic navigation for 1990 but not 2007. This explains why the relative change in emissions from international navigation and domestic navigation and international navigation is not equal.

Malta reported total greenhouse gas emissions for international navigation for 2007 but not 1990. This explains why the relative change in emissions from domestic navigation and domestic and international navigation is not equal.

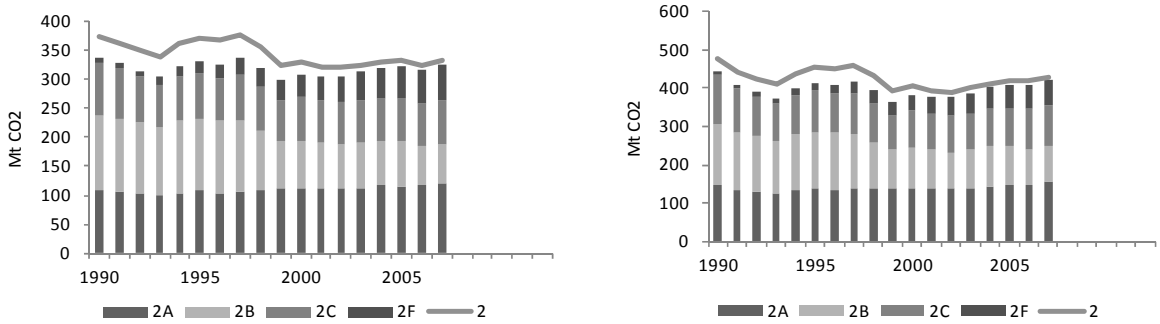
Source: EEA, 2009a

1.4 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).*

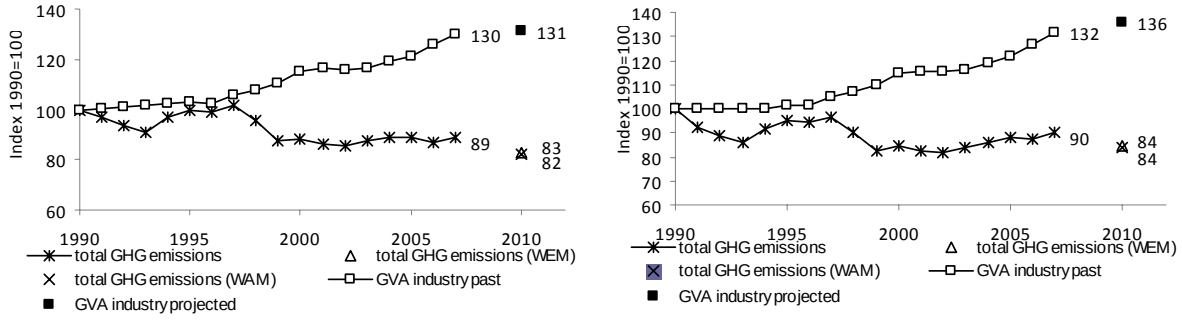
total GHG emission from 2	Share in 1990 total GHG	Share in 2007 total GHG	Change 1990-2007	Change 2000-2007
EU-15	8.5%	7.6%	-10.8%	0.8%
EU-27	8.3%	8.0%	-9.9%	6.3%

Figure 1.32 Trend in absolute EU-15 (left) and EU-27 (right) total greenhouse gas emissions from industrial processes (contribution of sub-categories)



Note: The sector 2 also covers emissions from 2D Other Production, 2E Production of Halocarbon and 2G that were not represented in the stacked bars. Emissions from 2C1 are included in emissions from 2C. Further details are given in A 1.2.2 CO_2 emissions from iron and steel.
Source: EEA, 2009a

Figure 1.33 Trend of EU-15 (left) and EU-27 (right) total greenhouse gas emissions from industrial processes compared to GVA in industry



Source: EEA, 2009a; EEA based on Member State greenhouse gas inventories and projections

- Total EU-15 greenhouse gas emissions from industry were 11 % below 1990 levels in 2007 whereas gross value added increased by 30 % during the same time. Highest absolute emission reductions were achieved by France, the Netherlands and the United Kingdom.

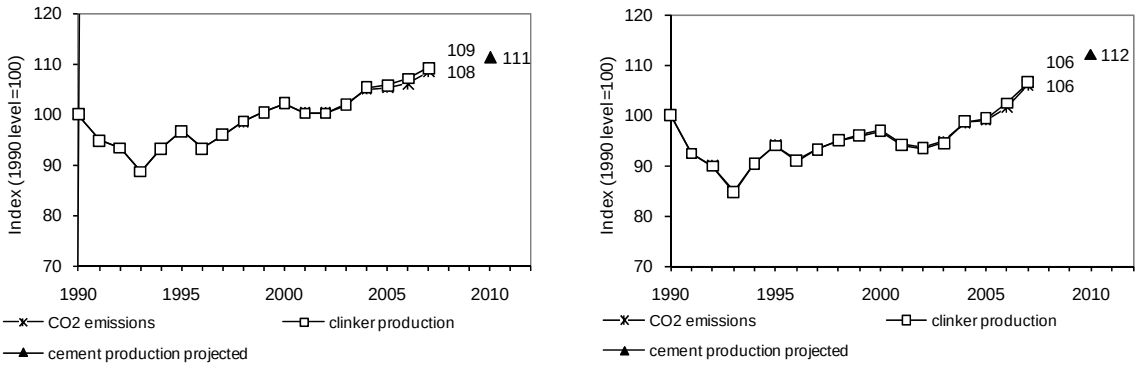
- In the EU-27 emissions were 10 % below 1990 emissions in 2007 whereas gross value added increased by 32 % during the same time.
- Greenhouse gas emissions in the EU-15 and EU-27 are expected to be below 2007 levels in 2010. Germany, the Netherlands and the United Kingdom project (WAM) that they will contribute most to the EU-15 emission reductions between 2007 and 2010.

1.4.1 CO2 emissions from cement production (2A1)

Definition (IPCC category 2A1)*: Emissions arising during the production of cement. Cement process CO_2 emissions occur during the production of clinker, an intermediate component in the cement manufacturing process.*

CO_2 emission from 2A1	Share in 1990 total GHG	Share in 2007 total GHG	Change 1990-2007	Change 2000-2007
EU-15	1.8%	2.0%	8.4%	6.1%
EU-27	1.8%	2.0%	6.0%	9.2%

Figure 1.34 CO_2 emissions from cement production compared with clinker production for the EU-15 (left) and the EU-27 (right)



Source: EEA, 2009a, PRIMES 2007 (projected data for cement production)

- Cement production has a major influence on greenhouse gas emissions from industrial processes. Factors for declining emissions in the early 1990s were low economic growth and cement imports. It is projected that cement production in the EU-15 will increase by 2 % by 2010.
- Production and emissions are strongly correlated in most Member States. 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 Denmark and Ireland.

Table 1.12 Change of CO_2 emissions and cement production between 1990 and 2007 for the EU-27 Member States

Relative Change (1990-2007)	CO2 emissions	Clinker production
Austria	4.8%	8.1%
Belgium	9.3%	8.3%
Bulgaria	-8.4%	-8.4%
Cyprus	32.4%	33.0%
Czech Republic	-17.9%	-18.8%
Denmark	59.5%	81.9%
Estonia	23.5%	22.4%
Finland	-18.3%	-18.3%
France	-14.7%	-13.5%
Germany	-5.5%	-5.5%
Greece	11.2%	13.1%
Hungary	-20.6%	-19.7%
Ireland	168.6%	175.8%
Italy	11.4%	13.3%
Latvia	-53.1%	-49.4%
Lithuania	-68.6%	-68.4%
Luxembourg	-23.5%	-22.1%
Malta	-	-
Netherlands	-3.1%	9.7%
Poland	29.3%	27.7%
Portugal	30.8%	30.8%
Romania	-8.8%	-8.5%
Slovakia	1.4%	-0.4%
Slovenia	15.3%	15.4%
Spain	38.1%	38.1%
Sweden	7.3%	6.2%
United Kingdom	-16.2%	-19.4%

Note: Malta reports cement production as not occurring.
Grey marked cells, label negative values.
Source: EEA, 2009a

1.4.2 CO_2 emissions from Iron and Steel production

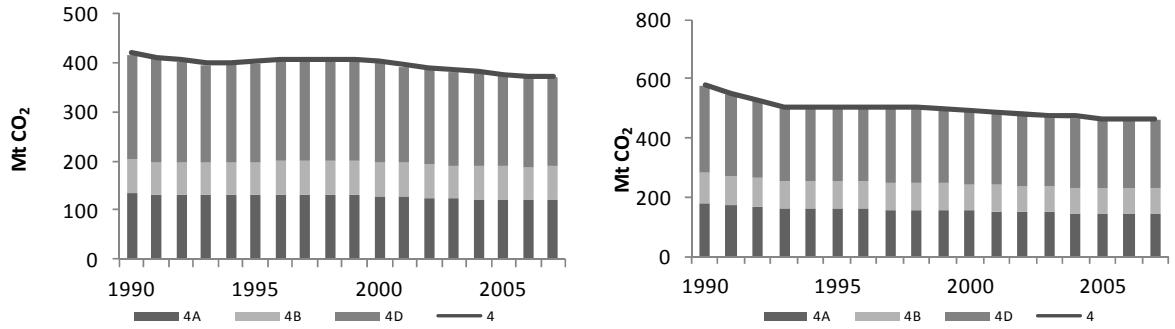
See chapter A 1.2.2 CO_2 emissions from iron and steel.

1.5 Agriculture

***Definition (IPCC sector 4)**: Describes all anthropogenic emissions from this sector except for fuel combustion and sewage emissions, which are covered in Energy 1 A and Waste 6 B, respectively.*

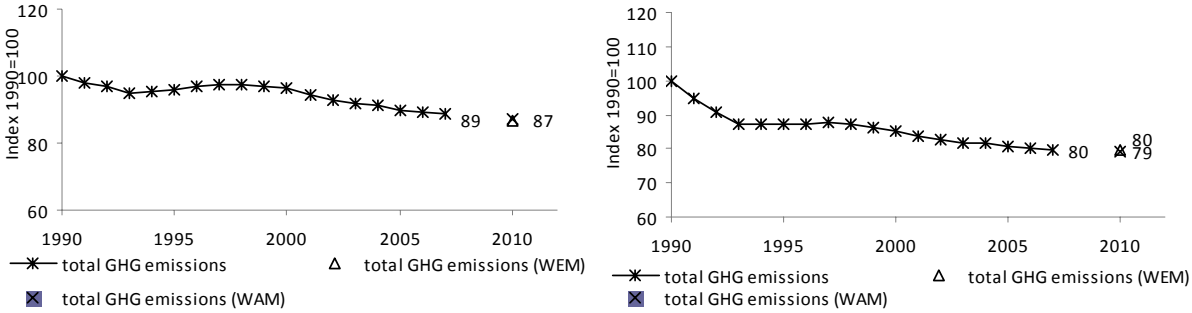
GHG emission from 4	Share in 1990 total GHG	Share in 2007 total GHG	Change 1990-2007	Change 2000-2007
EU-15	9.5%	8.5%	-11.3%	-7.8%
EU-27	10.1%	8.6%	-20.2%	-6.3%

Figure 1.35 Trend in absolute EU-15 (left) and EU-27 (right) total greenhouse gas emissions from agriculture (contribution of sub-categories)



Note: The sector 4 also covers emissions from 4D Agricultural Soils, 4E prescribed burning of Savannas, 4F Field Burning of Agricultural Residues and 4G Other.
Source: EEA, 2009a

Figure 1.36 Trend of EU-15 (left) and EU-27 (right) total greenhouse gas emissions from agriculture



Source: EEA, 2009a; EEA based on Member State greenhouse gas inventories and projections

- Total EU-15 greenhouse gas emissions from agriculture were 11 % below 1990 levels in 2007. Highest absolute reductions were achieved in France, Germany and the United Kingdom.
- In the EU-27 emissions were 20 % below 1990 emissions in 2007.
- Greenhouse gas emissions in the EU-15 and EU-27 are expected to be slightly below 2007 levels in 2010. The effect of additional measures compared to projections with existing measures is very minor for all countries. France, Germany, Greece, Spain and the Slovak

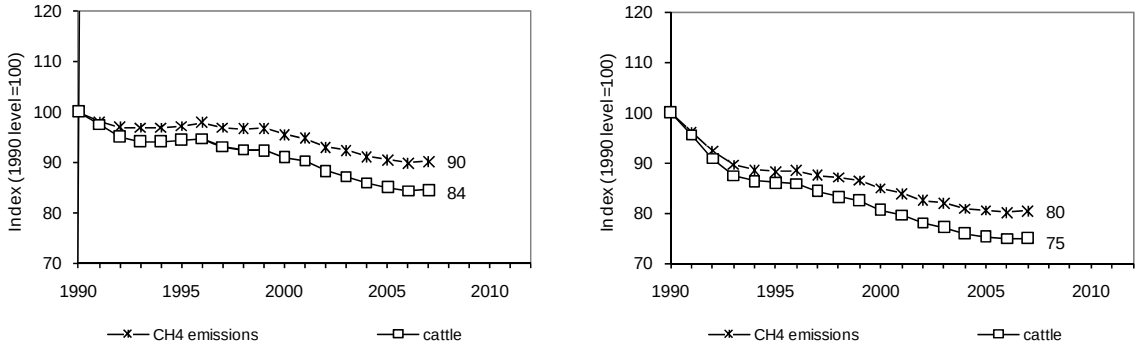
Republic project the highest reductions (in the range of 1 to 2.5 Mt CO_2-equivalent) and Bulgaria, Portugal and Romania the highest increase (in the range of 1 to 4 Mt CO_2-equivalent) during this time.

1.5.1 CH4 emissions from enteric fermentation

***Definition (IPCC category 4A)**: Methane production from herbivores as a by-product of enteric fermentation, a digestive process by which carbohydrates are broken down by micro-organisms into simple molecules for absorption into the bloodstream.*

CH_4 emission from 4A	Share in 1990 total GHG	Share in 2007 total GHG	Change 1990-2007	Change 2000-2007
EU-15	3.0%	2.8%	-10.0%	-5.6%
EU-27	3.1%	2.7%	-19.7%	-5.3%

Figure 1.37 CH_4 emissions and number of cattle from enteric fermentation in the EU-15 (left) and the EU-27 (right)



Source: EEA, 2009a

- 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 agricultural policy such as suckler cow premia and milk quotas but also by 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) and the BSE crisis between 2001 and 2003 (EEA, 2008a).
- For cattle, the decrease in numbers is mainly explained by an increase in milk production per dairy cow between 1990 and 2005 combined with an unchanged total milk production. The increased milk production per cow 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 number of cattle and CH_4 emissions from this category are rather closely linked in most countries. However, it has to be taken into account that changes in other animal

population numbers (in particular sheep) also influence overall CH_4 emissions from enteric fermentation.

Table 1.13 Change of CH_4 emission from enteric fermentation and number of cattle between 1990 and 2007 for the EU-27 Member States

Relative Change (1990-2007)	CH4 emissions	Number of cattle
Austria	-14.6%	-22.6%
Belgium	-13.5%	-18.4%
Bulgaria	-63.8%	-59.4%
Cyprus	8.9%	0.5%
Czech Republic	-51.3%	-60.6%
Denmark	-14.5%	-30.1%
Estonia	-60.1%	-68.1%
Finland	-19.1%	-31.8%
France	-8.5%	-8.4%
Germany	-22.1%	-34.9%
Greece	1.8%	1.4%
Hungary	-50.0%	-56.0%
Ireland	-6.9%	0.5%
Italy	-9.5%	-19.0%
Latvia	-71.2%	-72.3%
Lithuania	-60.4%	-66.8%
Luxembourg	-8.9%	-11.7%
Malta	6.7%	50.8%
Netherlands	-16.2%	-23.6%
Poland	-40.3%	-43.3%
Portugal	13.6%	4.1%
Romania	-42.5%	-55.1%
Slovakia	-52.4%	-67.9%
Slovenia	-6.4%	-10.0%
Spain	15.1%	28.5%
Sweden	-10.5%	-9.2%
United Kingdom	-15.3%	-15.7%

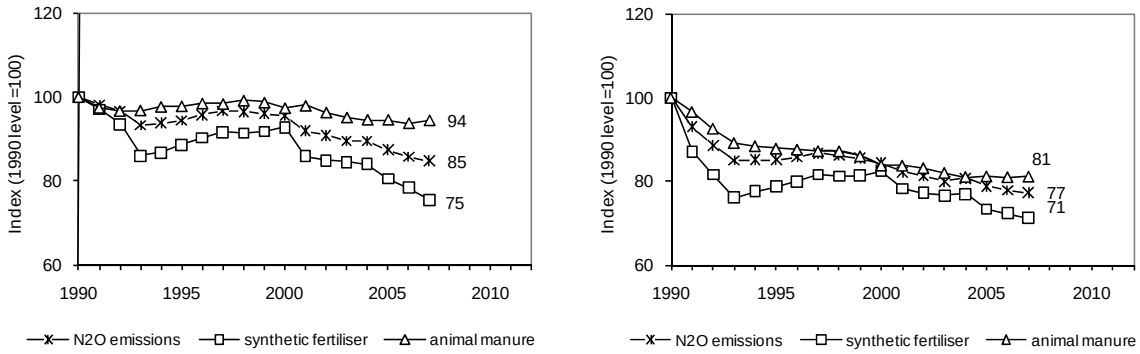
Note: Grey marked cells label negative values.
Source: EEA, 2009a

1.5.2 N_2O emissions from agricultural soils

***Definition (IPCC category 4D)**: Emissions and removals of CH_4 and N_2O from agricultural soil/land and NMVOCs from crops. These are influenced by irrigation practices, climatic variables, soil temperature and humidity. Nitrous oxide is produced naturally in soils through the processes of nitrification and denitrification.*

N_2O emission from 4D	Share in 1990 total GHG	Share in 2007 total GHG	Change 1990-2007	Change 2000-2007
EU-15	4.9%	4.2%	-15.4%	-11.3%
EU-27	5.1%	4.2%	-22.8%	-8.4%

Figure 1.38 N_2O emissions and fertiliser use for the EU-15 (left) and the EU-27 (right)



Source: EEA, 2009a

- For EU-15, emissions from all sub-categories in the category 4D have decreased since 1990. This was most significant for direct emissions from the application of synthetic fertilizer (-25 %), followed by indirect emissions from leaching and run-off (-17 %) and volatilisation of NH_3+NO_x (-16 %). In the latter two cases, the reduction of emissions can be explained by a reduction of nitrogen input, as the implied emission factor was not or only slightly (leaching) changing during the reporting period. The reduction of animal manure applied to soils more than counterbalanced the increase in the implied emission factor for animal wastes application so that emission decreased by 1 % (EEA, 2009a).
- In the EU-27 the decrease in the input of nitrogen to agricultural soils between 1990 and 2007was significant for all sub-categories and was 28 % for synthetic fertilizer application, 19 % for application of manure (EEA, 2009a).
- 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.

Table 1.14 Change of N_2O emission and fertiliser and manure use between 1990 and 2007 for the EU-27 Member States

Relative Change (1990-2007)	N2O emissions	synthetic fertiliser use	animal manure use
Austria	-11.2%	-25.3%	-10.1%
Belgium	-18.8%	-26.0%	-6.1%
Bulgaria	-61.5%	-55.1%	-66.4%
Cyprus	6.3%	-55.9%	29.2%
Czech Republic	-48.0%	-46.5%	-51.2%
Denmark	-32.0%	-51.5%	5.5%
Estonia	-52.1%	-61.3%	-59.5%
Finland	-25.9%	-34.9%	-3.0%
France	-15.4%	-17.2%	-7.3%
Germany	-13.3%	-26.1%	-12.7%
Greece	-23.4%	-55.2%	-3.2%
Hungary	-31.4%	-10.6%	-51.0%
Ireland	-9.2%	-15.3%	-1.0%
Italy	-8.5%	-0.4%	-5.5%
Latvia	-59.9%	-64.9%	-69.6%
Lithuania	-49.4%	-49.8%	-63.3%
Luxembourg	-10.1%	-25.7%	-3.4%
Malta	-4.0%	-4.0%	-
Netherlands	-22.7%	-38.3%	-9.1%
Poland	-27.0%	-17.1%	-27.8%
Portugal	-27.6%	-67.5%	-2.1%
Romania	-50.6%	-59.6%	-44.4%
Slovakia	-51.2%	-60.0%	-59.3%
Slovenia	2.5%	9.0%	-13.3%
Spain	3.4%	-11.2%	26.4%
Sweden	-9.6%	-25.8%	-9.7%
United Kingdom	-23.5%	-32.8%	-19.0%

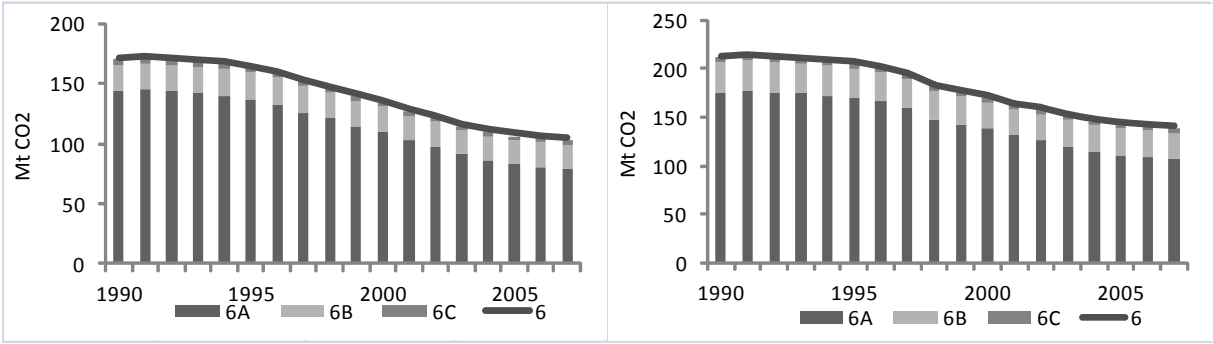
Note: Grey marked cells label negative values.
Source: EEA, 2009a

1.6 Waste

***Definition (IPCC sector 6)**: Total emissions from solid waste disposal on land, wastewater, waste incineration and any other waste management activity.*

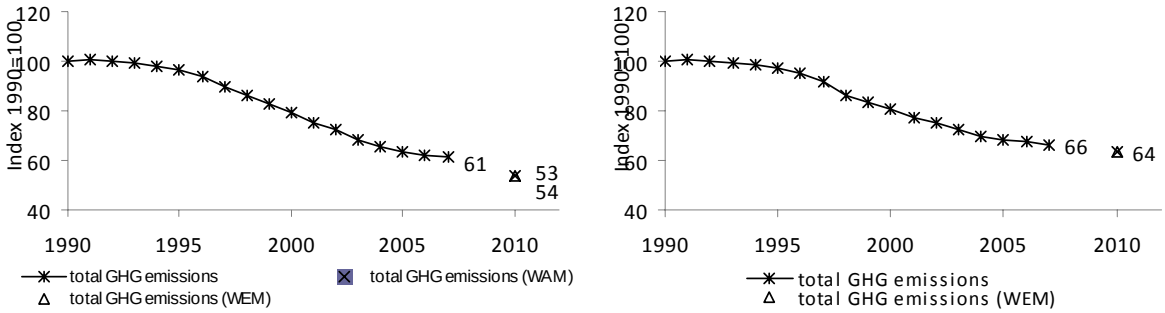
GHG emission from 6	Share in 1990 total GHG	Share in 2007 total GHG	Change 1990-2007	Change 2000-2007
EU-15	3.9%	2.4%	-38.9%	-23.0%
EU-27	3.7%	2.6%	-33.7%	-18.0%

Figure 1.39 Trend in absolute EU-15 (left) and EU-27 (right) total greenhouse gas emissions from waste (contribution of sub-categories)



Source: EEA, 2009a

Figure 1.40 Trend of EU-15 (left) and EU-27 (right) total greenhouse gas emissions from waste



Source: EEA, 2009a; EEA based on Member State greenhouse gas inventories and projections

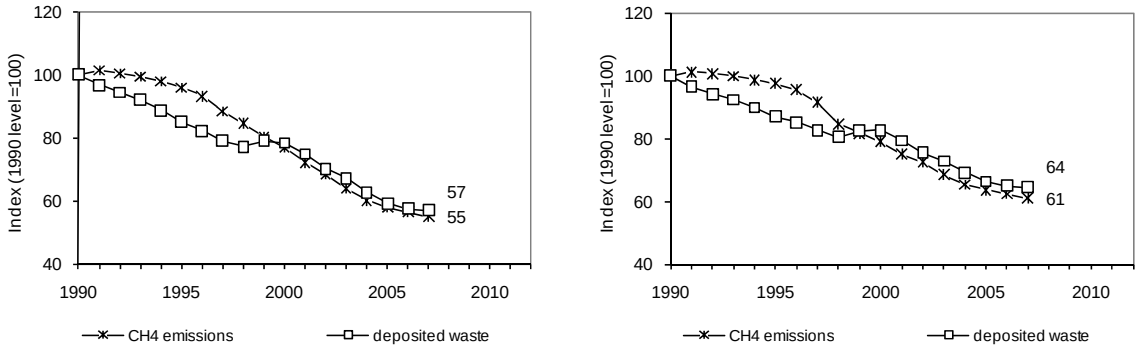
- Total EU-15 greenhouse gas emissions from waste were 39 % below 1990 levels. The highest absolute reductions were achieved in the United Kingdom and Germany.
- In the EU-27 emissions were 34 % below 1990 emissions in 2007.
- Greenhouse gas emissions in the EU-15 and EU-27 are expected to continue to decrease between 2007 and 2010. Within the EU-15, Germany and Spain project the highest reductions (in the range of 2-3 Mt CO_2-equivalent).

1.6.1 CH_4 emissions from solid waste disposal

***Definition (IPCC category 6A)**: Methane is produced from anaerobic microbial decomposition of organic matter in solid waste disposal sites. Carbon dioxide (CO_2) is also produced but only CO_2 from non-biologic or inorganic waste sources should be reported here.*

CH_4 emission from 6A	Share in 1990 total GHG	Share in 2007 total GHG	Change 1990-2007	Change 2000-2007
EU-15	3.3%	1.8%	-45.0%	-28.4%
EU-27	3.0%	2.0%	-39.0%	-22.8%

Figure 1.41 CH_4 emissions and amount of solid waste disposed for the EU-15 (left) and the EU-27 (right)



Source: EEA, 2009a

- Between 1990 and 2007, the amount of landfilled waste decreased in all EU-15 Member States except France, Greece, Ireland, Portugal and Spain. Germany became the first Member State to stop landfilling of biodegradable components completely. In the EU-12, emissions are mostly increasing (except in Bulgaria, Estonia, Hungary, Lithuania and Poland). As there is a time lag between disposal and emissions occurring it is possible for emissions to continue to increase while the amount of landfilled waste is decreasing.
- 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. However, many Member States are still far from fulfilling the Directive's targets.

Table 1.15 Change of CH_4 emissions and deposited waste between 1990 and 2007 for the EU-27 Member States

Relative Change (1990-2007)	CH4 emissions	deposited waste	CH4 recovery
Austria	-48.3%	-79.7%	286.6%
Belgium	-77.9%	-61.3%	-
Bulgaria	-37.7%	-53.9%	-
Cyprus	65.0%	2.4%	-
Czech Republic	45.4%	39.8%	536.9%
Denmark	-20.4%	-69.9%	1423.0%
Estonia	-13.9%	-29.0%	-
Finland	-43.5%	-41.2%	-
France	-25.0%	19.8%	1377.3%
Germany	-77.1%	-100.0%	114.3%
Greece	35.6%	51.1%	-
Hungary	30.6%	-1.2%	-
Ireland	32.9%	64.0%	-
Italy	0.3%	-12.0%	292.5%
Latvia	91.1%	79.6%	-
Lithuania	-15.8%	-43.9%	-
Luxembourg	-47.8%	-36.1%	-
Malta	108.8%	8.0%	-
Netherlands	-56.2%	-85.8%	118.6%
Poland	-51.2%	-17.9%	-
Portugal	63.1%	31.7%	-
Romania	122.6%	76.3%	-
Slovakia	283.7%	-	-
Slovenia	31.4%	20.8%	2953.3%
Spain	105.5%	74.2%	4100.5%
Sweden	-41.7%	-86.4%	104.6%
United Kingdom	-59.2%	-28.4%	696.5%

Note: Bulgaria, Cyprus, Lithuania and Romania report CH_4 recovery as not occurring. Poland reports CH_4 recovery as included elsewhere and Malta as not applicable. In Estonia, Finland, Greece, Hungary, Ireland, Latvia, Luxembourg and Portugal CH_4 recovery was not occurring in 1990. Belgium reports not applicable for 1990 and Slovenia included elsewhere for 1990.
Grey marked cells label negative values.
Source: EEA, 2009a

1.7 Solvents and Other

Definition (IPCC sector 3)*: This category covers mainly NMVOC emissions resulting from the use of solvents and other products containing volatile compounds.*

Definition (IPCC sector 7)*: If it is impossible to fit all emission sources/sinks into the six categories described above, this category may be used, accompanied by a detailed explanation of the source/sink activity.*

Due to the low contribution of this category to total emissions (0.3 % in the EU-15) no detailed information is given in this chapter.

2 Key policies and measures

This annex presents detailed information on the implementation of and expected savings from policies and measures. This information is presented at the Member State level – the same information, aggregated at the EU level (EU-15 and EU-27) is presented in the main report (Chapter 4).

2.1 Linkages between EU policies and national policies and measures (EU-15 and EU-12)

National policies and measures (PAMs) and EU Common and Coordinated Policies and Measures (CCPMs) are closely linked, as European Directives require Member States to enact legislation to implement them (which European regulations and voluntary agreements do not). National PAMs in place in Member States can therefore result from the implementation of EU CCPMs, but can also be driven by specific national policy objectives that are not necessarily related to the EU-wide CCPMs.

Based on detailed information from Member States, Table 2.1 and Table 2.2 illustrate the linkages between CCPMs and national PAMs. Examples include:

- The Emission Trading Directive led to the adoption of new national measures in all Member States except in Denmark and the United Kingdom, where similar schemes were introduced before this CCPM;

- The Biofuels Directive is a new policy in most Member States, but reinforced existing national policies in France, Germany and Sweden;

- The EU had been active in promoting both electricity generation from renewable energy sources and cogeneration before the corresponding directives were introduced, in 2001 and 2004 respectively. Many EU-15 Member States either took action before the directives were adopted or had existing measures reinforced by the directives. In contrast, most EU-12 Member States needed to introduce new policies to implement these two directives;

- In the case of the energy performance of buildings Directive, half of the Member States that provided information needed to introduce new policies and measures when the directive was adopted.

In general for the CCPMs on which EU-12 Member States reported, new national policies and measures were implemented following adoption of a CCPM. Transfer of good practice and CCPM implementation experience from EU-15 Member States will help to facilitate implementation of CCPMs in the EU-12.

Table 2.1 Linkages between CCPMs and national policies and measures of the EU-15

Sector	CCPM	Austria	Belgium	Denmark	Finland	France	*Germany	Greece	Ireland	Italy	Luxembourg	Netherlands	Portugal	Spain	Sweden	United Kingdom	Total N	Total R	Total B
Cross-cutting	Kyoto Protocol project mechanisms 2004/101/EC	N	N	N	N	N	N		N		N	B		N	N		10	0	1
Cross-cutting	Emissions trading 2003/87/EC	N	N	R	N	N	N	N	N	N	N	N	N	N	N	R	13	2	0
Cross-cutting	Integrated pollution prevention and control 96/61/EC	N	N	B			R		R		N	N		N	R		5	3	1
Energy supply	Promotion of cogeneration 2004/8/EC	B	B	B	R	B	B	R	N	N	B	B	B	N	B	N	4	2	9
Energy supply	Promotion of electricity from RE sources 2001/77/EC	R	N	B	R	R	B	R	R	N	R	R	R	R	B	N	3	9	3
Energy supply	Taxation of energy products 2003/96/EC	R	N	B	R	B	B		B	R	B	B	N	R	R	B	2	5	7
Energy supply	Internal electricity market 2003/54/EC	R	N	R			N		N		R	R		N	R		4	5	0
Energy supply	Internal market in natural gas 98/30/EC	R	N	R	D		N		N		R	N		N	R		5	4	0
Energy consumption	Directives on energy labelling of appliances	N	N	B	N	N	N	N	N	R	N	N	N	N	N	N	13	1	1
Energy consumption	Ecodesign requirements for energy-using products 2005/32/EC	B		N		N	N		N		R	N		N			5	1	1
Energy consumption	Energy performance of buildings 2002/91/EC	R	N	B	B	N	R	R	N	N	R	R	R	R	N	N	6	7	2
Energy consumption	End-use efficiency and energy services 2006/32/EC	N		B	R	N	N		N			N		N			6	1	1
Energy consumption	Eco-management & audit scheme (EMAS) EC 761/2001	N	N	N	N	N	N	R			R	B	N	N	B		8	2	2
Energy consumption	Energy labelling for office equipment 2422/2001	N		N	N				N			N		N	N		7	0	0
Energy consumption	Efficiency fluorescent lighting 2000/55/EC	N		N	N		N		N		N	N		N	N		9	0	0
Energy consumption	Efficiency of hot water boilers 92/42/EEC	R	N	B		N	R	B	N		R	B	N	N	N	N	7	3	3
Energy consumption	Motor challenge, voluntary EC programme			N			R		N			N			N		4	1	0
Transport	Promotion of biofuels for transport 2003/30/EC	N	N	N	N	R	R	N	N	N	N	N	N	N	R	N	12	3	0
Transport	Integrated European railway area (COM(2002)18 final)	N		B			R				R	R					1	3	1
Transport	Transport modal shift to rail 2001/12/EC etc.	R	N	R	N	B	B		N	N	B	B		N	R	N	6	3	4
Transport	Consumer information on cars 1999/94/EC	R	N	R		N	N		N		N	N	N	N	N	N	10	2	0
Transport	Agreement with car manufacturers ACEA etc.		N	N		R	R	R		B	NA	N	N		N	R	5	4	1
Transport	Marco Polo programme on freight transport	R		B			B										0	1	2
Transport	HFCs in mobile air conditioning 2006/40/EC	R	N	N		N					N	R			N		5	2	0
Industrial Process	F-gas regulation (842/2006)	B	R / N	B			R				R	R			N		1	3	2
Agriculture	Support under CAP (1782/2003)	R	B	R	N	R	N / R		N		R	N		N	N	N	6	4	1
Agriculture	Support under CAP - amendment (1783/2003)	R	B	N	N	R	N / R		N		R	N		R	N	N	6	4	1
Agriculture	Rural development support and CAP(2603/1999, 1698/2005 and 1290/2005)	R	N	N					N		R			N			3	2	0

Sector	CCPM	Austria	Belgium	Denmark	Finland	France	*Germany	Greece	Ireland	Italy	Luxembourg	Netherlands	Portugal	Spain	Sweden	United Kingdom	Total N	Total R	Total B
Agriculture	Support scheme for energy crops under CAP (795/2004)						R				R	N		B			1	2	1
Agriculture	Support for rural development from EAGGF (1257/1999)	R	N	N			B		N		R	N		R	B		3	3	2
Agriculture	Pre-accession measures for agriculture and rural development (1268/1999)	NA	NA	NA							R			R			0	2	0
Agriculture	Nitrates Directive 91/676/EEC	R	N	R		R	R		N		R	R		N	B		3	5	1
Waste	Landfill Directive 1999/31/EC	B	B	B	R	B	B	R	N	N	R	B	N	R	B	N	4	4	7
Waste	Packaging and packaging waste (94/62/EC, 2004/12/EC, 2005/20/EC)	B	B	B					N		R	B		N			2	1	3
Waste	Directive on waste 2006/12/EC	B	B	B		N			R		R			N			2	2	2
All	**Total N**	**10**	**19**	**9**	**10**	**11**	**10**	**3**	**23**	**7**	**8**	**16**	**9**	**21**	**14**	**11**	**181**		
All	**Total R**	**15**	**0**	**6**	**5**	**6**	**10**	**6**	**3**	**2**	**19**	**7**	**2**	**7**	**6**	**2**		**96**	
All	**Total B**	**6**	**6**	**12**	**1**	**4**	**7**	**1**	**1**	**1**	**3**	**8**	**1**	**1**	**6**	**1**			**59**

Note: N: new national PAM implemented or in preparation after CCPM was adopted
R: existing national PAM reinforced by CCPM
B: national PAM already in force before CCPM was adopted
D: derogation
NA: not applicable
<blank>: not reported
* Germany's CCPMs status is preliminary — the description of policies implementing the CCPMs has not been submitted yet.
Source: 2007 questionnaire and Member State communications to the EEA in 2008 and 2009.

Table 2.2 Linkages between CCPMs and national policies and measures of the EU-12

Sector	CCPM	Bulgaria	Cyprus	Czech Republic	Estonia	Hungary	Latvia	Lithuania	Malta	Poland	Romania	Slovak Republic	Slovenia	Total N	Total R	Total B
Cross-cutting	Kyoto Protocol project mechanisms 2004/101/EC	B	B	N	B			B		N	N	B		3	0	5
Cross-cutting	Emissions trading 2003/87/EC	N	B	N	N	N	N	N		N	N	N	N	10	0	1
Cross-cutting	Integrated pollution prevention and control 96/61/EC	R	B	N	N			R		N		R		3	3	1
Energy supply	Promotion of cogeneration 2004/8/EC	N		N	N	N	N	R				B	B	5	1	2
Energy supply	Promotion of electricity from RE sources 2001/77/EC	N	B	N	N	N	R	N		N	N	N	B	8	1	2
Energy supply	Taxation of energy products 2003/96/EC			N	R		N	R					B	2	2	1
Energy supply	Internal electricity market 2003/54/EC	N	B				R	R				B		1	2	2
Energy supply	Internal market in natural gas 98/30/EC	N										B		1	0	1
Energy consumption	Directives on energy labelling of appliances	N			N	B	N			N		B	N	5	0	2
Energy consumption	Ecodesign requirements for energy-using products		N									R		1	1	0

Sector	CCPM	Bulgaria	Cyprus	Czech Republic	Estonia	Hungary	Latvia	Lithuania	Malta	Poland	Romania	Slovak Republic	Slovenia	Total N	Total R	Total B
	2005/32/EC															
Energy consumption	Energy performance of buildings 2002/91/EC	R	B	N	R	N	N	N		N		N		6	2	1
Energy consumption	End-use efficiency and energy services 2006/32/EC	R				B		R				B		0	2	2
Energy consumption	Eco-management & audit scheme (EMAS) EC 761/2001	N	B				N			N		B	N	4	0	2
Energy consumption	Energy labelling for office equipment 2422/2001	N			N					N				3	0	0
Energy consumption	Efficiency fluorescent lighting 2000/55/EC	N			N									2	0	0
Energy consumption	Efficiency of hot water boilers 92/42/EEC	N			N		N			N		B	N	5	0	1
Energy consumption	Motor challenge, voluntary EC programme													0	0	0
Transport	Promotion of biofuels for transport 2003/30/EC	N		N	N	N	N	N		N		N		8	0	0
Transport	Integrated European railway area (COM(2002)18 final)													0	0	0
Transport	Transport modal shift to rail 2001/12/EC etc.	N					N							2	0	0
Transport	Consumer information on cars 1999/94/EC						N					B	N	2	0	1
Transport	Agreement with car manufacturers ACEA etc.													0	0	0
Transport	Marco Polo programme on freight transport													0	0	0
Transport	HFCs in mobile air conditioning 2006/40/EC		B											0	0	1
Industrial Process	F-gas regulation (842/2006)		B											0	0	1
Agriculture	Support under CAP (1782/2003)		B				N						N	2	0	1
Agriculture	Support under CAP - amendment (1783/2003)						R							0	1	0
Agriculture	Rural development support and CAP(2603/1999, 1698/2005 and 1290/2005)					N						B		1	0	1
Agriculture	Support scheme for energy crops under CAP (795/2004)													0	0	0
Agriculture	Support for rural development from EAGGF (1257/1999)			N								R		1	1	0
Agriculture	Pre-accession measures for agriculture and rural development (1268/1999)											B		0	0	1
Agriculture	Nitrates Directive 91/676/EEC	R	B			N				N		B		2	1	2
Waste	Landfill Directive 1999/31/EC		B	N	N		N	N		N		B	N	6	0	2
Waste	Packaging and packaging waste (94/62/EC, 2004/12/EC, 2005/20/EC)		B	N	N			N						3	0	1
Waste	Directive on waste 2006/12/EC				R					N		N		2	1	0
All	**Total N**	**12**	**1**	**11**	**11**	**7**	**12**	**6**	**0**	**13**	**3**	**5**	**7**	**88**		
All	**Total R**	**4**	**0**	**0**	**3**	**0**	**3**	**5**	**0**	**0**	**0**	**3**	**0**		**18**	
All	**Total B**	**1**	**13**	**0**	**1**	**2**	**0**	**1**	**0**	**0**	**0**	**13**	**3**			**34**

Note: **N**: new national PAM implemented or in preparation after CCPM was adopted
R: existing national PAM reinforced by CCPM
B: national PAM already in force before CCPM was adopted
D: derogation
NA: not applicable
<blank>: not reported
Source: 2007 questionnaire and Member State communications to the EEA in 2008 and 2009.

2.2 Quantified expected effects of policies and measures

This section contains quantifications of policy impacts as estimated by the European Commission and by Member States themselves. EC estimates are for CCPMs only while Member States estimates are for both CCPMs and other national policies. Due to the large number of Member States policies and measures, Member States estimates are presented for each CCPM and each sector. Note however that Member States rarely provide complete estimates, conveying the impact of all their policies and measures. More information methodological issues associated with these estimates is provided in section 2.3.

2.2.1 EC estimates of CCPMs savings

Table 2.3 shows EC CCPM annual reduction potentials in 2010 for EU-15 and in 2020 for EU-27. Unfortunately, quantified estimates are not available for all CCPMs.

The comparison between EC and Member State estimates in the main report shows wide discrepancies between EC and Member States' reduction potentials (details in section 4.3). For some CCPMs EC estimates show large reduction potentials, while Member State estimates show no or small reduction potentials (e.g. CAP, IPPC and biomass action plan). This is probably due to two main reasons: firstly not all Member States provide quantified reduction potentials, and secondly, when Member States quantify PAMs savings they only do it for a small number of PAMs. For other CCPMs Member State estimates show large reduction potentials while the EC does not provide quantified estimates (e.g. EU-ETS, Kyoto use of flexible mechanisms, 2020 savings for the biofuels Directive).

Table 2.3 Emission reduction potentials of the EU policies in EU-15 and EU-27 Member States in 2010 and 2020, as estimated by the European Commission

Cross-cutting	Emission reduction potential (in Mt CO_2-eq.)		Stage of implementation / timetable / comments
	in 2010 in the EU-15	in 2020 in the EU-27	
EU Emission Trading Scheme	N/A	N/A	In force. First phase (2005–07). Second phase (2008–12). Planned third phase (2013–20). ETS cap will lead to a 21% reduction in emissions in 2020 compared to 2005 levels[1].
Revision of the monitoring mechanism	N/A	N/A	In force
Link Kyoto flexible mechanisms to emission trading	N/A	N/A	In force
Energy supply			
Promotion of electricity from RES-E (2001)	100-125[2]		In force.
(New) Renewable energy Directive		600-900[3]	In force.

[1] This amounts to an approximate reduction of over 0.4 $GtCO_2$ based on verified emissions in 2005 (First Phase). Note the actual reduction will be larger as the scope of the scheme has been expanded in subsequent Phases. The reductions from the EU ETS should not be double counted with other policies, which may also affect the participants either directly or indirectly.

[2] Second ECCP progress report April 2003 http://ec.europa.eu/environment/climat/pdf/second_eccp_report.pdf

[3] Directive on the promotion of energy from renewable sources, Citizens' Summary, 23 January 2008

Cross-cutting	Emission reduction potential (in Mt CO_2-eq.)		Stage of implementation / timetable / comments
	in 2010 in the EU-15	in 2020 in the EU-27	
CCS Directive	N/A	0.875[4]	In force.
Directive on promotion of cogeneration	65[5]		In force
Further measures on renewable heat (including biomass action plan)	36-48[6]		Biomass Action Plan, Dec 2005, over 20 further actions planned. Renewable heat included in proposed new Directive on renewable energy
Intelligent Energy for Europe: programme for renewable energy	N/A		Programme for policy support in renewable energy
Developing the internal energy market	80-120[2]		Amendments to a number of directives[7] to continue to help complete the internal energy market.
Energy demand			
Directive on the energy performance of buildings	20[5]		In force Monitoring and review
Directive on the energy performance of buildings (recast)		190-290[8]	Currently in second reading; agreement expected for December 2009.
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	 1[2] N/A 10[2] 15[2]		In force: monitoring and review Consultation on amending Directive held in 2008.
Framework Directive on eco-efficiency requirements of energy-using products		200[9]	In force; preparatory studies for daughter directives underway;
Directive on energy end use efficiency and energy services	92[10]		In force. National Energy Efficiency Action Plans adopted in all EU-27.
Action Plan on Energy efficiency as a follow-up to the Green Paper	N/A		Launched Oct 2006[11]. Identifies 10 priority actions to achieve up to 20% energy savings by 2020.
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

[4] EUROPEAN PARLIAMENT, CCS, text adopted at the sitting of 17 DEC 2008 (P6_TA-PROV(2008)12-17). The original figure refers to a cumulative estimate of 7 Mt CO_2 -eq by 2020. Assuming that the effect starts in 2012 when the Directive is expected to enter into force, we calculated the annual saving by dividing the 2020 saving by 8 years.

[5] Proposal for a Directive of the European Parliament and of the Council on the promotion of cogeneration based on a useful heat demand in the internal energy market

[6] COM (2005) 628 final 'Biomass Action Plan, December 2005'

[7] Decision No 1229/2003/EC, Regulation (EC) No 807/2004, Directive 2003/54/EC & 2003/55/EC, Regulation (EC) No 1228/2003

[8] Energy performance of buildings – impact assessment on the revised directive SEC(2008) 2864

[9] Proposal for a directive on Eco design of EuP, COM (2003) 453 final

[10] Proposal for a Directive of the European Parliament and of the Council on End-Use Energy Efficiency and Energy Services, COM(2003) 739 final

[11] COM(2006)545 – final 'Action Plan for Energy Efficiency: Realising the Potential'

Cross-cutting	Emission reduction potential (in Mt CO_2-eq.)		Stage of implementation / timetable / comments
	in 2010 in the EU-15	in 2020 in the EU-27	
			2008.
Intelligent Energy for Europe programme for energy efficiency	N/A		Programme for policy support in energy efficiency
Public awareness campaign on energy efficiency	N/A		Supporting program as part of Intelligent Energy for Europe: In implementation
Programme for voluntary action on motors (Motor Challenge)	30[2]		Supporting programme for voluntary action on efficient motor systems
Public procurement	25-40 [2]		EU Handbook developed for guidance for increased energy efficient public procurement
Transport			
Fuel quality Directive		62.5[12]	First implemented in 1998. Revisions adopted in December 2008
Directive on the promotion of transport bio-fuels	35-40[2]		In force
Voluntary agreements with European, Japanese and Korean car manufacturers.	75-80[2]		Implemented
Strategy for Car CO_2		50[13]	Adopted
Infrastructure charging for heavy goods (revised Eurovignette)	N/A		Adopted
Shifting the balance of transport modes	N/A		Package of measures in implementation
Fuel taxation	N/A		In force Focus on EU harmonisation of taxation, not on CO_2 reduction; ongoing review
Directive on mobile air conditioning systems: HFCs	See regulation on fluorinated gases		In force
Inclusion of Aviation in EU ETS		183[14]	Adopted. Will include all flights from 1/01/2012
Public procurement of vehicles		1.9[15]	
Industry			
Regulation on fluorinated gases	23[16]		In force
IPPC & non-CO_2 gases	60-70[2]		In force In 2008 the Directive was codified.
Waste			
Landfill Directive	41[2]		In force
Waste Framework Directive			Adopted. Launched December 2005[17], including a revision of the original waste Directive of 1975, revised in 2008.

[12] Estimate based savings of 1% of baseline transport emissions in 2020 from http://ec.europa.eu/environment/climat/pdf/climat_action/analysis_appendix.pdf

[13] Questions and answers on the EU strategy to reduce CO_2 emissions from cars, MEMO/07/46. The original figure refers to a cumulative estimate of 400 MtCO2eq by 2020. Assuming that the effect starts in 2012 when the decision is expected to enter into force, we calculated the annual saving by dividing the 2020 saving by 8 years.

[14] Inclusion of Aviation in the EU Greenhouse Gas Emissions Trading Scheme (EU ETS), Summary of the Impact Assessment, SEC(2006) 1685

[15] Directive on the promotion of clean and energy efficient road transport vehicles, 2005/0283 (COD)

[16] Regulation proposal on certain fluorinated greenhouse gases, COM (2003) 492 final

Cross-cutting	Emission reduction potential (in Mt CO_2-eq.)		Stage of implementation / timetable / comments
	in 2010 in the EU-15	in 2020 in the EU-27	
Directives on waste electrical and electronic equipment (WEEE)	35[18]		In force. Revised directive in 2008
Research and development			
R&D Framework Programmes	N/A		In force. Under the 7th Framework programme (FP7), which runs from 2007 to 2013, a budget of EUR 53.2 billion will be allocated over the entire period. Over 2.3 billion to energy related R&D activities[19].
Competitiveness and Innovation Framework Programme (CIP)			CIP runs from 2007 to 2013 with a total budget of EUR 3.6 billion. The CIP is divided in three operational programmes two of which are related to energy and climate change[20].
Structural and cohesion funds			
Integration climate change in structural funds & cohesion funds	N/A	N/A	The Community Strategic Guidelines highlight investments to promote Kyoto commitments, including renewable energy, energy efficiency and sustainable transport systems as eligible areas for support. About EUR 48 billion are planned to co-finance projects on climate change in the 2007–2013 Cohesion Policy.
Agriculture			
CAP health check (2003 reform) • Rural development policies • Market policies	60-70[21] 12[20]		Adopted. In 2008 the EU Commission decided to move to new changes to the CAP.
Rural development policy	N/A		Rural development policy for 2007–13 focus on: • Improving competitiveness • Improving the environment • Improving quality of life and encourage diversification of the rural economy.
Support scheme for energy crops	N/A		In force, to be abolished as from 2010
N_2O from soils	10[22]		Improved implementation of the nitrates Directive

[17] Thematic Strategy on Waste Prevention, COM (2005) 666 and 667 (final)

[18] Value in 2011 - Directive on waste electrical and electronic equipment (WEEE), (recast) Impact Assessment, {COM(2008) 810}, {SEC(2008) 2933}

[19] European Commission Cordis, http://cordis.europa.eu/fp7/energy/home_en.html

[20] Competitiveness and Innovation Framework Programme, http://ec.europa.eu/cip/docs/factsheets_en.pdf

[21] From ECCP working group on agriculture and sub-group on carbon sinks related to agricultural soils. Some of potential for bioenergy crops will be covered within potential from biofuels, cogeneration from biomass, further promotion of RES-H etc.

[22] EEA, 2008, GHG Trends and Projections in Europe http://www.eea.europa.eu/publications/eea_report_2008_5/TPReport2008Annexes.pdf

Cross-cutting	Emission reduction potential (in Mt CO_2-eq.)		Stage of implementation / timetable / comments
	in 2010 in the EU-15	in 2020 in the EU-27	
Proposed soil Directive	N/A	N/A	The European Climate Change Programme (ECCP) Working Group on Sinks Related to Agricultural Soils estimated this potential at equivalent to 1.5 to 1.7% of the EU's anthropogenic CO_2 emissions during the first commitment period under the Kyoto Protocol[23]
Forests			
EU Forest Action Plan	N/A	N/A	Adopted. The Forest Action Plan presented in June 2006 builds on the EU's Forestry Strategy adopted in 1998.
Afforestation and reforestation: • Afforestation programmes • Natural forest expansion	14[2]		Possibility for support through forestry scheme of rural development
Forest management (various measures)	19[2]		Possibility for support through forestry scheme of rural development, dependent on national implementation.

Note: The emission reduction potentials are based on ex-ante estimates of the emissions reduction potential made by the European Commission.

2.2.2 Member States estimates of CCPMs savings

In 2010, the policies with the biggest savings potentials in EU-15 are (Figure 2.1): the EU-ETS (Greece, United Kingdom), the use of Kyoto flexible mechanisms (Spain, Italy, Netherlands) and the renewable electricity Directive (United Kingdom, Greece, Germany, Netherlands). Other CCPMs also show significant savings in the United Kingdom (the aid scheme for forestry measures in agriculture and the F-gas regulation) and Netherlands (Landfill Directive).

The policies with the biggest savings potentials in EU-12 Member States are: the renewable electricity Directive (the Czech Republic, Hungary); and other CCPMs. Other CCPMs with biggest savings potentials in the Czech Republic include: the environmental performance freight transport (Marco Polo Programme), and the landfill Directive.

Reduction potentials in EU-15 Member States are significantly larger than those in EU-12 Member States. There may several reasons for this, examples include: fewer EU-12 Member States quantify their emissions, their absolute greenhouse gas emissions are lower, and they have lower Kyoto targets in comparison to Member States in the EU-15.

Available savings estimates for 2020 are even more incomplete than in 2010. Just under half of the EU-15 Member States and more than half of the EU-12 Member States present no or limited quantified CCPM savings for 2020.

In 2020, the policies with the biggest savings in EU-15 are (Figure 2.2): the EU-ETS (United Kingdom, Greece, Germany) and the RES Directive (Germany, Greece, United Kingdom, Italy). Other CCPMs in Italy also show large reduction potentials: the environmental

[23] Thematic Strategy for Soil Protection, COM(2006)231

performance of freight transport (Marco Polo Programme), the integrated European railway area, and the ecodesign requirements for energy-using products Directive.

In EU-12, only the Czech Republic and Hungary provides substantial quantified reduction estimates. The policies with the biggest savings in the Czech Republic are: the RES Directive (also in Hungary), the energy services Directive and other CCPMs (the environmental performance of freight transport, and the taxation of energy products and electricity Directive).

Overall, Member States estimates of the effects of CCPMS lack completeness and consistency:

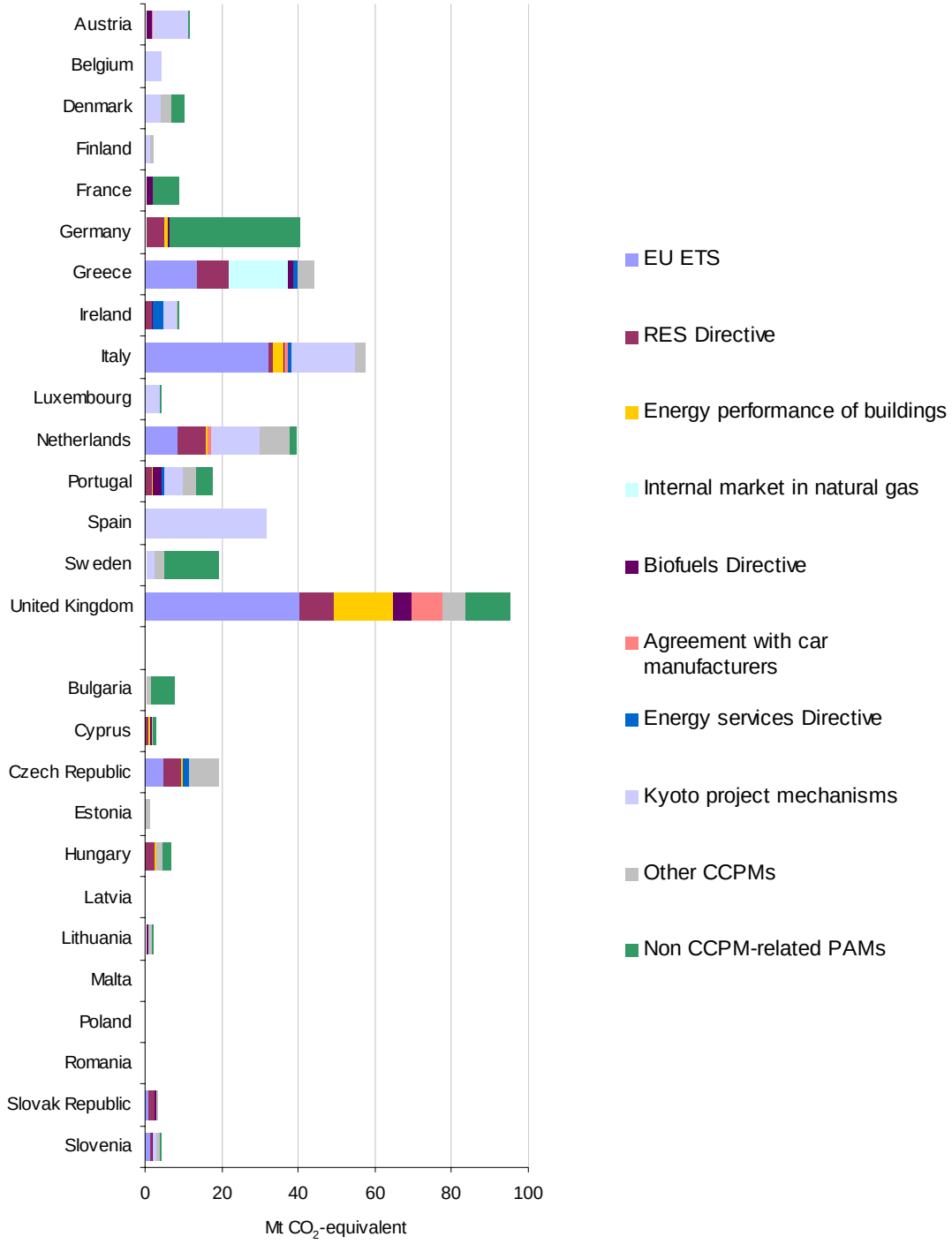
- Many Member States do not quantify savings from CCPMs. This gives an incomplete picture of the savings. In general, the main reason is that Member States do not quantify enough their PAMs sufficiently. Another reason could be that Member States do not adequately relate their PAMs to EU CCPMs, therefore underestimating the reduction potentials of CCPMs. However, this seems to contradict the analysis of linkages between EU CCPMs and national PAMs which shows a strong link between national policies and measures and EU CCPMs (detail in section 2.1.1 of the main report).

- When Member States do provide quantified estimates for CCPMS, in general it is incomplete as estimates are only provided for a few of them.

- There is inconsistency in the CCPMs that Member States provided quantified estimates for. This gives a very inconsistent picture of the savings for individual CCPMs.

- As a consequence the whole EU-27 picture is distorted. For example, Member States with smaller emissions (Greece) expect more savings than Member States with larger emissions (Germany); and Member States with large emissions (France) expect only limited savings from their PAMs. This may result from differing policy appraisal methodologies, implementation patterns, or efforts and successes in implementing policies.

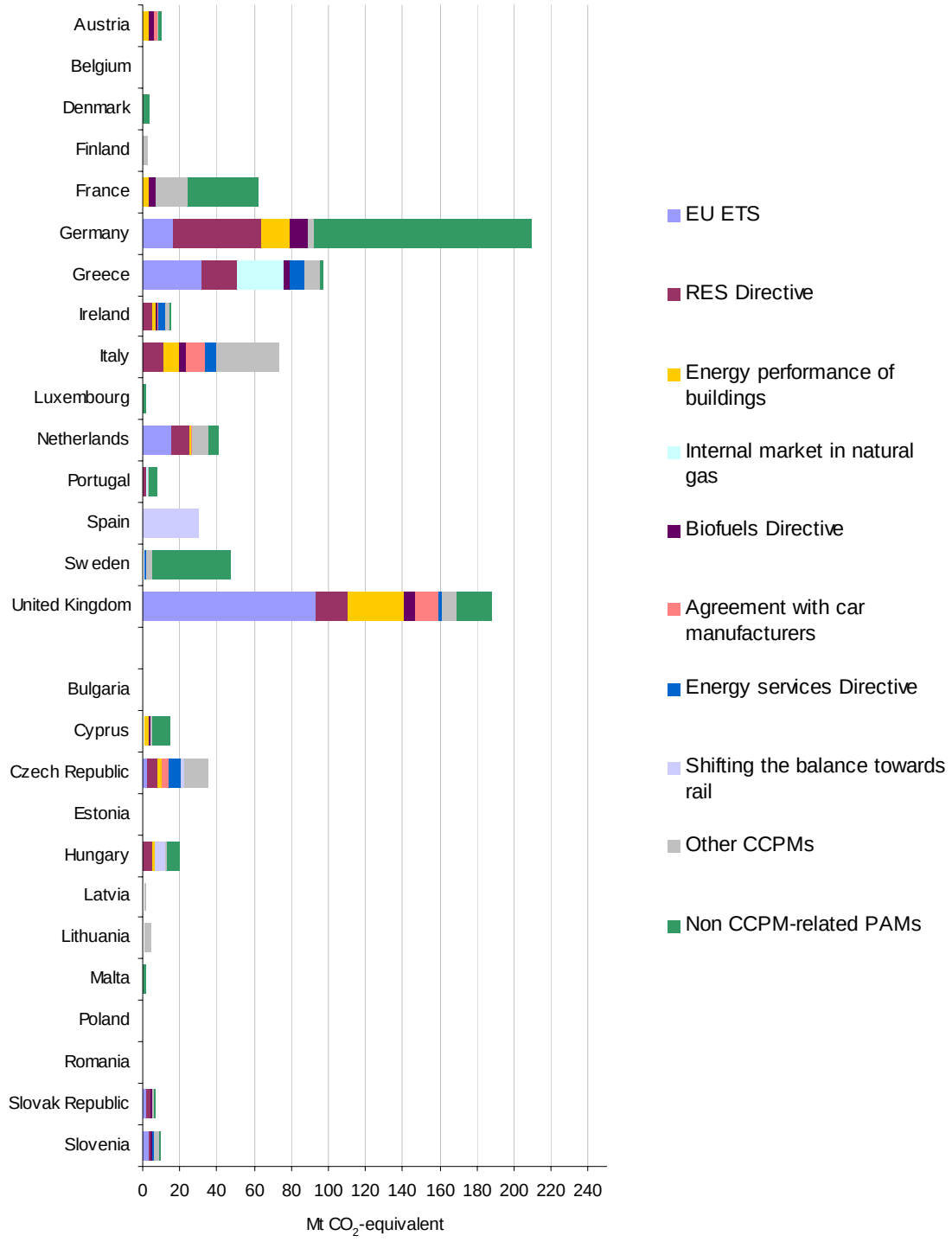
Figure 2.1 Member States estimates of CCPM savings in 2010



Note: Hungary reported that it plans to release AAUs to the value 16.5 Mt per annum into the market via International Emissions Trading. This is not reflected in Figure 2.1

Source: EEA (2009), Policies and Measures database, 9 September 2009 extract, http://www.eea.europa.eu/themes/climate/pam-database. 2009 Member States' questionnaires on the use of flexible mechanisms.

Figure 2.2 Member States estimates of CCPM savings in 2020



Source: EEA (2009), Policies and Measures database, 9th September 2009 extract, http://www.eea.europa.eu/themes/climate/pam-database. 2009 Member States' questionnaires on the use of flexible mechanisms.

2.2.3 Member State estimates of policy savings in key source sectors

Two sets of data are presented in this section in accordance with the two methods described in detail in section 2.3:

- **Bottom-up method**: an aggregation of Member State estimates of the effect of individual policies and measures. This method is used to derive estimates of savings from implemented and adopted policies.

- **Top-down method**: savings are estimated using Member State greenhouse gas emission projection scenarios. This method is used to derive estimates of savings from planned policies.

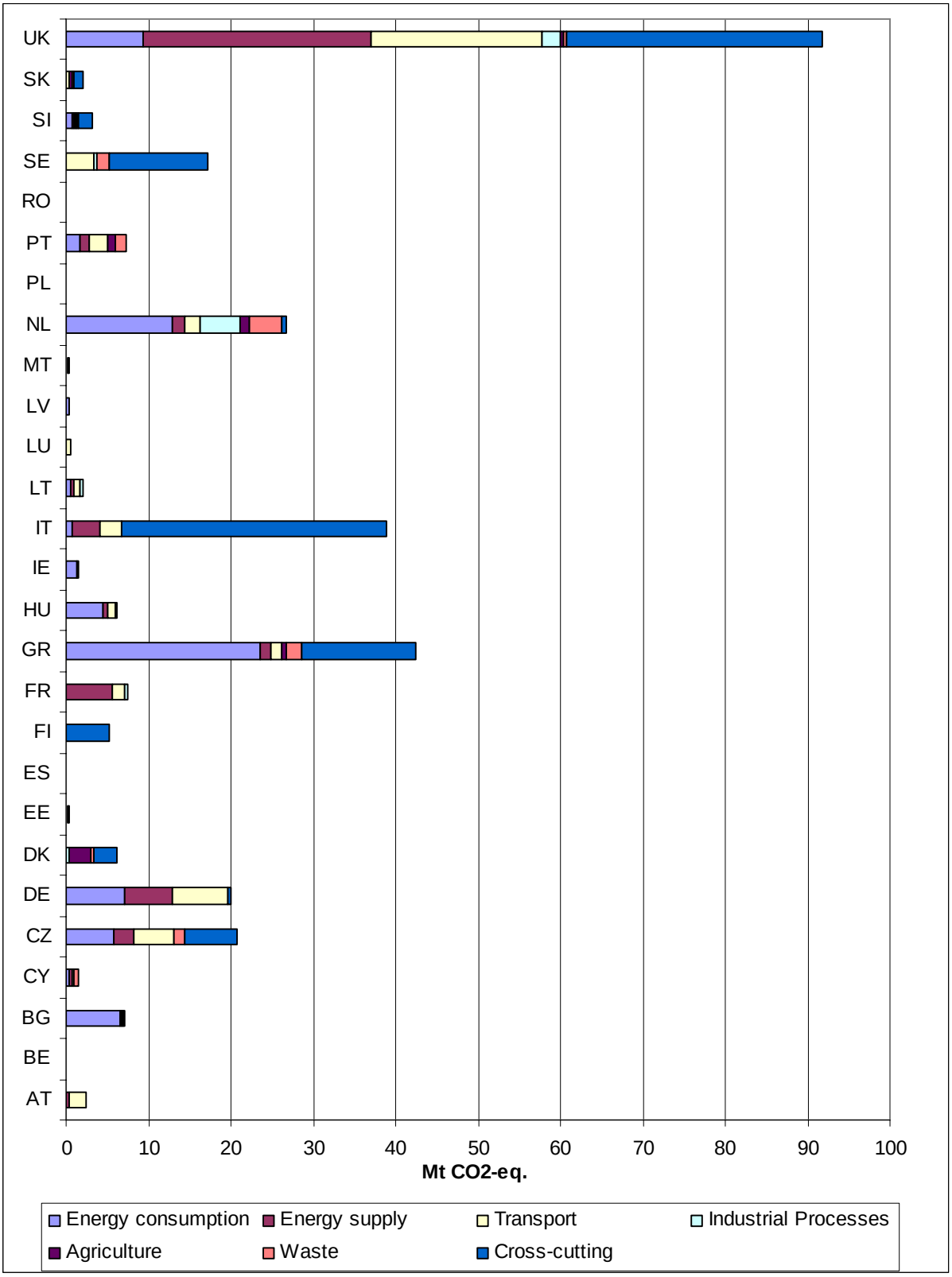
Both methods estimate savings from all measures, including the impact of national measures related to EU CCPMs as well as strictly national policies. Data is presented here for individual Member States. Data is presented for the EU-15 and the EU-27 in the main report.

The figures below illustrate the sectoral split of policy savings expected by Member States and reveal some interesting trends and anomalies between Member States. A large proportion of savings from implemented and adopted policies and measures in 2010 are expected to come from cross-cutting policies such as the EU ETS, taxation and the Kyoto flexible mechanisms. Thereafter, savings in energy consumption are expected to provide most savings, with energy supply and transport policies also making important contributions in some Member States. Planned policies in 2010 are expected to contribute the greatest savings in the energy supply sector in many Member States, with energy consumption and transport policies also making significant contributions in some Member States.

In 2020, policies already implemented or adopted to address energy consumption are expected to have the greatest impact in most Member States, with transport and cross-cutting policies also making important contributions. Planned policies to address energy consumption also have greatest impact in 2020 in many Member States, followed by energy supply and transport policies.

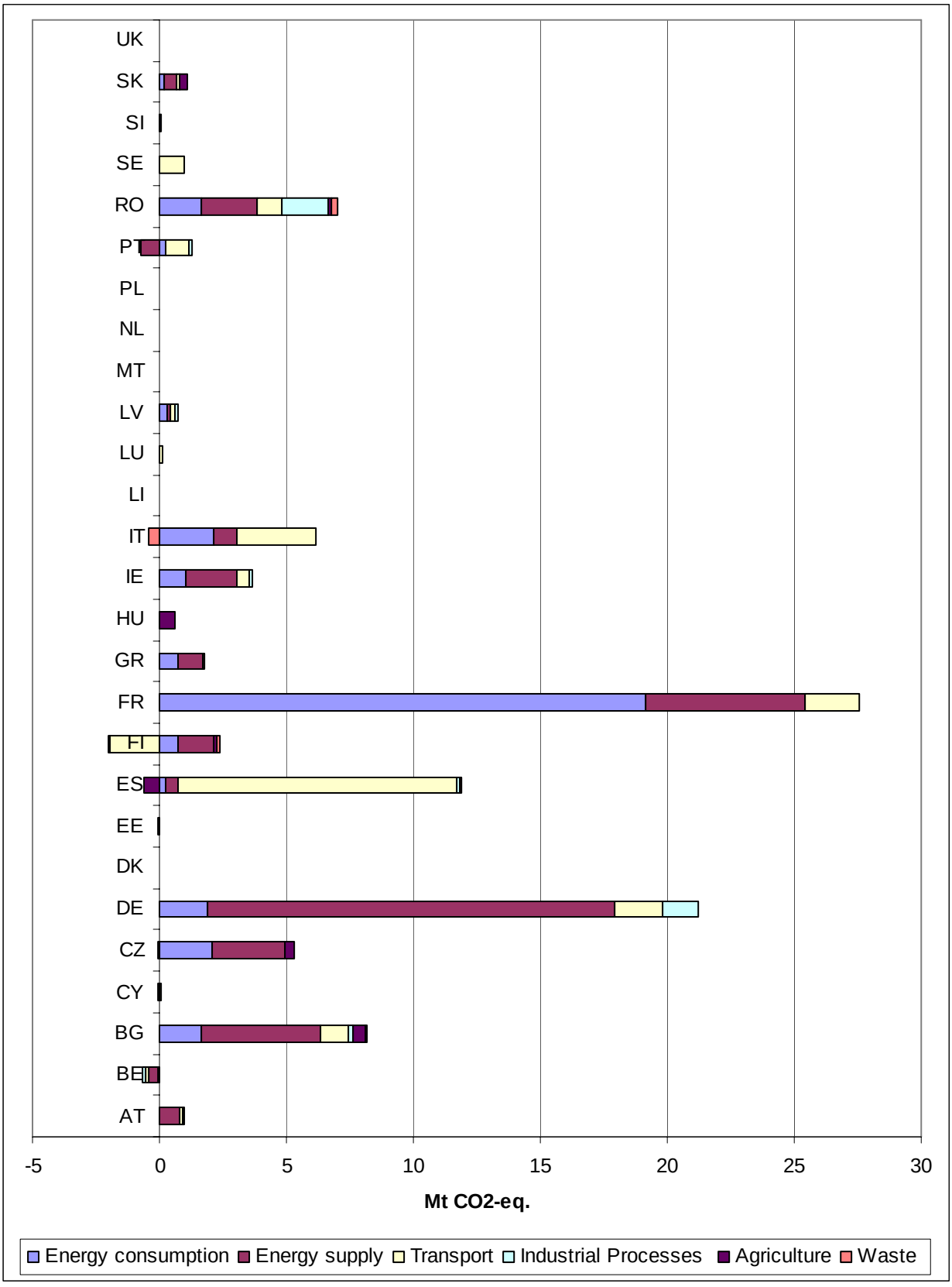
In terms of contribution to absolute reductions, the non-energy sectors make a much lower contribution in most Member States. Some exceptions where the industrial process, agriculture and waste sectors are expected to make a significant relative contribution include the Netherlands, Romania, Germany, France and Greece.

Figure 2.3 Member States estimates of savings from implemented and adopted policies in 2010, split by sector



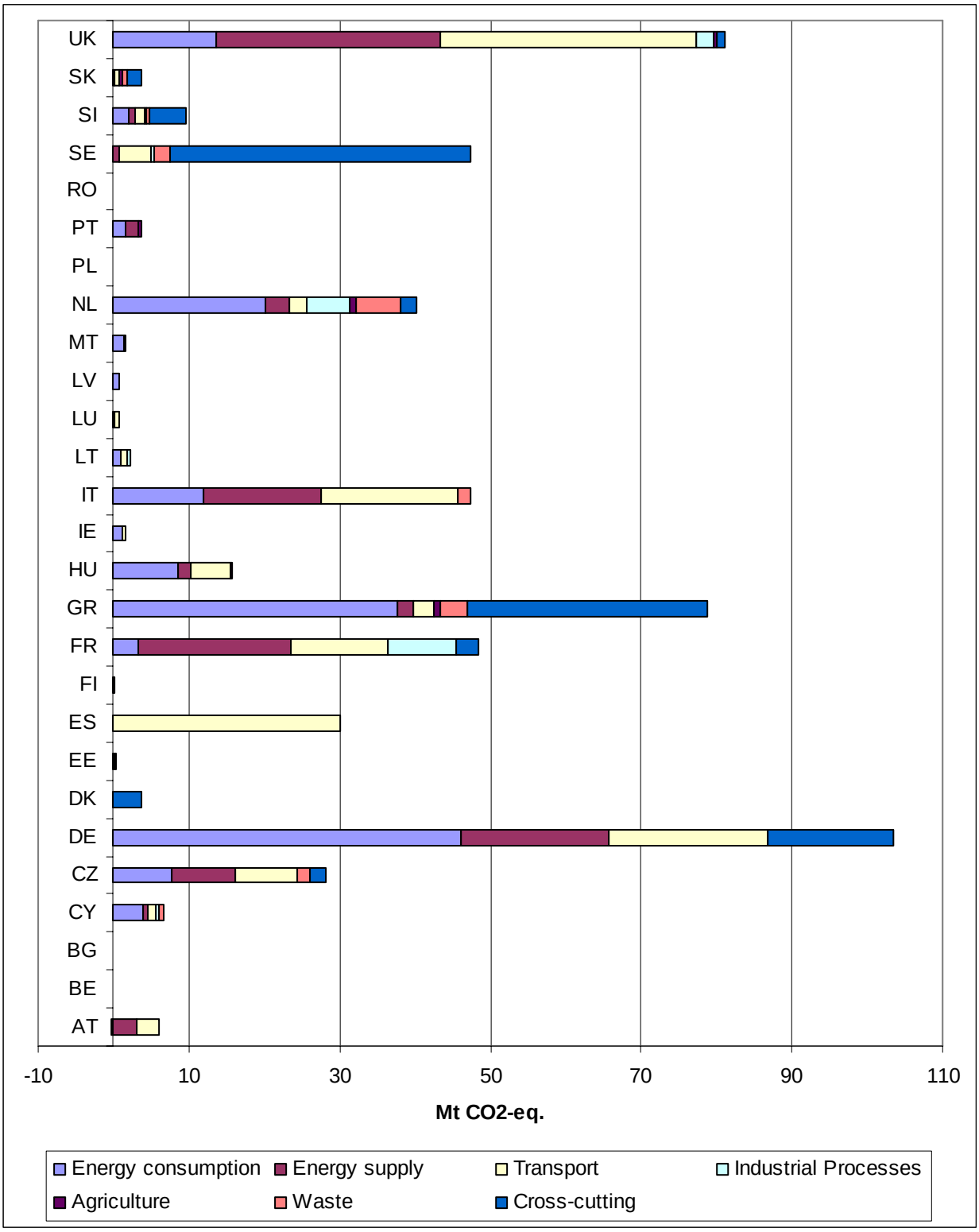
Source: EEA (2009), Policies and Measures database, 9th September 2009 extract, http://www.eea.europa.eu/themes/climate/pam-database. 2009 Member States' questionnaires on the use of flexible mechanisms.

Figure 2.4 Member States estimates of savings from planned policies in 2010, split by sector



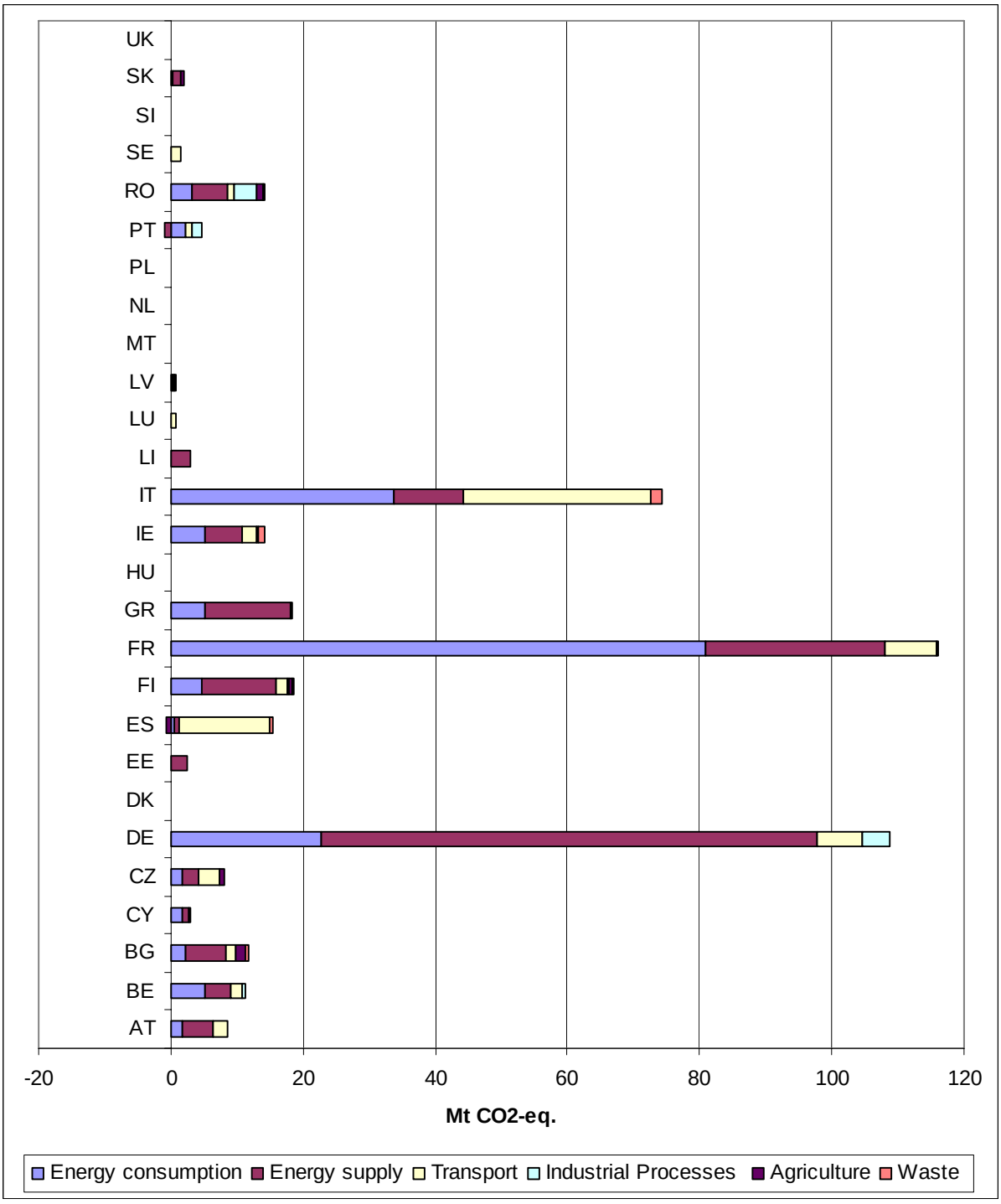
Source: 2009 Member States total emission projections; EEA 2008a for Hungary and Poland.

Figure 2.5 Member States estimates of savings from implemented and adopted policies in 2020, split by sector



Source: EEA (2009), Policies and Measures database, 9th September 2009 extract, http://www.eea.europa.eu/themes/climate/pam-database. 2009 Member States' questionnaires on the use of flexible mechanisms.

Figure 2.6 Member States estimates of savings from planned policies in 2020, split by sector



Source: 2009 Member States total emission projections; EEA 2008a for Hungary and Poland.

2.3 Methodological issues associated with the quantified expected effects of policies and measures

2.3.1 Impacts of individual policies

Identifying the most effective policy instruments across Europe to reduce greenhouse gas emissions is possible by focusing on EU policies and measures (CCPMs), which are implemented in all EU Member States. Comparing the effectiveness of individual PAMs relies on proper quantification of their effects.

Two main sets of estimates of the emission reductions from EU CCPMs are available:

- Reduction estimates from the Member States, based on Member States' ex-ante emission savings estimates for their national PAMs and the indication of whether these PAMs are driven by EU-CCPMs. Looking at the Member States estimates gives an indication of what savings Member States expect from their national PAMs by implementing EU CCPMs. National PAMs are distinguished between existing PAMs (implemented or adopted) and additional PAMs (planned but not yet implemented). Reporting of these savings remains incomplete at two levels: not all Member States report quantified estimates and Member States do not necessarily estimate the effects of all PAMs.[24] Therefore, aggregated estimates from Member States are an underestimate of the real effect of PAMs at EU level.

- Reduction estimates from the European Commission, based on ex-ante estimates by the European Commission of the expected reduction effect of its CCPMs. Quantified estimates are available for a limited number of CCPMs (details in Annex). Most of the estimates presented here were published in 2003.

The Commission estimates for 2010 concern the EU-15 and imply full implementation of the CCPMs by Member States, while Member States estimates operate a distinction between savings expected from existing measures and additional measures. Member States estimates have been aggregated at EU-15 and EU-27 level.

The picture resulting from a comparison of the European Commission and Member States estimates of savings from individual EU CCPMs in 2010 can be contrasted (Cf. main report, Figure 4.1 and Figure 4.6):

For the same CCPMs, Commission estimates are in general much higher than Member States estimates. This can be explained by different projection assumptions between Commission and Member States, and by the incompleteness of reporting from Member States. The Directive on the energy performance of buildings is the only CCPM where a good match between the estimates can be observed.

Some CCPMs have been identified by the Commission as representing a high emission reduction potential, although this was not reflected in Member States estimates: CAP, IPPC

[24] In 2009, the following Member States provided quantified PAMs emission reduction potential estimates for 2010: Austria (6 CCPMs), France (3), Bulgaria (5), Cyprus (5), Czech Republic (14), Germany (4), Denmark (4), Estonia (11), Finland (5), Greece (9), Hungary (4), Ireland (11), Lithuania (7), Latvia (3), Malta (3), Netherlands (6), Portugal (12), Sweden (4), Slovenia (16), Slovak Republic (7), United Kingdom (10), Italy (8).

and biomass action plan. This is probably due to the limited number of estimates available from Member States.

Interestingly, two Member States reported negative effects of national PAMs this year, i.e. PAMs that are projected to result in emission increases:

- Austria reported rising emissions resulting from the implementation of the EU Framework Directive on Water Bodies (2000/60/EC): + 0.16 Mt CO2-eq. in 2015 and + 0.3 Mt CO2-eq. in 2020;

- Germany reported rising emission under the 'KfW programme - home ownership' (national PAM not driven by an EU Directive, which applies to old and new buildings): + 0.34 Mt CO2-eq. in 2010; + 0.42 Mt CO2-eq. in 2015 and + 0.50 Mt CO2-eq. in 2020).

2.3.2 Aggregation: the total impact of policies and measures

The total impact of policies and measures and the sectors where most emission reductions are projected can be identified by aggregating the expected effects of PAMs across the Member States.

Two methods can be used and compared to quantify total greenhouse gas savings from existing and additional PAMs at an aggregated level:

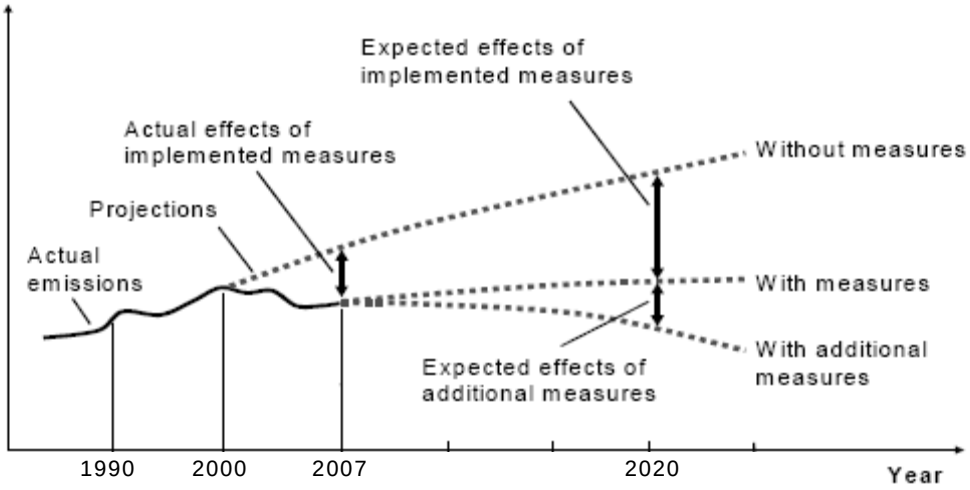
Bottom-up: total savings from PAMs are estimated based on the sum of all the expected savings from each individual PAM. Due to the fact that not all Member States quantify the expected impact of (all) their policies, this method is likely to underestimate the total potential effect of climate PAMs.

Top-down: total savings from PAMs are estimated based on the difference between the different projection scenarios of total greenhouse gas emissions prepared by the Member States (as show in Figure 2.7): 'without measures' (WOM) (greenhouse gas projections in the absence of the current policies and measures), 'with existing measures' (WEM) (greenhouse gas projections as a consequence of the measures existing at the time of preparing the projections, i.e. if no further measures are adopted or implemented) and 'with additional measures' (WAM) (greenhouse gas projections that would result from the implementation of the additional measures planned at the time of preparing the projections). Savings from the existing and additional PAMs are therefore calculated as follows:

Savings from existing measures = WEM scenario – WOM scenario. This method underestimates savings from existing PAMs at EU level because only 10 Member States provide a WOM projection.

Savings from additional measures = WAM scenario – WEM scenario

Figure 2.7 Emission projections scenarios and top-down estimates of savings from PAMs



Note: This figure relies on the assumption that the latest greenhouse gas inventory data are from 2000.

Source: Adapted from UNFCCC guidelines for national communications.

Both methods estimate savings from all measures and therefore include the impact of national measures related to EU CCPMs as well as strictly national policies.

The merits of each method – which, in theory, should give similar results – are contrasted. The top-down approach would seem best fitted to analyse the aggregated effects of PAMs on total emissions, including at sectoral level, as it does not rely on a comprehensive assessment by each Member State of all its policies and measures. This is the case for the effects of additional PAMs, where distinct WEM and WAM scenarios are reported by most of the Member States. In all but one case (waste sector in 2010), the top-down method provides larger estimates of the total impact of additional policies and measures than the bottom-up method.

Assessing the total effects of existing policies and measures at sectoral level is more difficult because the limited availability of WOM scenarios from Member States reduces the interest of the top-down approach, while the bottom-up method underestimates savings for the sectors (such as energy and industrial processes) affected by 'cross-cutting' PAMs ([25]). The bottom-up method provides larger estimates for the energy and transport sector, however in the remaining sectors, the top-down estimate is higher. In 2009, only ten Member States have provided a WOM projection, therefore the bottom-up approach is taken to be best fitted for estimating the effects of existing PAMs. In the figures presented throughout this chapter, the savings from existing PAMs calculated using the bottom-up approach and the savings from additional PAMs calculated using the top-down approach are combined, unless otherwise stated.

[25] Emission savings from cross-cutting PAMs are not distributed into each of the sectors these PAMs target.

3 Greenhouse gas emission targets in Europe

Emission targets in Europe under the Kyoto Protocol (2008–2012)

- The Kyoto Protocol sets binding targets for 37 industrial countries and the European Community (EU-15) for reducing greenhouse gas emissions.
- All EEA member countries, including the EU and its 27 Member States, and Croatia have ratified the Kyoto Protocol. All, except Cyprus, Malta and Turkey, have individual national targets to be achieved in the first commitment period 2008–2012.
- The European Community (EU-15) is committed to reducing its greenhouse gas emissions by 8 % compared to the base year. The EU-27 does not have a common target.
- For a party to the Protocol, achieving its Kyoto target requires that GHG emission levels during the first commitment period are no higher than the total number of Kyoto units held by that Party. GHG emissions can be limited or reduced through domestic action. The number of Kyoto units can be increased by achieving GHG removals through carbon sink activities and, in supplement to domestic action, by purchasing additional units from other Parties through the Kyoto mechanisms. The initial number of Kyoto units attributed to each Party (the assigned amount) is established according to the Party's initial Kyoto target.
- In 2010, the analysis of progress of Member States and the EU-15 towards their respective Kyoto targets will be carried by the EEA through a new indicator. This will take into account different accounting and emissions units, based on available information from registries.
- International negotiations are ongoing to decide on future commitments to reduce global emissions by 50 % by 2050, in order to limit climate change to 2°C above pre-industrial levels.
- The EU is committed unilaterally to reducing its overall emissions by 20 % in 2020 compared to 1990 levels, which is equivalent to a 14 % reduction compared to 2005 levels.
- The EU climate and energy package adopted in 2009 aims to achieve the 2020 EU target by setting a 21 % reduction target compared to 2005 for emissions falling under the EU emission trading scheme (ETS) and a 10 % reduction target compared to 2005 for emissions from the non-trading sectors. The ETS target must be achieved at EU level while the non-trading target must be achieved by each Member State, for which an individual target has been set.
- The EU is committed to reducing greenhouse gas emissions by 30 % by 2020 compared to 1990 as its contribution to a global and comprehensive agreement for the period beyond 2012. The commitment is conditional on other developed countries committing to comparable emission reductions and economically more advanced developing countries contributing adequately according to their responsibilities and respective capabilities.

Objectives under the EU climate and energy package

- A package of six legislative texts known as the climate and energy package were adopted by the Council on 23 April 2009. The package will help the EU achieve its unilateral commitment to reduce its greenhouse gas emissions by 20 % by 2020 compared to 1990.

- The new legislation strengthens and expands the emission trading scheme (EU ETS), and sets a single EU-wide cap on ETS emissions for the period 2013–2020, instead of national caps determined in national allocation plans, as in the two first trading periods. Free allocation of emission allowances will be progressively replaced by auctioning of allowances.
- Although not included in the package, the inclusion of aviation in the EU ETS from 2012 will be a major first step to curb emissions from this sector, currently experiencing the fastest growth in greenhouse gas emissions.
- Emissions from sectors not included in the EU ETS will have to be cut by 10 % from 2005 levels by 2020. Member States all have individual targets expressed as a percentage, under a new 'effort sharing'. A linear target path is established for these emissions, requiring Member States to reduce emissions gradually between 2013 and 2020.
- To achieve by 2020 a mandatory 20 % share of energy from renewable sources in the EU's gross final consumption of energy and a 10 % share of energy from renewable sources in each Member state's transport energy consumption, national targets for the overall share of energy from renewable sources in gross final consumption of energy have been set. Each EU country will adopt a national renewable energy action plan and apply support schemes or measures of cooperation between different Member States and with third countries.
- The package seeks to promote the development and safe use of carbon capture and storage (CCS) by providing a legal framework for the deployment of this technology in the EU.
- Average CO_2 emissions from new passenger cars will have to be brought down to 120 g CO_2 / km. This will be achieved by a reduction to 130 g CO_2 / km through engine technology plus an additional cut of 10 g CO_2 / km through more efficient vehicle features, for instance air-conditioning systems or tyres.
- greenhouse gas emissions from fuels will have to decrease by 6 % by 2020 over the entire fuel life-cycle. This will be achieved in particular by blending biofuels with petrol and diesel as well as by improving production technology in refineries. Revised environmental quality standards as well as sustainability criteria for biofuels will apply from 2011.

Combating climate change and minimising its potential consequences by achieving stabilisation of atmospheric greenhouse gas concentrations are key objectives of the United Nations Framework Convention on Climate Change (UNFCCC) and are a high priority for the European Union.

The Kyoto Protocol was the first international agreement that set binding targets to be achieved during the commitment period (2008–2012) for 37 industrialised countries. The UNFCCC holds annual meetings, where parties to the Convention (COP) meet to review the implementation of the Convention. Decisions taken by the COP make up a detailed set of rules for practical and effective implementation of the Convention. The COP serves as the meeting of the Parties to the Kyoto Protocol (CMP). In 2005, at the United Nations Climate Change Conference in Montreal, the process of developing a successor to the Kyoto Protocol started. Parties to the UNFCCC agreed at Bali in 2007 to jointly step up international efforts to combat climate change and reach an agreed outcome in Copenhagen in December 2009 at the fifteenth Conference of the Parties (COP15). The COP15 will aim to reach an ambitious deal to follow on the first phase of the Kyoto Protocol. The Copenhagen outcome must provide clarity on a number of issues, including in particular on the emission reduction targets that industrialised countries will commit to.

This Annex describes the current arrangements for 2008–2012 under the Kyoto Protocol and then the 2020 targets under the EU climate and energy package adopted in 2009.

3.1 Emission targets in Europe under the Kyoto Protocol (2008–2012)

3.1.1 The Kyoto Protocol

Under the UNFCCC, which entered into force on 21 March 1994, industrialised countries are encouraged to stabilise anthropogenic emissions of greenhouse gases. These countries are referred to as Annex I countries. In 1997, Parties to the UNFCCC adopted the Kyoto Protocol. The Protocol has mandatory targets on greenhouse gas emissions for Annex I countries which have accepted it, 'with a view to reducing their overall emissions of such gases by at least 5 % below 1990 levels in the commitment period 2008 to 2012'. However, since the United States of America has not ratified the Protocol, the absolute reduction target for those countries that have ratified the Protocol amounts to a lower value of approximately 2.8 % below the base-year emissions. The achievement by the EU-15 and the EU-12 Member States of their respective Kyoto targets (Table 3.1) by 2008–2012 would contribute to a 2.4 % reduction of the total greenhouse gas emissions of developed countries relative to 1990 levels.

As of 19 June 2009, 185 countries and 1 regional economic integration organization (the European Community - EU-15) had ratified, accepted, approved or acceded to ([26]) the Kyoto Protocol. This includes 41 Annex I Parties who account for 63.7 % ([27]) of total greenhouse gas emissions from all Kyoto Parties. The Kyoto Protocol entered into force on 16 February 2005, following ratification by the Russian Federation, which was necessary to represent at least 55 % of the emissions from all Annex I Parties to the Convention.

3.1.2 Kyoto and burden-sharing targets in Europe

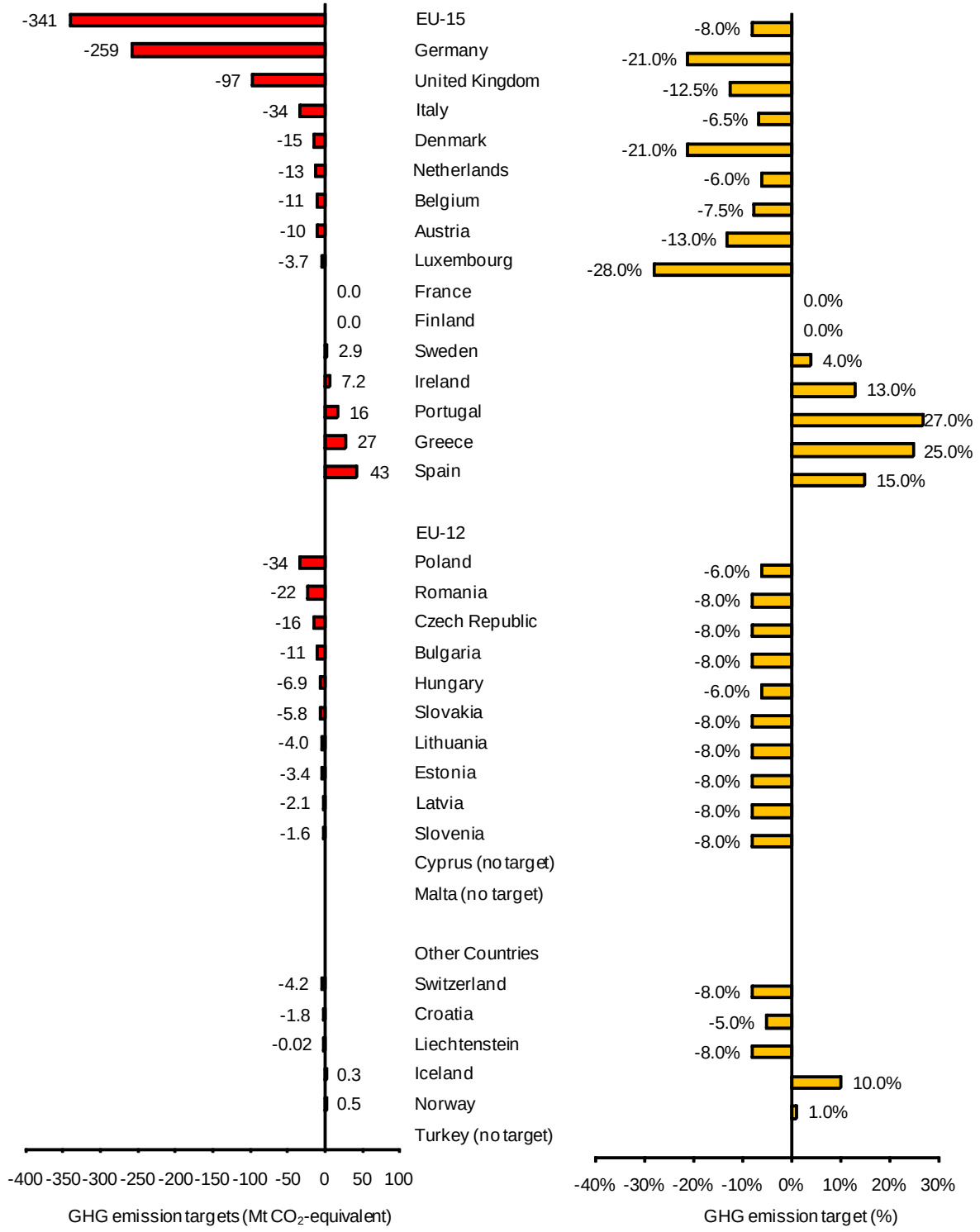
Under the Kyoto Protocol, the EU-15 has taken on a common commitment to reducing emissions by 8 % on average between 2008 and 2012, compared to base-year emissions. Within this overall target, differentiated emission limitation or reduction targets have been agreed for each of the 15 pre-2004 Member States under an EU accord known as the 'burden-sharing agreement' (Figure 3.1).

The EU-27 does not have any Kyoto target, since the Protocol was ratified before the 12 new Member States became EU Member States .Therefore the EU-12 Member States have individual targets under the Kyoto Protocol (apart from Cyprus and Malta, who do not have any target).

([26]) Acceptance, approval and accession have the same legal effect as ratification.

([27]) UNFCCC

Figure 3.1 Greenhouse gas emission targets in Europe under the Kyoto Protocol (2008–2012) relative to base-year emissions



Note: In Commission Decision 2006/944/EC, determining the respective emission levels allocated to the Community and each of its Member States under the Kyoto Protocol, the respective emission levels were expressed in t CO2-eq. In connection with Council Decision 2002/358/EC, the Council of Environment Ministers and the Commission have, in a joint statement, agreed to take into account inter alia the assumptions in Denmark's statement to the Council Conclusions of 16–17 June 1998 relating to base-year emissions in 2006. In 2006, it was decided to postpone a decision on this until after all Community and Member State initial reports have been reviewed under the Kyoto Protocol. Croatia's base-year emissions include an additional 3.5 Mt CO2-eq, in accordance with Decision 7/CP.12 of the Conference of the Parties under the UNFCCC.

Source: UNFCCC, EEA.

Of the additional EEA member countries, Iceland, Liechtenstein, Norway and Switzerland have individual targets under the Kyoto Protocol. Croatia has also an individual target. Turkey acceded to the Kyoto Protocol in February 2009 but, like Cyprus and Malta, has no commitment under the Kyoto Protocol.

3.1.3 Base-year emissions and assigned amounts units

Under the Kyoto Protocol, the greenhouse gas emission level in the 'base year' is the relevant starting point for tracking progress of domestic emissions for the EU-15 and all countries that have a Kyoto target. The EU-27 does not have a Kyoto target and an aggregated base year for the EU-27 is therefore not applicable in any discussion of progress towards Kyoto targets.

The base year is not a 'year' per se, but corresponds to an emission level from which emission reductions will take place. For most EU Member States, the base year is 1990 for CO_2, CH_4 and N_2O, and 1995 for fluorinated gases (SF_6, HFCs and PFCs). Five EU-12 Member States have base years or periods under the Convention and the Kyoto Protocol that differ from 1990 for CO_2, CH_4 and N_2O, due to the fact they were economies in transition (Table 3.1).

In accordance with Article 3.7 of the Kyoto Protocol, net emissions from the land use, land-use change and forestry sector during the base year can be taken into account for the calculation of the assigned amount. This was the case for the Netherlands, Portugal and the United Kingdom. Base-year emissions data have been subject to several revisions over past years, due to improved emission estimation methods or improved data. Final base-year levels under the Kyoto Protocol are now fixed for all Annex I Parties, following the review and approval by the UNFCCC. For the EU-15, the base-year emissions are 0.77 % higher than 1990 emissions.

Together with the base year, the assigned amount for each Party has been fixed and corresponds to the total allowed emissions during all five years of the first commitment period of the Kyoto Protocol (2008–2012). In general, the assigned amount of a Party is calculated by multiplying the Party's base-year emissions by its emission target and by multiplying the total by five, to account for the five years of the commitment period. The quantity of the initial assigned amount is counted in individual units, called assigned amount units (AAUs), each representing an allowance to emit one tonne of CO_2-eq.

Table 3.1 Greenhouse gas emission targets in Europe under the Kyoto Protocol and the burden-sharing agreement

	Ratified Kyoto Protocol	Emission target (%)	Base years for CO_2, CH_4, N_2O	Base years for HFCs, PFCs, SF_6	Base-year emissions (Mt CO_2-eq.)	Total assigned amount 2008–2012 (Mt CO_2-eq.)
EU-15 *	Yes	- 8.0 %	1990	1990, 1995	4 265.52	19 621.38
Austria	Yes	- 13.0 %	1990	1990	79.05	343.87
Belgium	Yes	- 7.5 %	1990	1995	145.73	674.00
Bulgaria	Yes	- 8.0 %	1988	1995	132.62	610.05
Cyprus	Yes	No target	Not	Not	No base	no target

			relevant	relevant	year	
Czech Republic	Yes	- 8.0 %	1990	1995	194.25	893.54
Denmark	Yes	- 21.0 %	1990	1995	69.32	273.83
Estonia	Yes	- 8.0 %	1990	1995	42.62	196.06
Finland	Yes	0 %	1990	1995	71.00	355.02
France	Yes	0 %	1990	1990	563.93	2 819.63
Germany	Yes	- 21.0 %	1990	1995	1,232.43	4 868.10
Greece	Yes	25.0 %	1990	1995	106.99	668.67
Hungary	Yes	- 6.0 %	1985- 87	1995	115.40	542.37
Ireland	Yes	13.0 %	1990	1995	55.61	314.18
Italy	Yes	- 6.5 %	1990	1990	516.85	2 416.28
Latvia	Yes	- 8.0 %	1990	1995	25.91	119.18
Lithuania	Yes	- 8.0 %	1990	1995	49.41	227.31
Luxembourg	Yes	- 28.0 %	1990	1995	13.17	47.40
Malta	Yes	No target	Not relevant	Not relevant	No base year	no target
Netherlands	Yes	- 6.0 %	1990	1995	213.03	1 001.26
Poland	Yes	- 6.0 %	1988	1995	563.44	2 648.18
Portugal	Yes	27.0 %	1990	1995	60.15	381.94
Romania	Yes	- 8.0 %	1989	1989	278.23	1 279.84
Slovak Republic	Yes	- 8.0 %	1990	1990	72.05	331.43
Slovenia	Yes	- 8.0 %	1986	1995	20.35	93.63
Spain	Yes	15.0 %	1990	1995	289.77	1 666.20
Sweden	Yes	4.0 %	1990	1995	72.15	375.19
United Kingdom	Yes	- 12.5 %	1990	1995	776.34	3 396.48
Other EEA member and EU candidate countries						
Croatia **	Yes	- 5.0 %	1990	1990	36.03	171.13
Iceland	Yes	10.0 %	1990	1990	3.37	18.52
Liechtenstein	Yes	- 8.0 %	1990	1990	0.23	1.06
Norway	Yes	1.0 %	1990	1990	49.62	250.58
Switzerland	Yes	- 8.0 %	1990	1990	52.79	242.84
Turkey	Yes	No target	Not relevant	Not relevant	No base year	no target

Note: * 1990 (Austria, France, Italy), 1995 (other EU-15 Member States)
** Croatia's base-year emissions include an additional 3.5 Mt CO2-eq. in accordance with Decision 7/CP.12 of the Conference of the Parties under the UNFCCC.

Source: UNFCCC.

3.1.4 Meeting commitments under the Kyoto Protocol

Compliance under the Kyoto Protocol can be achieved by a combination of:

- domestic action (to limit or reduce greenhouse gas emissions),
- use of the Kyoto mechanisms, which allow acquisition of additional Kyoto units from other Parties, provided that this is supplemental to domestic action,
- carbon sink activities to remove greenhouse gases, which can generate additional Kyoto units.

Domestic action

Countries with commitments under the Kyoto Protocol to limit or reduce greenhouse gas emissions must meet their targets primarily through national (domestic) emission reduction policies and measures. The Kyoto Protocol does not oblige governments to implement any particular policy, but rather gives an indicative list of policies and measures that might help cut emissions and promote sustainable development. This list includes:

- promoting renewable energy, carbon sequestration and other environmentally-sound technologies;
- enhancing energy efficiency;
- tackling transport sector emissions;
- protecting and enhancing carbon stocks;
- promoting sustainable agriculture;
- removing subsidies and other market imperfections for environmentally-damaging activities;
- encouraging reforms in relevant sectors to promote emission reductions;
- controlling methane emissions through recovery and use in waste management.

Projections from Member States are based on expected emission reductions resulting from the current existing policies and measures, and additional policies and measures.

Existing policies and measures are those for which one or more of the following apply:

- national legislation is in force;
- one or more voluntary agreements have been established;
- financial resources have been allocated;
- human resources have been mobilized;
- an official government decision has been taken and there is a clear commitment to proceed with implementation.

Additional (planned) policies and measures are options under discussion with a realistic chance of being adopted and implemented in time to influence the emissions during the commitment period.

Detailed information on the type of existing and additional policies and measures to reduce or limit greenhouse gas emissions and their projected effects by 2010, is presented in Section 2.

Use of Kyoto mechanisms

As an additional means of meeting commitments under the Kyoto Protocol, three market-based mechanisms were introduced to lower the overall costs of achieving emission targets for the commitment period 2008–2012: joint implementation (JI), clean development mechanism (CDM) and international emission trading. Use of these mechanisms must be 'supplemental to domestic action' to achieve the Kyoto Protocol targets.

JI and the CDM enable developed countries to invest in approved projects ([28]) leading to emission reductions, hosted by other countries (developed countries for JI, developing countries for CDM). Investing countries can use the resulting emission credits to meet their Kyoto targets. These mechanisms aim in particular at stimulating investment and transfer of clean technologies, while providing flexibility for developed countries to meet their emission targets.

([28]) Project activities under the CDM must be fully registered and approved by the CDM executive board. See: http://unfccc.int/kyoto_protocol/mechanisms/items/1673.php

International emission trading allows countries that have achieved emission reductions beyond those required by the Kyoto Protocol to sell their surplus Kyoto units to countries finding it more difficult or expensive to meet their commitments.

For further information on Kyoto mechanisms see Annex A.3.

Use of carbon sink activities

In addition to policies and measures targeting sources of greenhouse gas emissions, Member States can also use policies and measures to protect their existing terrestrial carbon stocks (e.g. through reduced deforestation, devegetation, forest degradation, and land degradation) and to enhance terrestrial carbon stocks (e.g. increasing the area or carbon density of forests by afforestation and reforestation, rehabilitating degraded forests, altering the management of forest and agricultural lands to sequester more carbon in biomass and soil). These activities, dubbed land use, land-use change and forestry (LULUCF) activities were included in the Kyoto Protocol to mitigate carbon emissions and as a mechanism for countries to meet their commitments to reduce net emissions to the atmosphere. They include:

- mandatory activities covered by Article 3.3 of the Kyoto Protocol (afforestation, reforestation and deforestation)
- voluntary activities under Article 3.4 of the Kyoto Protocol (forest management, cropland management, grazing land management and revegetation).

For further information on carbon sinks see Annex A.5.

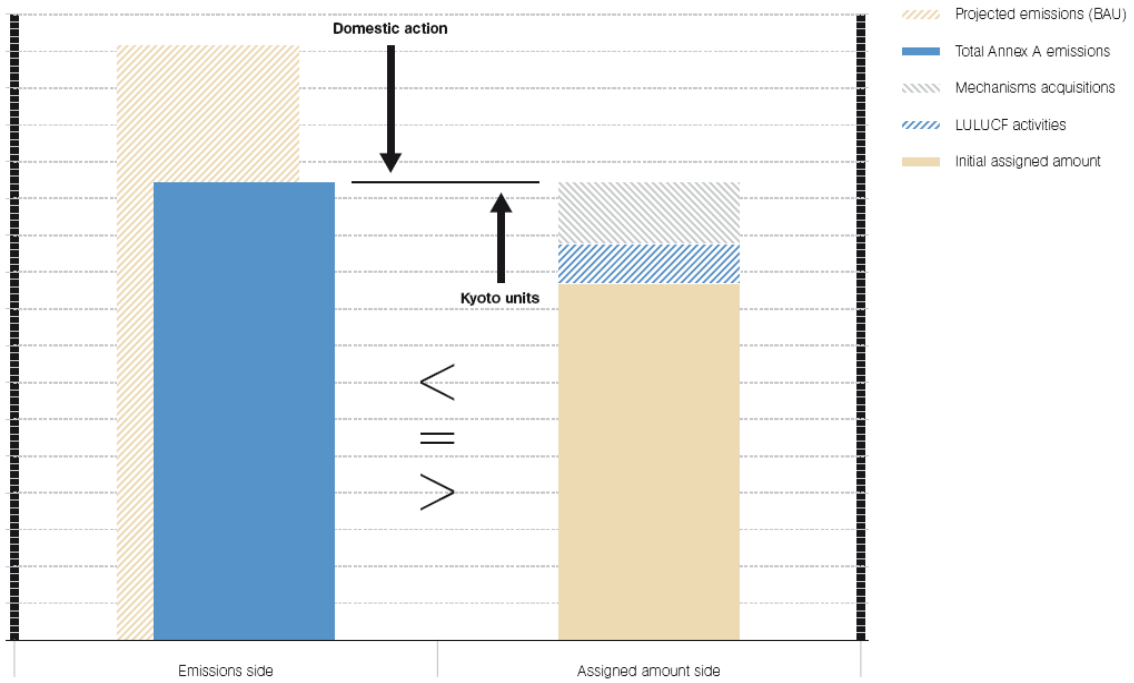
3.1.5 Determination of compliance under the Kyoto Protocol

Each Party is required to maintain a national system to estimate its greenhouse gas emissions and removals, along with a national registry to account for Kyoto units (AAUs, RMUs, CERs and ERUs), all equivalent to 1 tonne of CO_2-eq. Emission units may be exchanged through emission trading, whereby all transactions are monitored in a transaction log. The UNFCCC secretariat also monitors the trading within an independent transaction log (ITL), which will be the basis for the final accounting at the end of the commitment period. As 2012 emissions are reported in inventories submitted in 2014, the final assessment of compliance under the Kyoto Protocol will not take place before 2014.

At the end of the commitment period, the determination of each Annex I Party's compliance with its emission commitment will be made by comparing its total emissions during the first commitment period (2008–2012) to the assigned amount available in its national registry. Each Party's available assigned amount is equal to its initial assigned amount resulting from base-year emissions and Kyoto target and measured in assigned amount units (AAUs), plus any additional Kyoto units that the Party has acquired from other Parties through the Kyoto mechanisms (CERs, ERUs, AAUs) or issued for net removals from a LULUCF activity (RMUs), minus any units that the Party has transferred to other Parties (CERs, ERUs, AAUs) or cancelled for net emissions from a LULUCF activity. EUAs (European Union allowances) currently equivalent to AAUs may be purchased or sold by ETS operators and can therefore influence the total number of Kyoto units (Cf. Section 7.2 of the main report).

Figure 3.2 shows the relationship between domestic action, LULUCF activities and the Kyoto mechanisms in meeting a Kyoto target (Article 3.1 under the Kyoto Protocol).

Figure 3.2 Determination of compliance with a Kyoto target



Source: Kyoto Protocol Reference Manual on accounting of emissions and assigned amount, UNFCCC (November 2008), p. 19.

3.2 Objectives under the EU climate and energy package

In March 2007, the Council of the European Union decided on an EU independent commitment to reduce its overall greenhouse gas emissions to at least 20 % below 1990 levels by 2020, and to scale up this reduction to as much as 30 % under a new global climate change agreement if other developed countries make comparable efforts. The EU has also set itself the target of increasing the share of renewables in energy use to 20% by 2020. On 23 January 2008, the European Commission put forward a package of proposals aiming to deliver on the EU's commitments to fight climate change and promote renewable energy up to 2020 and beyond. This climate and energy package sets out the contribution expected from each Member State to meeting these targets and proposes a series of measures to help achieve the targets, transform Europe into a low-carbon economy and increase its energy security. In December 2008, the European Parliament and Council reached an agreement in first reading on the package. The package includes six legislative texts, which were adopted by the Council on 23 April 2009 and published in the Official Journal of the European Union on 5 June 2009.

The six component legislative texts are described in more detail in the following sections.

3.2.1 Directive revising the EU Emission Trading Scheme (EU ETS)

A strengthening and expansion of the EU ETS (29), the EU's key tool for cutting emissions cost-effectively, is central to the EU strategy. The Directive 2009/29/EC revising the Emission trading Directive (2003/87/EC) was adopted as part of the EU climate and energy package on 23 April 2009. It covers more than 40 % of EU greenhouse gas emissions and almost half of EU total CO2 emissions. The main changes compared to the regulation in the first and second trading period are:

Emissions from the sectors covered by the system will have to be cut by 21 % by 2020 compared with levels in 2005. A single EU-wide cap on ETS emissions is set (instead of national caps determined in national allocation plans, as in the two first trading periods).

The third trading period will start on 1 January 2013 and run until 2020. The emission cap decreases annually along a linear trend (factor 1.74 %) between 2013 and 2020 (see Table 3.2 in Section 3.2.7. and continues beyond that date until it is revised no later than 2025.

Free allocation of emission allowances will be progressively replaced by auctioning of allowances, with auctioning becoming the basic principle for allocation. Industrial ETS sectors not significantly at risk of carbon leakage must start by purchasing 20 % of their emissions permits at auctions in 2013 and that rate will rise gradually to 70 % in 2020. In general the power sector will no longer receive free allowances as of 2013, but derogations will be possible to facilitate the energy transition for countries with high dependence on fossil fuel or insufficient connection to the European electricity network.

Emission trading will be extended to additional sectors (e.g. aluminium processing) and additional greenhouse gases from certain activities (e.g. N2O). At the same time small installations (<25 000 t CO2 per year) can be excluded from the ETS under certain conditions.

The directive also provides for a solidarity mechanism in order to help less affluent EU Member States with the transition to a low-carbon economy. These countries will receive more emissions permits to auction, giving them an opportunity to generate substantial revenues from selling allowances. Each Member State will determine the use of its revenues from auctioning EUAs, but at least half of the proceeds should be used to combat climate change in the EU and abroad and to alleviate the social consequences of moving towards a low-carbon economy. In addition, up to 300 million emission allowances will be set aside for the financing of clean technologies (estimated value EUR 6 to 9 billion). This will contribute to the funding of up to twelve demonstration projects in carbon capture and storage and innovative renewable energy projects.

The generation of credits by use of JI (ERUs) and CDM (CERs) is still foreseen in the revised directive, which allows a limited additional quantity to be used in such a way that the overall use of credits is limited to 50 % of the EU-wide reductions below 2005 levels over the period 2008–2020.

Finally, the directive includes provision for a possible modification after the conclusion of an international agreement to fight climate change and a subsequent change in EU overall

(29)Directive 2009/29/EC, MEMO/08/796

reduction target. The revised ETS will apply from the start of its third trading period on 1 January 2013. Member states must bring the acts necessary for compliance with the directive into force by 31 December 2012.

From 1 January 2012, air transport will be included in the EU ETS (although this is not formally part of the climate and energy package). A separate directive (2008/101/EC) regulates the inclusion of aviation activities in the EU ETS. All flights landing or starting in the EU are included. Allowances are allocated according to a benchmark based on a cap (97% of average emissions 2004–2006 in 2012 going down to 95% for the consecutive years) and the freight transport (tkm) of all involved aircraft operators in 2010. 15 % of the allowances will be auctioned.

Specific details on greenhouse gas 2020 targets are provided in Section a.3.2.7.

3.2.2 'Effort sharing' Decision setting binding national targets for emissions from sectors not covered by the EU ETS

The Effort-Sharing Decision (30) between Member States applies only for the reduction in emissions from sectors not covered by the EU ETS. These include emissions from transport, housing, agriculture, waste and small industrial installations. Overall, emissions will have to be cut by 10 % from 2005 levels by 2020 and Member States all have individual targets expressed as a percentage reduction (see **Table 3.3** in Section 3.2.7). Member States have agreed to share this effort in line with the principles of solidarity and equity so that individual countries have different targets set with consideration given to their economic situation (GDP), population and past emission trends. EU Member States with low GDP per capita and strong prospects for economic growth may increase their carbon emissions by up to 20 %, whereas those with high national income per head must cut CO2 emissions by up to 20 %.

A linear target path is established for these emissions, requiring Member States to reduce emissions gradually between 2013 and 2020. The national trajectory of carbon emissions until 2020 is binding on Member States and enforceable through the usual EU infringement procedure. In addition to the infringement procedure, a Member State that exceeds its annual emission allocation, even after taking into account the flexibility provisions and the use of JI/CDM credits, will face a deduction from the annual emission allocation for the next year of the excess emissions multiplied by 1.08 (8% interest rate).

To make the reductions more cost-effective, the Council has introduced several flexibility mechanisms, including the possibility of trading emissions cuts among Member States and carrying forward excess reductions to future years. EU countries can also use a limited amount of carbon credits from developing countries, through the CDMs. The combined effect of the flexibility mechanisms would be to cut costs while ensuring that emissions drop substantially in the EU and abroad.

The decision also includes provision for its adaptation after the conclusion of an international agreement to fight climate change and for a subsequent move beyond the EU's overall 20 % reduction target.

[30] Decision No 406/2009/EC, MEMO/08/797, PE-CONS 3738/08

Under the Kyoto Protocol and previous EU legislation, Member States were responsible for the entirety of greenhouse gas emissions in their country and the Kyoto or burden-sharing targets cover all these emissions. This new legislation therefore abolishes the concept of overall national targets, since Member States remain only responsible for non-trading emissions.

Specific details on greenhouse gas 2020 targets are provided in Section a.3.2.7.

3.2.3 Directive setting binding national targets for increasing the share of renewable energy sources in the energy mix

The national renewable energy targets proposed for each Member State aim to help achieve emissions reductions and alleviate the European Union's dependence on foreign sources of energy. The aim of the Directive (31) is to achieve by 2020 a 20 % share of energy from renewable sources in the EU's gross final consumption of energy ([32]) and a 10 % share of energy from renewable sources in each Member state's transport energy consumption. To achieve these objectives, the directive for the first time sets for each Member State a mandatory national target for the overall share of energy from renewable sources in gross final consumption of energy, taking account of countries' different starting points.

To ensure that the mandatory national targets are achieved, Member States are required to follow an indicative trajectory towards the achievement of their target. Each Member State will adopt a national renewable energy action plan setting out its national targets for the share of energy from renewable sources consumed in transport, electricity, heating and cooling in 2020 and will notify it to the Commission by June 2010. To reach the mandatory targets, Member States are able to apply support schemes or measures of cooperation between different Member States and with third countries.

The 10 % target for the transport sector is set at the same level for each Member State in order to ensure consistency in transport fuel specifications and availability. The new directive also lays down rules relating to statistical transfers between Member States, joint projects between Member States and with third countries, guarantees of origin, administrative procedures, information and training, and access to the electricity grid for energy from renewable sources.

Finally, the directive establishes sustainability criteria for biofuels and bioliquids with the aim of ensuring, in particular, that biofuels and bioliquids can be counted as renewable energy for the purposes of this directive only when it can be guaranteed that they meet these criteria which relate inter alia to biodiversity, the protection of rare, threatened or endangered species and ecosystems, and greenhouse gas emission savings.

Member States are required to transpose the directive into national law within 18 months after its publication in the Official Journal of the EU.

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[31] Directive 2009/28/EC, MEMO/08/797, PE-CONS 3838/08

[32] 'Gross final consumption of energy' means the energy commodities delivered for energy purposes to industry, transport, households, services including public services, agriculture, forestry and fisheries, including the consumption of electricity and heat by the energy branch for electricity and heat production and including losses of electricity and heat in distribution and transmission.

3.2.4 Directive creating a legal framework for use of carbon capture and storage technologies

The package also seeks to promote the development and safe use of carbon capture and storage (CCS), a suite of technologies that allows the carbon dioxide emitted by industrial processes to be captured and stored underground where it cannot contribute to climate change. Revised guidelines on state aid for environmental protection will enable governments to support CCS demonstration plants.

This Directive (33) is intended to provide the legal framework for the deployment of this technology in the EU, which could help to mitigate climate change. Whether to use carbon capture and storage or not is still a matter for independent decision by each EU Member State. For EU countries that wish to do so, the directive sets out the conditions for the assessment of storage sites, for authorisation procedures and for the closure of such sites. In order to ensure harmonized application throughout the European Union, the Commission will review draft storage permits and draft decisions on closure prepared by national authorities before their final approval.

Operators are obliged to monitor storage sites and report to the Member State's authorities, both while storing carbon dioxide and after the cessation of storage activities and closure of sites. Responsibility for a site reverts to a public authority when sufficient proof is obtained that the carbon dioxide will be completely and permanently contained.

Member states are required to transpose the directive into national law within two years.

3.2.5 Regulation for CO2 emissions from passenger cars

CO2 emissions from passenger cars are a key contributor to greenhouse gas emissions in the non-ETS sector. As the voluntary agreements by car manufacturers failed, this regulation ([34]) will give legal effect to the EU's existing goal of reducing average emissions from new cars to 120 g CO2 / km. This is to be achieved in two ways: a reduction to 130 g CO2 / km through engine technology plus an additional cut of 10 g CO2 / km through more efficient vehicle features, for instance air-conditioning systems or tyres.

The new regulation (443/2009/EC) makes these objectives binding for the average fleet of a given car manufacturer in successive stages: In 2012, 65 % of their car fleet must meet the target, in 2013 75 % and in 2014 80 %. From 2015, the entire fleet needs to comply with the CO2 emissions objective. The Council proposed this phase-in to respect the length of industrial planning and production cycles and give the automotive industry the necessary time to adjust.

To send a signal to industry for further production cycles, Council and European Parliament introduced in addition an objective of 95 g CO2 / km for 2020. By 2013, the Commission is required to review the modalities for reaching this target.

If car manufacturers do not comply with the mandatory CO2 targets, they face penalties depending on how far their fleet exceeds the targets and on the number of their new passenger cars. From 2012 until 2018, EUR 5 per newly registered car must be paid for the

[33] Directive 2009/31/EC), PE CONS 3739/08, 8036/09 ADD1, MEMO/08/798

[34] Regulation (EC) No 443/2009, PE CONS 3741/08, MEMO/08/799

first gram above the target. For the second gram of exceedance EUR 15 are due and EUR 25 for the third gram. For emissions of more than 3 grams over the limit, EUR 95 will be charged per newly registered vehicle. From 2019, the penalty will be EUR 95 per new car for every gram above the target.

Manufacturers can improve their fleet emissions performance by including eco-innovations, i.e. new technology that is not measured through the standard EU CO2 emissions test, or by producing ultra-low emissions cars, which emit less than 50 g CO2 / km. Niche manufacturers can be excluded from the regulation under certain conditions.

The regulation will come into force shortly after its publication in the Official Journal of the EU and will be effective without implementing measures, although the emissions targets will apply only as of 2012.

3.2.6 Directive on environmental quality standards for fuel

The revised directive ([35]) introduces for the first time a reduction target for greenhouse gas emissions from fuels. By 2020, fuel suppliers have to decrease by 6 % greenhouse gas emissions over the entire life cycle of their products. This can be reached in particular by blending biofuels with petrol and diesel as well as by improving production technology in refineries. Member States may require an additional 4 % reduction from fuel companies, achieved through the supply of energy for electric vehicles or other clean technologies, including carbon credits from third countries (CDM).

To enable these greenhouse gas emissions cuts, a higher biofuel content is permitted in petrol. From 2011, petrol may contain up to 10 % ethanol. In order to avoid damage to old cars, however, fuel with 5 % ethanol (E5) will continue to be available until 2013, with the possibility for Member States to extend that period.

The directive also lays down stringent environmental and social sustainability criteria for biofuels, which correspond to those in the Directive on the promotion of energy from renewable sources (3736/08). The revised environmental quality standards as well as the sustainability criteria for biofuels will apply from 2011.

Member States are required to transpose the directive into national law by the end of 2010.

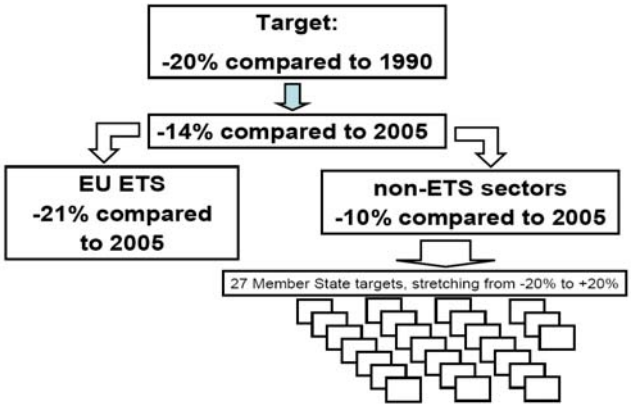
3.2.7 EU emission targets by 2020

The EU is committed to reducing its overall emissions to at least 20% below 1990 levels by 2020, and is ready to scale up this reduction to as much as 30% under a new global climate change agreement if other developed countries make comparable efforts. It has also set itself the target of increasing the share of renewables in energy use to 20% by 2020.

Following a January 2008 legislative proposal from the European Commission and an agreement between the European Council and the European Parliament on a climate and energy package in December 2008, six legislative acts were adopted on 23 April 2009, with the overall objective to reduce EU greenhouse gas emissions to 20 % below 1990 level in 2020. This was done by setting legally binding targets (Figure 3.3), with a split between emissions covered by the EU emission trading scheme (EU ETS) and the other emissions.

[35] Directive 2009/30/EC, PE CONS 3740/1/08, MEMO/08/800

Figure 3.3 Distribution of reduction effort for the unilateral EU target of - 20 % compared to 1990



Source: European Commission.

Emissions from the sectors covered by the EU ETS will have to be cut by 21 % by 2020 compared with the levels in 2005. To achieve this aim, an EU-wide target for the trading sector (representing approximately 43 % of total emissions in 2007) is set, with uniform allocation rules for installation allowances. From 2013, the total number of allowances will decrease annually in a linear manner. The starting point of this line is the average total number of allowances (phase 2 cap) to be issued by Member States for the 2008–2012 period, adjusted to reflect the broadened scope of the system from 2013 as well as any small installations that Member States have chosen to exclude. The linear factor by which the annual amount shall decrease is 1.74% in relation to the phase 2 cap.

Table 3.2 Tentative annual cap figures for the third trading period

Year	Mt CO_2-eq.
2013	1 974
2014	1 937
2015	1 901
2016	1 865
2017	1 829
2018	1 792
2019	1 756
2020	1 720

Note: These figures are based on the scope of the ETS as applicable in phase 2 (2008 to 2012), and the Commission's decisions on the national allocation plans for phase 2, amounting to 2083 million tonnes. These figures will be adjusted for several reasons. Firstly, adjustment will be made to take into account the extensions of the scope in phase 2, provided that Member States substantiate and verify their emissions accruing from these extensions. Secondly, adjustment will be made with respect to further extensions of the scope of the ETS in the third trading period. Thirdly, any opt-out of small installations will lead to a corresponding reduction of the cap. Fourthly, the figures do not take account of the inclusion of aviation, nor of emissions from Norway, Iceland and Liechtenstein.

Source: European Commission, Questions and Answers on the revised EU Emissions Trading System, MEMO/08/796, 17/12/2008.

EU-27 emissions from sectors not included in the EU ETS will have to be cut by 10 % from 2005 levels by 2020. To achieve this aim, mandatory individual national targets covering 'non-trading emissions' are set. As with the third phase of the EU ETS, these national targets for non-ETS emissions foresee a linear reduction path in 2013–2020. In the Effort Sharing Decision (406/2009/EC), Member States are set annual binding emission limits in accordance with the reduction path and they must report their emissions to the Commission each year. This will ensure a gradual move towards agreed 2020 targets in sectors where changes take time, such as buildings, infrastructure and transport.

Table 3.3 National greenhouse gas targets for emissions from sectors not covered by the EU ETS, by 2020

Country	Target for non-ETS emissions (by 2020, compared with 2005 level)
Austria	- 16 %
Belgium	- 15 %
Bulgaria	20 %
Cyprus	- 5 %
Czech Republic	9 %
Denmark	- 20 %
Estonia	11 %
Finland	- 16 %
France	- 14 %
Germany	- 14 %
Greece	- 4 %
Hungary	10 %
Ireland	- 20 %
Italy	- 13 %
Latvia	17 %
Lithuania	15 %
Luxembourg	- 20 %
Malta	5 %
Netherlands	- 16 %
Poland	14 %
Portugal	1 %
Romania	19 %
Slovak Republic	13 %
Slovenia	4 %
Spain	- 10 %
Sweden	- 17 %
United Kingdom	- 16 %

Source: Decision No 406/2009/EC, Annex II; Directive 2009/28/EC, Annex I.

The package retains the goal of a 30% reduction of EU greenhouse gas emissions by 2020 compared to 1990 as its contribution to a global and comprehensive agreement for the period beyond 2012, provided that other developed countries commit themselves to comparable emission reductions and that economically more advanced developing countries should contribute adequately according to their responsibilities and respective capabilities. The proportion between the reduction effort in the trading and non-trading sectors is intended to remain constant in the case of an adequate international agreement and a stricter EU reduction obligation. Both the Effort Sharing Decision and the revised EU ETS Directive (2009/29/EC) contain an automatic procedure for increasing the targets after the conclusion of such an agreement.

4 Use of Kyoto mechanisms

- For the EU-15, the projected use of Kyoto mechanisms amounts to 93.1 Mt CO_2-eq. per year of the commitment period.
- This represents approximately 27 % of the total required emission reduction for the EU-15 under the Kyoto Protocol, or 2.2 percentage points of the 8 % emission reduction commitment.
- The intended acquisition of these units by the EU-15 through international emission trading, JI or CDM represents an investment of EUR 2 962 million for the whole five-year commitment period.

4.1 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 'flexible 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):

- international emission trading ([36]),
- joint implementation (JI),
- the clean development mechanism (CDM).

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.

4.1.1 International emission 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. International emission trading allows countries that have achieved

[36] This type of emission 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.

emission reductions beyond those required by the Kyoto Protocol to sell their surplus Kyoto units to countries finding it more difficult or expensive to meet their commitments.

Although the Kyoto Protocol does not address domestic or regional emission trading, the Kyoto mechanism of international emission trading forms an umbrella under which national and regional trading schemes can operate. Annex I Parties may choose to implement domestic or regional (e.g. with a group of Parties) schemes for entity-level emission trading (e.g. between operators of industrial installations).

The European Union emission trading scheme (EU ETS), an EU measure to reduce CO_2 emissions from certain installations in the EU, is one example of such a regional trading system operating under the Kyoto Protocol umbrella. Trading takes place between private entities. To ensure consistency with the accounting rules under the Protocol, the transfer of an EU ETS allowance from a private entity in one Member State to a private entity in another corresponds to a transfer of one Kyoto allowance between the two countries. This transfer is reflected in the accounting under the Kyoto Protocol.

4.1.2 Joint implementation

Joint implementation (JI) is provided for under Article 6 of the Kyoto Protocol. It enables industrialised countries (Annex I Parties) 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. An emission credit generated by JI is called an emission reduction unit (ERU), equivalent to an allowance to emit one tonne of CO_2-eq. ERUs are received for the emission reductions or removals achieved through a project in the host country.

JI 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 project. The use of carbon sinks (e.g. forestry projects) is also permitted under JI.

4.1.3 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).

CDM projects result in three types of Kyoto units: certified emission reduction (CER) units are issued for projects that reduce emissions, while temporary CERs (tCERs) and long-term CERs (lCERs) may be issued for projects that enhance removals through afforestation and reforestation projects.

The rules governing CDM projects allow only certain types of carbon sinks projects (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.

4.2 Projected emission reductions through Kyoto mechanisms

Twenty-one Member States updated or confirmed information on their intended use of the Kyoto mechanisms in 2009 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 in the projection report was used.

Eleven Member States have decided to use the Kyoto mechanisms at government level[37] for compliance (Table 4.1). 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 93.1 Mt CO_2-eq. per year of the commitment period. This amount corresponds to 27 % of the total required emission reduction for the EU-15 of 341 Mt CO_2-eq. per year during the first commitment period compared to base-year emissions or 2.2 % of the 8 % emission reduction commitment.

Hungary is the only Member State that has reported quantified projections for selling assigned amount units (AAUs).

[37] Beyond the intended use of Kyoto mechanisms at government level, Kyoto units are used at EU ETS operators' level. The available estimates show a balance of 61.2 Mt per year for the EU-15 (Table 4.1).

Table 4.1 Planned use of Kyoto mechanisms by EU Member States

EU Member State	Planned use of Kyoto mechanisms at government level	Type of Kyoto mechanisms (IET, JI, CDM)	Achievement of Kyoto target planned through domestic action only	Intended use of flexible mechanisms at government level [Mt CO_2-eq./yr]	Allocated budget at government level [million EUR]
Austria	Yes	IET, JI, CDM	No	9.0	531
Belgium	Yes	IET, JI, CDM	No	4.4	252
Bulgaria	No	-	Yes	-	-
Cyprus	No	-	Not applicable [(a)]	-	-
Czech Republic	No	-	Yes	-	-
Denmark	Yes	IET, JI, CDM	No	4.2	152
Estonia	No	-	Yes	-	-
Finland	Yes	IET, JI, CDM	No	1.4	70
France	No	-	Yes	-	-
Germany	No	-	Yes	-	-
Greece	No	-	Yes	-	-
Hungary	Yes	IET	Yes	-16.5 [(b)]	-
Ireland	Yes	IET, JI, CDM	No	3.6	290
Italy	Yes	IET, JI, CDM	No	17.1	79
Latvia	No	-	Yes	-	-
Lithuania	No	-	Yes	-	-
Luxembourg	Yes	IET, JI, CDM	No	3.7	330
Malta	No	-	Not applicable [(a)]	-	-
Netherlands	Yes	IET, JI, CDM	No	13.0	506
Poland	No	-	Yes	-	-
Portugal	Yes	IET, JI, CDM	No	4.8	305
Romania	No	-	Yes	-	-
Slovak Republic	No	-	Yes	-	-
Slovenia	Yes	IET, JI, CDM	No	1.0 [(c)]	80
Spain	Yes	IET, JI, CDM	No	31.8	409
Sweden	No	(JI, CDM)	Yes	(2) [(d)]	38
United Kingdom	No	-	Yes	-	-
Total EU-15	**Yes**	**IET, JI, CDM**	**No**	**93.1**	**2 962**
Total EU-27	**Yes**	**IET, JI, CDM**	**No**	**77.6**	**3 042**

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] Hungary is the only country that has reported quantified projections for selling AAUs.

[c] Slovenia plans to acquire units either through project mechanisms or on the carbon market but has not yet decided on the exact quantity. The value depends on the actual development of emissions, especially in the transport sector.

[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 2 Mt CO_2-eq. per year through the Swedish CDM and JI programme. This figure has not been considered in the target assessment for Sweden and EU-15.

For the EU ETS effect, a positive sign indicates that operators' emissions are expected to be higher than the cap; a negative sign indicates them to be lower, respectively.
The exchange rates US$ and SEK per Euro were assumed to be 1.4 and 10.19, respectively.

Source: Questionnaires and projection reports submitted under the EC greenhouse gas Monitoring Mechanism; Member States comments to draft report.

4.3 Allocated budgets

Of the eleven EU-15 Member States that allocated resources for the use of Kyoto mechanisms, only Sweden does not intend to use the units for meeting its Kyoto target. 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 531, EUR 330, EUR 506, EUR 305 and EUR 409 million, respectively, for the five-year commitment period).

Together the eleven EU-15 Member States decided to invest EUR 2 962 million (including 38 million from Sweden) for the acquisition of allowances through international emission trading, JI or CDM for the whole five-year commitment period.

In Slovenia, the preliminary budget will be set at a maximum of EUR 80 million.

4.4 Type of projects

Table 4.2 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 4 624 projects are expected to deliver 3084 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 ([38]) for non-CO_2 gases (CH_4: 21, N_2O: 310; HFC-23: 11 700),
- the abundance of point sources with large emissions, and
- low abatement costs.

Twenty-seven projects for the destruction of HFC-23, a by-product of HCFC-22 production, are expected to generate 16 % of the overall emission allowances from project-based mechanisms. The second largest source for emission reductions are 1 210 hydroelectricity projects, which contribute 15 % to the overall quantity of emission allowances, followed by 88 projects abating N_2O and contributing 11 % 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 another 18 % to the overall expected quantity of emission reductions. Projects targeting energy efficiency in own generation, fossil fuel switching, biomass energy and renewable energy from wind reduce emissions of CO_2 and have a share between 6-9 % each.

[38] 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 4.2 Overview on CDM and JI projects by project type

Project type	All CDM projects		All JI projects		CDM & JI			
	Number of projects	Reduction until 2012 [Mt CO2-eq.]	Number of projects	Reduction until 2012 [Mt CO2-eq.]	Number of projects	Reduction until 2012 [Mt CO2-eq.]	Share [%]	units/project [Mt CO2-eq.]
Afforestation	4	0.2	0	0.0	4	0	0%	0.0
Agriculture	178	45.2	0	0.0	178	45	1%	0.3
Biogas	283	61.8	4	2.1	287	64	2%	0.2
Biomass energy	645	194.8	25	10.4	670	205	7%	0.3
Cement	30	32.0	1	1.0	31	33	1%	1.1
CO_2 capture	3	0.2	1	1.1	4	1	0%	0.3
Coal bed/mine methane	67	131.0	18	48.9	85	180	6%	2.1
Energy distribution	5	8.2	8	3.7	13	12	0%	0.9
EE households	13	3.6	0	0.0	13	4	0%	0.3
EE industry	158	28.7	12	22.8	170	51	2%	0.3
EE own generation	398	248.9	1	8.5	399	257	8%	0.6
EE service	14	0.8	0	0.0	14	1	0%	0.1
EE supply side	49	31.0	16	14.2	65	45	1%	0.7
Fossil fuel switch	122	178.2	10	10.0	132	188	6%	1.4
Fugitive	23	54.4	35	96.4	58	151	5%	2.6
Geothermal	15	17.2	0	0.0	15	17	1%	1.1
HFCs	23	479.2	4	6.6	27	486	16%	18.0
Hydro	1 200	464.4	10	4.1	1 210	468	15%	0.4
Landfill gas	322	220.3	19	12.4	341	233	8%	0.7
N_2O	67	249.9	21	82.9	88	333	11%	3.8
PFCs	10	9.9	1	1.2	11	11	0%	1.0
Reforestation	44	12.2	0	0.0	44	12	0%	0.3
Solar	28	2.0	0	0.0	28	2	0%	0.1
Tidal	1	1.1	0	0.0	1	1	0%	1.1
Transport	10	4.8	0	0.0	10	5	0%	0.5
Wind	705	268.5	21	9.8	726	278	9%	0.4
Total	**4 417**	**2 748.1**	**207**	**336.0**	**4 624**	**3 084**	**100%**	**0.4**

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, 1 June 2009.

Under the CDM, 21 out of 26 project types are registered in or have applied for the small-scale category. It accounts for 45% of the projects (Table 4.3), but only for 10% of total emission allowances. Of this category hydroelectricity (3%) and biomass energy projects (3%) claim the highest shares of total emission allowances.

Table 4.3 Number of CDM projects and total amount of emission allowances by project size

Average emission allowances per project Size (and type)	Number of projects	Share in total number of projects [%]	Total emission allowances [million CERs]	Share of total emission allowances [%]
small-scale	2 008	45%	264	10%
Hydro	*646*	*15%*	*82*	*3%*
Biomass energy	*365*	*8%*	*73*	*3%*
large-scale	2 409	55%	2 484	90%
Total	**4 417**	**100%**	**2 748**	**100%**

Note: 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.

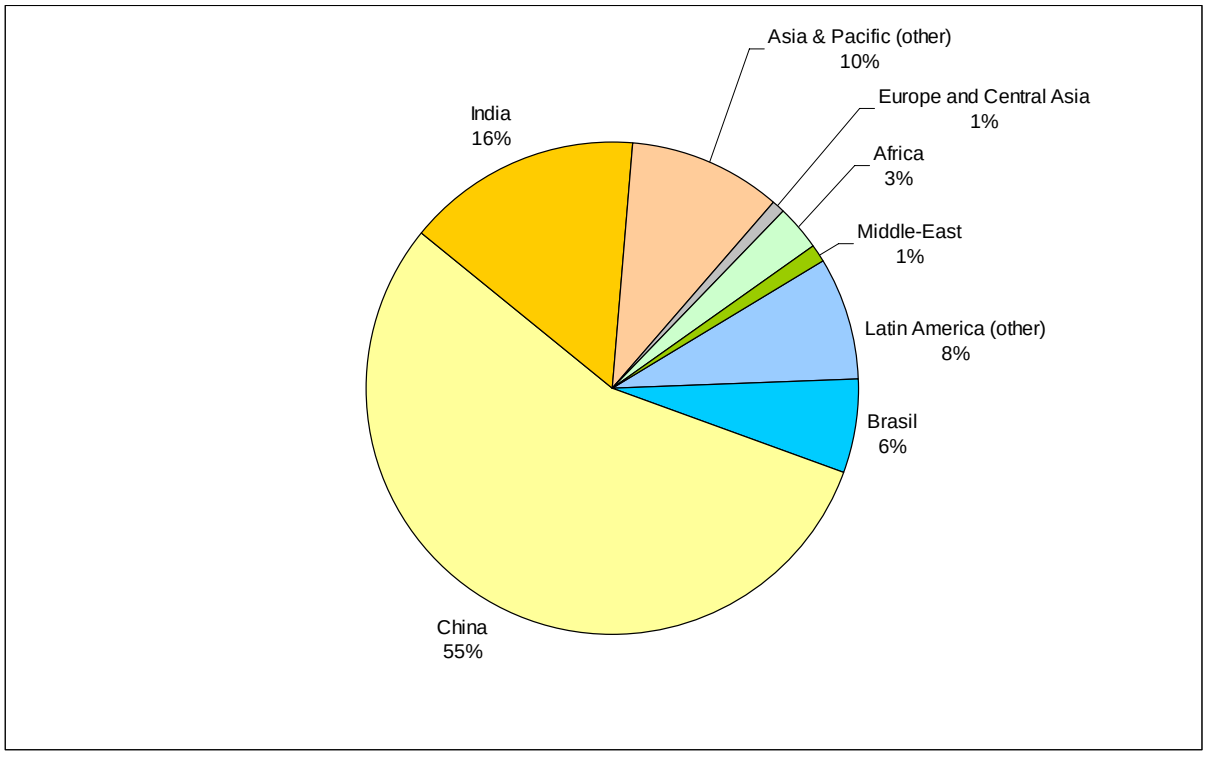
Source: UNEP Risoe CDM/JI Pipeline Analysis and Database, 1 June 2009.

4.5 Host regions for CDM projects

The CDM 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 77 % of the total CERs (Figure 4.1). Africa only hosts 2 % 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 Africa will generate 0.09 CERs/capita until 2012, in China about 1.1 and in Brazil about 0.9 CERs/capita (Table 4.4). 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 0.18 per year and person in Africa and EUR 2.20 in China.

Figure 4.1 Host regions for CDM projects by share of expected CERs until 2012



Source: UNEP Risoe CDM/JI Pipeline Analysis and Database, 1 June 2009.

Table 4.4 Overview on CDM projects by region

Total in CDM Pipeline	Number of projects	Share [%]	Reduction until 2012 [kt CO_2-eq.]	Share [%]	Population [million]	Reduction until 2012 [t CO_2-eq. per capita]
Latin America	791	18%	391 718	14%	449	0.87
Brasil	*340*	*8%*	*173 816*	*6%*	*199*	*0.87*
Asia & Pacific	3 432	78%	2 224 722	81%	3 418	0.65
China	*1 726*	*39%*	*1 520 236*	*55%*	*1 338*	*1.14*
India	*1 123*	*25%*	*426 969*	*16%*	*1 166*	*0.37*
Europe and Central Asia	46	1%	18 487	1%	149	0.12
Africa	100	2%	79 762	3%	891	0.09
Middle-East	48	1%	33 449	1%	186	0.18
Total	**4 417**	**100%**	**2 748 139**	**100%**	**5 093**	**0.54**

Source: UNEP Risoe CDM/JI Pipeline Analysis and Database, 1 June 2009; CIA online world fact book, July 2009

4.6 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 (79 %) within 135 projects (66 % of all JI projects). Table 4.5 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 (

Figure 1.2). The largest share of EU-hosted ERUs will be allocated to Germany (26 % of EU-generated ERUs within 7 projects) which is the only EU-15 member state that hosts JI projects. Out of the EU-12 member states Poland hosts the largest share (25 % of EU-generated ERUs) within 10 projects. Bulgaria has a larger number of projects (14) but accounts for a smaller share of ERUs (9 % of EU-generated ERUs).

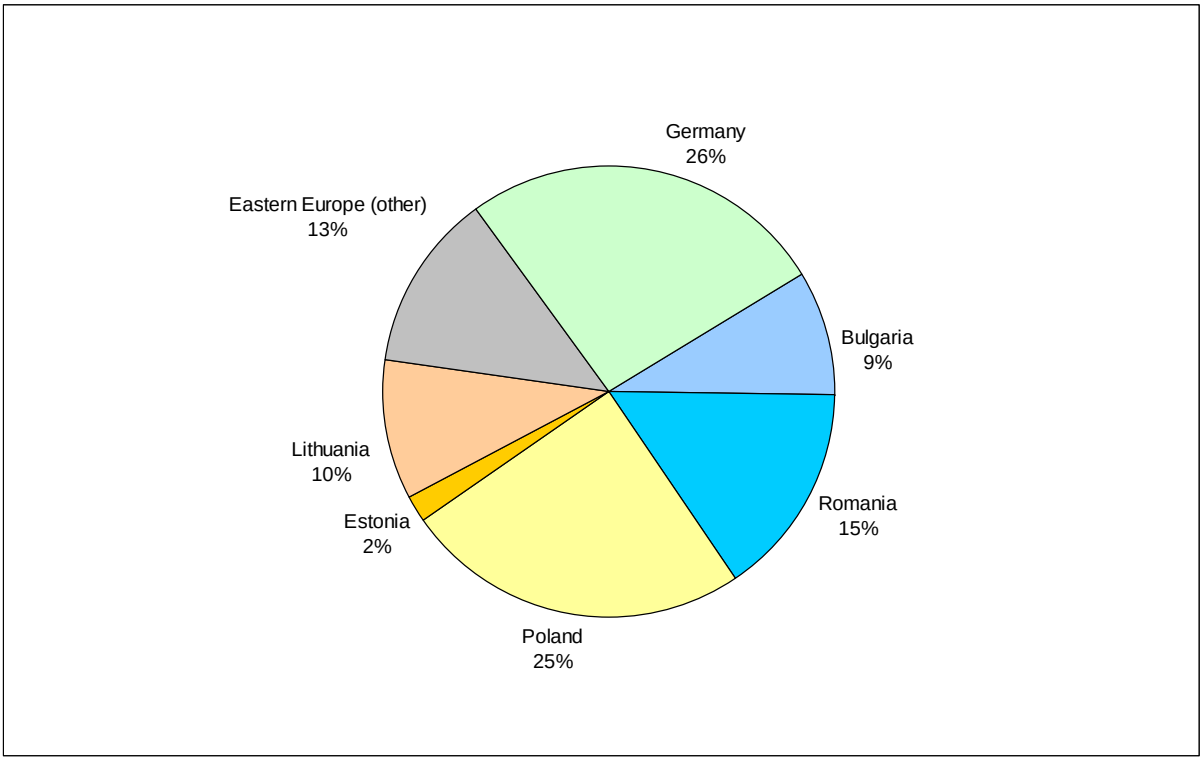
On an average per-capita basis, ERUs expected to be generated until 2012 in Russia and the Ukraine are nearly three times as high (at 1.44 ERUs/capita) as in Eastern Europe (0.49 ERUs/capita). Only Lithuania, one of the smaller countries in terms of population, is expected to host a higher per-capita level of ERUs (1.85 ERU/capita).

Table 4.5 Overview on JI projects by region

Total in JI Pipeline	Number of projects	Share [%]	Reduction until 2012 [kt CO_2-eq.]	Share [%]	Population [million]	Reduction until 2012 [t CO_2-eq. per capita]
Russia & Ukraine	135	66%	267 080	79%	186	1.44
Eastern Europe	58	28%	48 773	15%	101	0.49
Bulgaria	*14*	*7%*	*5 926*	*2%*	*7*	*0.82*
Czech Republic	*1*	*0%*	*167*	*0%*	*10*	*0.02*
Estonia	*4*	*2%*	*1 237*	*0%*	*1*	*0.95*
Hungary	*10*	*5%*	*8 233*	*2%*	*10*	*0.83*
Latvia	*1*	*0%*	*27*	*0%*	*2*	*0.01*
Lithuania	*10*	*5%*	*6 657*	*2%*	*4*	*1.85*
Poland	*10*	*5%*	*16 459*	*5%*	*39*	*0.43*
Romania	*7*	*3%*	*10 005*	*3%*	*22*	*0.45*
Slovak Republic	*1*	*0%*	*63*	*0%*	*5*	*0.01*
Others	13	6%	20 194	6%	87	0.23
Germany	*7*	*3%*	*17 474*	*5%*	*82*	*0.21*
France	*1*	*0%*	*0*	*0%*	*64*	*0.00*
New Zealand	*6*	*3%*	*2 721*	*1%*	*4*	*0.65*
Total	**206**	**100%**	**336 048**	**100%**	**373**	**0.90**

Source: UNEP Risoe CDM/JI Pipeline Analysis and Database, 1 June 2009; CIA online world fact book, July 2009

Figure 4.2 EU host regions for JI projects by share of expected ERUs until 2012



Source: UNEP Risoe CDM/JI Pipeline Analysis and Database, 1 June 2009

5 Accounting of carbon sinks

- Activities under Articles 3.3 and 3.4 of the Kyoto Protocol in EU-15 Member States are projected to reduce emissions by 42.4 Mt CO_2 per year of the commitment period and by 5.5 Mt CO_2 per year of the commitment period in EU-12 Member States.
- This is equivalent to 12 % of the EU-15 reduction commitment of 341 Mt CO_2 per year of the commitment period compared to base-year emissions, or 1.0 % of the EU-15 Kyoto target of – 8 %.

5.1 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, land use change and forestry (LULUCF) activities, or 'carbon sinks' under the Kyoto Protocol to achieve their UNFCCC and EU burden-sharing targets. This is the case, if LULUCF activities lead to net removals (carbon sinks) from the atmosphere in the 2008–2012 first commitment period. These carbon sinks include:

- mandatory activities covered by Article 3.3 of the Protocol (afforestation, reforestation and deforestation) on lands that have been subject to direct, human-induced conversion from a forested to a non-forested state, or vice versa,

- voluntary activities under Article 3.4 (forest management, cropland management, grazing land management and revegetation) on lands that have not undergone conversion since 1990, but are otherwise subject to a specific land use.

The activities include policies and measures to protect existing terrestrial carbon stocks (e.g., through reduced deforestation, devegetation, forest degradation, and land degradation) and to enhance terrestrial carbon stocks (e.g., increasing the area or carbon density of forests by afforestation and reforestation, rehabilitating degraded forests, altering the management of forest and agricultural lands to sequester more carbon in biomass and soil).

The rules about how carbon sinks are accounted for under the Kyoto Protocol are described in Articles 3.3 and 3.4 of the Protocol and in the UNFCCC Marrakech Accords (2001). Parties must account for net emissions or removals for each activity during the commitment period by issuing RMUs (removal units) in the case of greenhouse gas removals from carbon sinks (e.g. afforestation) or cancelling Kyoto units in the case of net greenhouse gas emissions from carbon sinks. LULUCF activities can therefore be used to compensate emissions from other sources. Accounting for these units is subject to review and compliance procedures.

5.1.1 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.

5.1.2 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.

5.2 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 2009, fourteen Member States submitted updated or confirmed estimates while information for seven additional countries had been submitted in previous years (Table 5.1). Six 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. Austria, the Czech Republic, Denmark, France, Greece, Ireland, Latvia, Luxembourg, the Netherlands, Poland, Portugal, the Slovak Republic, Spain and the 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.

5.3 Use of sinks for achieving the EU Kyoto target

So far, a total net sequestration of about 8.23 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. Thereof, Sweden expects a net average emission of 0.6 Mt CO_2 per year and Finland 2.2 Mt CO_2 per year. Latvia and Luxembourg provided first assumptions about emissions and removals from activities under Article 3.3 and expect a net sink resulting from these activities.

The use of activities under Article 3.4 (maximum allowance for forest management and net carbon stock changes from cropland management, grazing land management, revegetation as indicated by Member States) is projected to contribute another 25.6 Mt CO_2 per year of the

commitment period in the EU-15. In addition, the 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 42.4 Mt CO_2 per year of the commitment period. As Italy revised the estimates for its emissions from activities under Article 3.3 (afforestation, reforestation and deforestation), net sequestration resulting from activities under Article 3.3 and 3.4 in EU-15 Member States was reduced significantly compared to what was projected in 2008 (57.5 Mt CO_2). The Czech Republic, Poland and Slovenia expect an additional reduction of 5.5 Mt CO_2 per year of the commitment period.

For EU-15, this is equivalent to 12 % of the EU-15 reduction commitment of 341 Mt CO_2 per year of the commitment period compared to base-year emissions. Among the other EEA member countries, Croatia estimates that carbon sinks will contribute a reduction of 1 Mt CO_2 per year towards its Kyoto target, for Switzerland this amount is expected to reach 0.7 Mt CO_2 per year. Croatia has elected to account for forest management under Article 3.4 of the Kyoto Protocol. Norway decided not to make use of the accountable effect of Art. 3.4 (equivalent to 1.5 Mt CO_2 per year).

Table 5.1 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	NA	NA	– 0.7
Belgium	No estimates available	None	NA	NA	NE
Bulgaria	Not reported	None	NA	NA	NE
Cyprus	Not reported	NA	NA	NA	NE
Czech Republic	Probably small sink	FM	Likely larger than max. allowance	– 1.17	– 1.17
Denmark	– 0.288	FM, CM, GM	FM: – 3.60 CM: – 1.72	– 0.18	– 2.185
Estonia	No separate estimates available	None	No separate estimates available	NA	NE
Finland	+ 1.9 to + 2.4	FM	– 2.5 to – 3.0	– 0.59	– 0.59
France	– 0.84	FM	– 67.62	– 3.23	– 4.07
Germany	No estimates available	FM	– 7.3	– 4.55	– 4.547
Greece	– 0.80	FM	– 2 to – 4	– 0.33	– 1.13
Hungary	Not reported	FM	Not reported	– 1.06	NE
Ireland	– 2.236	None	NA	NA	– 2.236
Italy	No separate estimate available	FM	– 10.2	– 10.19	– 10.2
Latvia	Net sink	FM	No estimates available	– 1.25	NE
Lithuania	No separate estimates available	FM	No separate estimates available	– 1.03	NE
Luxembourg	Net sink	None	NA	NA	NE
Malta	Not reported	NA	NA	NA	NE
Netherlands	– 0.11	None	NA	NA	– 0.11
Poland	Net sink	FM	Likely larger than	– 3.01	– 3.01

	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]
			max. allowance		
Portugal	– 3.36	FM, CM, GM	FM: – 0.8 CM & GM: – 0.5	– 0.81	– 4.66
Romania	Not reported	FM, Revegetation	Not reported	– 4.03	NE
Slovak Republic	Net sink	None	NA	NA	NE
Slovenia	No estimates available	FM	– 1.3	– 1.32	– 1.3
Spain[c]	Not estimated separately	FM, CM	Not estimated separately	– 2.46	– 5.8
Sweden	0.6	FM	– 15	– 2.13	– 2.13
United Kingdom	– 2.68	FM	– 1.69	– 1.36	– 4.04
EU-15[d]	**– 8.23**	**– 25.57**			**– 42.40**
EU-27	**– 8.23**	**– 31.07**			**– 47.87**

Notes: Consistent with the reporting of emission inventories a negative sign '-' is used for removals and a positive sign '+' for emissions; NA: not applicable; NE: 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 and Sweden, 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.

5.4 Supplementary information related to activities under Article 3.3 and 3.4 of the Kyoto Protocol

As Annex I parties to the UNFCCC, EU-27 Member States are required to provide in their annual greenhouse gas inventories information on emissions and removals from activities under Article 3.3 and 3.4 in accordance with relevant decisions of the COP/MOP on LULUCF (e.g. 17/CMP.1).

Mandatory reporting of information for the year 2008 is due by 2010. In the meantime parties are asked to voluntarily submit common reporting tables on LULUCF activities under Article 3.3 and 3.4 to UNFCCC. Voluntary submissions for 2007 and 2008 enable a first assessment of the accuracy of projected estimates of annual net carbon stock changes under Article 3.3 and 3.4. Information on LULUCF activities was provided by only four EU-27 Member States in 2009: Austria, the Czech Republic, France, and Portugal (Table 5.2).

For the Czech Republic, UNFCCC data for 2007 correspond rather well with projected expectations of annual net carbon stock changes under Article 3.3 and 3.4 during the first commitment period. However for Austria (only activities under Article 3.3.) and France, reported removals from LULUCF activities under both Article 3.3 and 3.4 were higher in 2007 than projected estimates in following years. The reverse trend could be found for Portugal. National greenhouse gas inventory data were found to underestimate carbon stock changes under Article 3.3 compared to information provided in the questionnaires. By

contrast carbon stock changes under Article 3.4 in 2008 were overestimated (except for grazing land management).

Table 5.2 Net carbon stock changes under Articles 3.3 and 3.4 in 2007 and 2008

	Article 3.3		Article 3.4			
	Net carbon stock change in 2007 (KP inventory)	Net carbon stock change during 2008–12	Election of activities[a]	Net carbon stock change in 2007 (KP inventory)	Net carbon stock change during 2008–12	Maximum allowance for FM
	[Mt CO_2 / year]	[Mt CO_2 / year]		[Mt CO_2 / year]	[Mt CO_2 / year]	[Mt CO_2 / year]
Austria	- 1.229	- 0.70	None	NE	NA	NA
Czech Republic	- 0.251	Probably small sink	FM	- 1.187	Likely larger than max. allowance	- 1.17
France	- 2.405	- 0.84	FM	- 72.614	- 67.62	- 3.23
Portugal	- 1.47*	- 3.36	FM	FM: 3.897	FM: - 0.80	- 0.81
			CM	CM: - 1.426	CM & GM: - 0.50	NA
			GM	GM: - 0.164		

Notes: Consistent with the reporting of emission inventories a negative sign '-' is used for removals and a positive sign '+' for emissions; NA: not applicable; NE: not estimated.
[a] FM: forest management; CM: cropland management; GM: grazing land management.
* Net carbon stock change data provided for 2008.

Source: Questionnaires submitted by EU Member States; Supplementary information related to activities under Article 3, paragraphs 3 and 4 Kyoto Protocol (KP inventory) submitted to UNFCCC by EU Member States in 2009.

6 Historic and projected indicators

This chapter presents historic and projected indicators as reported by Member States under the Monitoring Mechanism Decision (Commission Decision 280/2004/EC) and its Implementing Provisions (Decision 166/2005/EC).

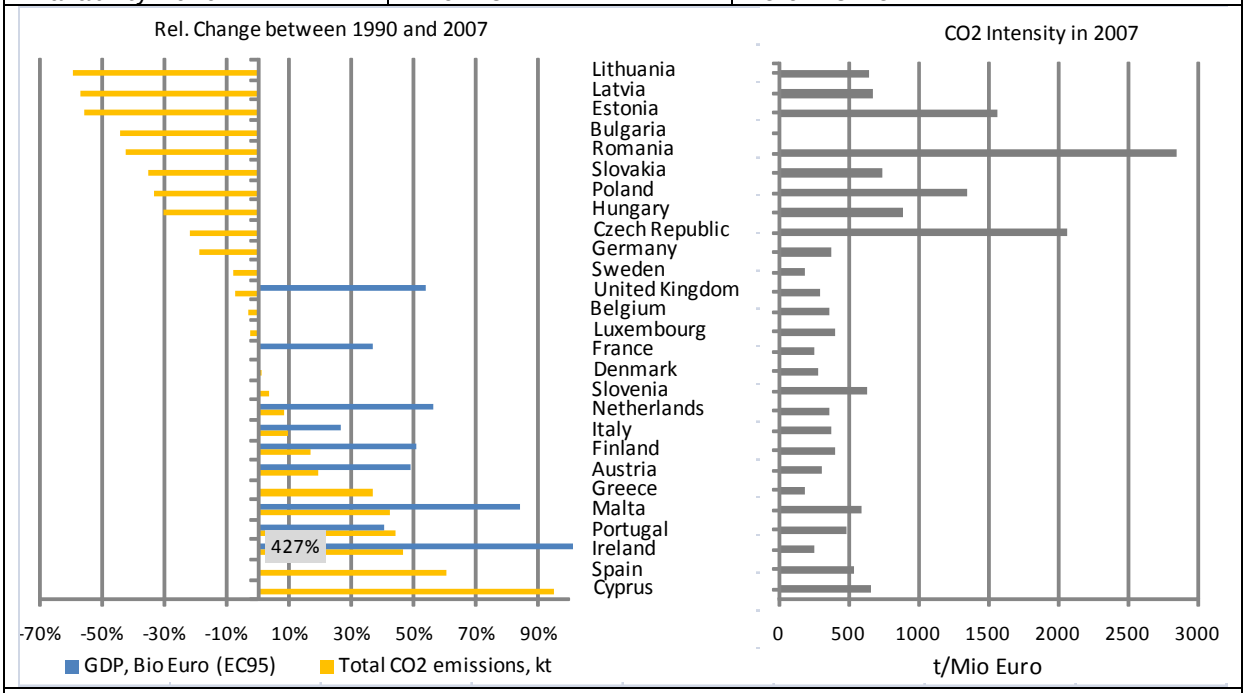
The indicators have been defined to measure the effects of policies and measures over time. Four categories of indicators are defined, three concerning past data and one relative to projected data:

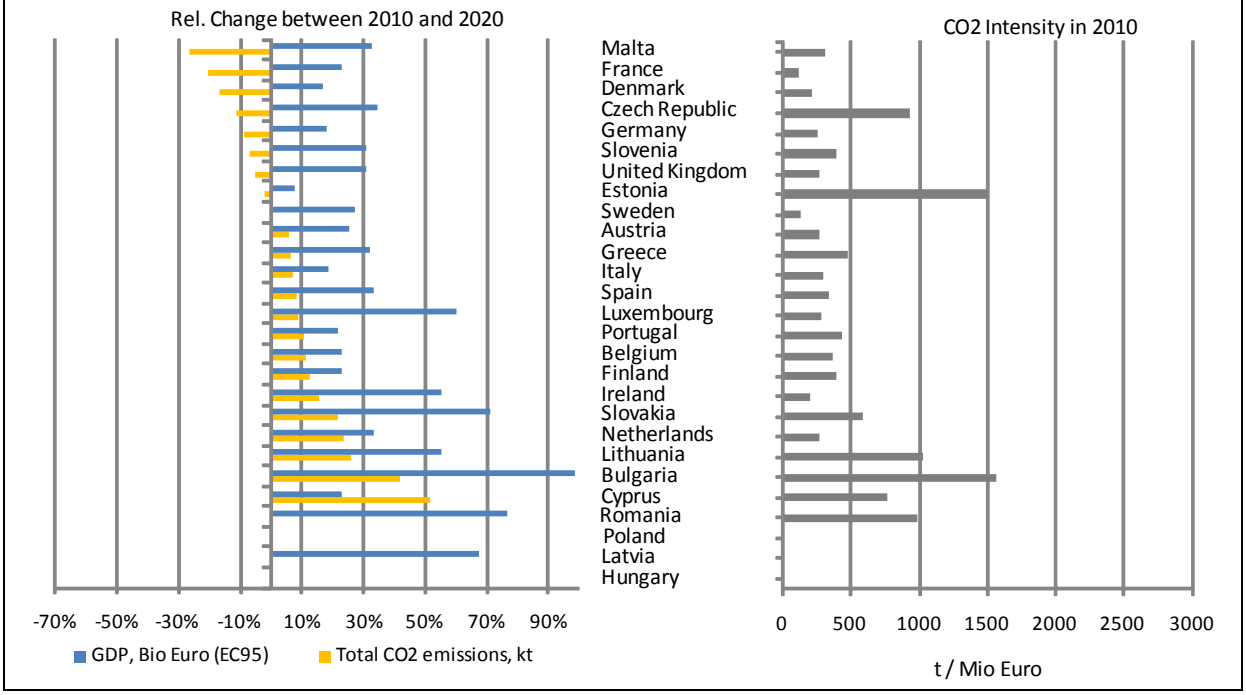
- 7 priority indicators, which shall be reported by Member States every year,
- 6 additional priority indicators and 15 Supplementary Indicators, which Member States should report every year, and
- 10 indicators for projections for the years 2005, 2010, 2015 and 2020.

The historic indicators cover data at least for the last inventory year (2007). However, the provision of the whole time series 1990–2007 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 sometimes use different methods for accounting of numerator and denominator. The availability of both numerator and denominator is essential to calculate the emission intensity of several activities.

In the following definition, availability, values, graphical and verbal assessments for each indicator are given. As the projected indicators relate to certain past indicators, these are presented together.

Indicator	**Total CO_2 intensity of GDP, t/ Mio €**	
Indicator reference	Priority indicator 1, Projected Indicator 1	
Eurostat sector	MACRO	
Numerator	Total CO_2 emissions, kt	
Denominator	GDP, Bio Euro (EC95)	
Availability 1990	9 of EU-27	8 of EU-15
Availability 2007	26 of EU-27	15 of EU-15
Availability 2010	24 of EU-27	15 of EU-15
Availability 2020	24 of EU-27	15 of EU-15





Intensity	1990	2007	2010	2020
Austria	384.9	308.8	314.0	264.9
Belgium	-	350.2	403.9	365.5
Bulgaria	-	-	2191.1	1565.1
Cyprus	-	650.0	622.4	766.7
Czech Republic	-	2056.2	1405.0	926.3
Denmark	-	274.2	303.6	216.5
Estonia	-	1563.1	1646.5	1498.2
Finland	520.1	403.1	431.2	395.4
France	345.3	253.0	185.4	119.8
Germany	-	375.2	334.0	258.0
Greece	-	-	579.3	467.1
Hungary	-	886.3	-	-
Ireland	895.4	249.2	256.6	191.1
Italy	427.1	369.9	324.3	294.0
Latvia	-	668.1	0.0	0.0
Lithuania	-	644.5	1267.5	1030.3
Luxembourg	-	403.4	414.3	281.7
Malta	758.2	584.2	550.8	304.5
Netherlands	520.5	361.7	293.9	273.1
Poland	-	1345.9	-	-
Portugal	472.8	484.2	478.7	436.1
Romania	-	2855.1	1332.3	981.7
Slovak Republic	-	737.1	824.0	585.9
Slovenia	-	624.6	543.2	386.9
Spain	-	529.7	411.5	334.2
Sweden	-	174.9	155.9	123.3
United Kingdom	471.9	283.6	364.8	263.9

Main Messages 1990–2007:

- High emission intensity in the Czech Republic, Estonia, Poland and Romania can be explained by their lower GDP compared to other Member States

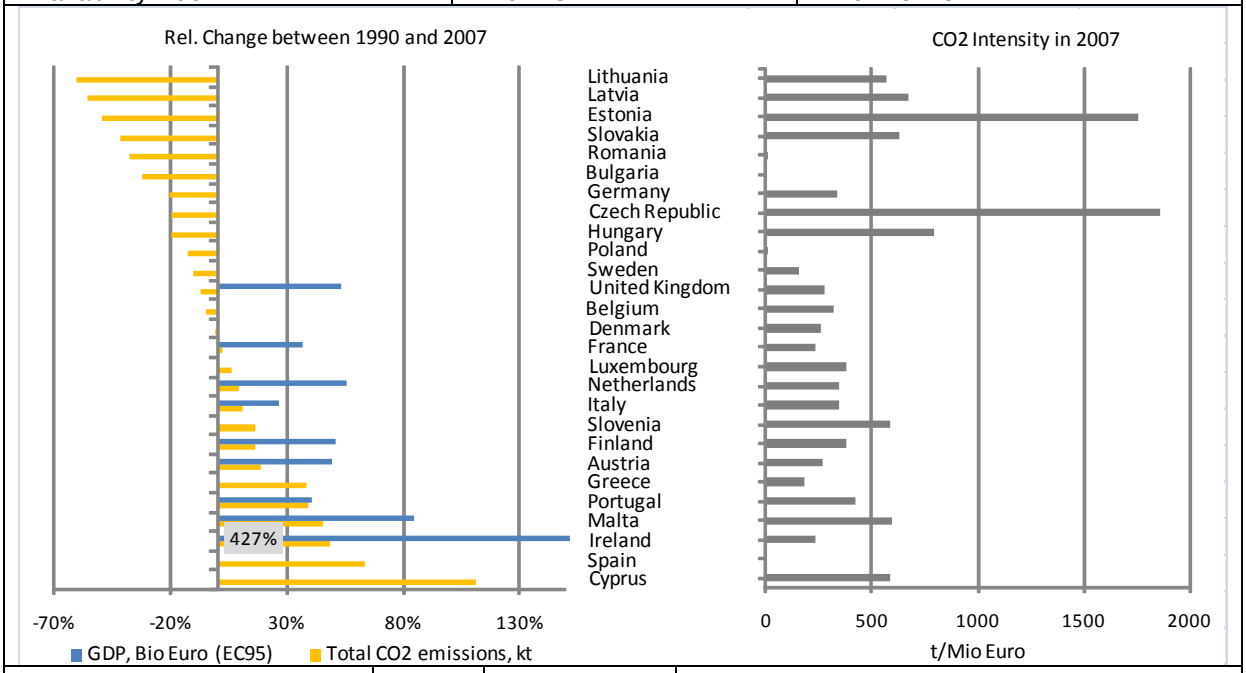
Main Messages 2010–2020:

- In most Member States CO_2 emissions are projected to increase between 2010 and 2020;all Member States project increasing GDP
- As GDP growth is generally higher than emissions growth, intensity is projected to decrease in most countries.

Notes:

- GDP data are for most Member States provided in 2000 prices as reference year
- GDP data from Poland and Romania have been converted to billion of Euros
- Latvia's projected GDP converted to billions of Euro

Indicator	Energy related CO_2 intensity per GDP, t/Mio €	
Indicator reference	Priority indicator 2	
Eurostat sector	MACRO B0	
Numerator	CO_2 emissions from energy consumption, kt	
Denominator	GDP, Bio Euro (EC95)	
Availability 1990	9 of EU-27	8 of EU-15
Availability 2007	24 of EU-27	14 of EU-15

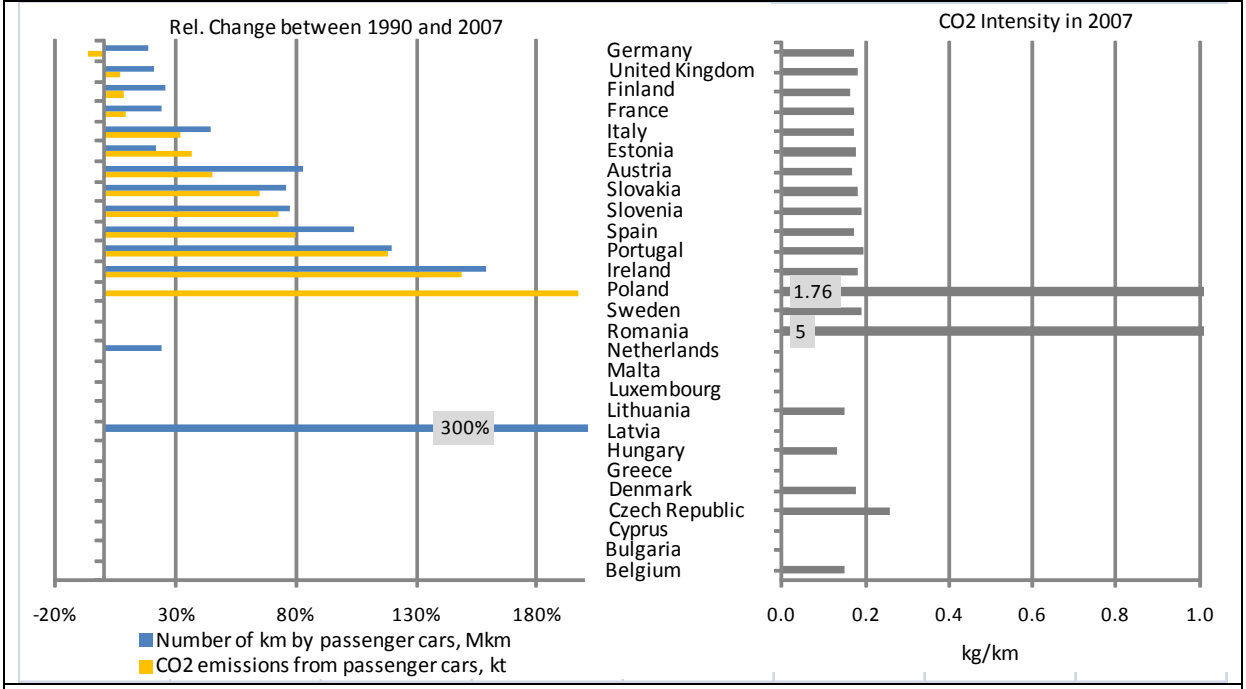


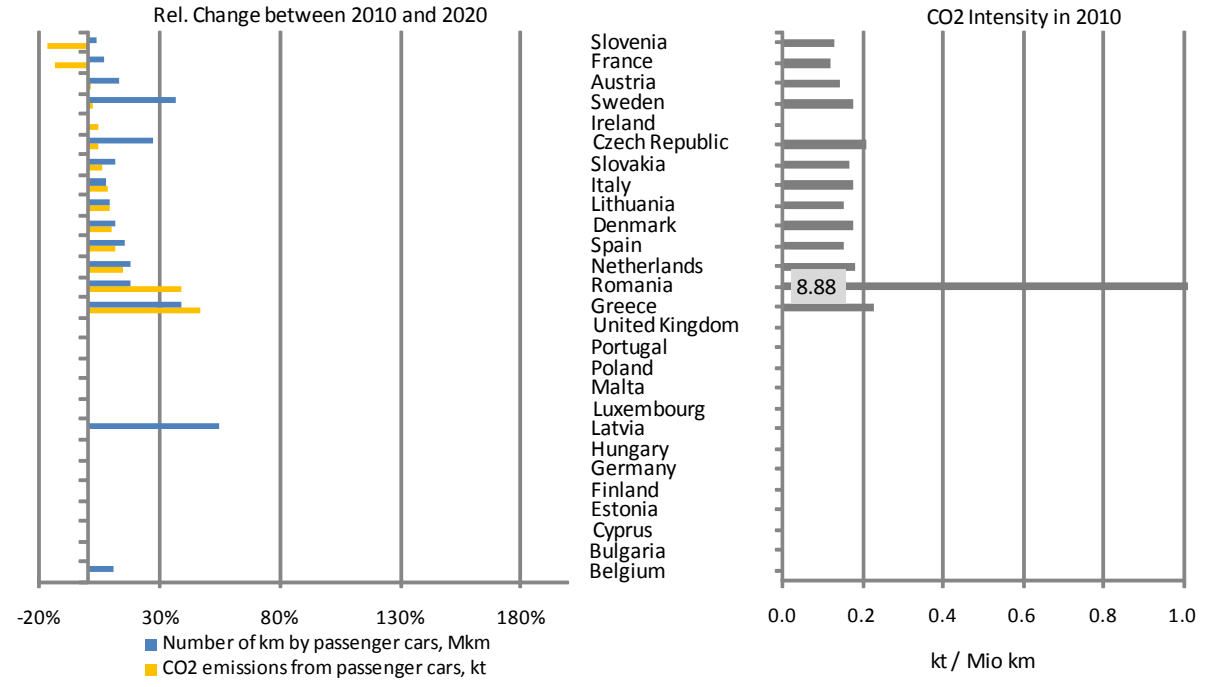
Intensity	1990	2007
Austria	335.3	267.0
Belgium	-	320.1
Bulgaria	-	-
Cyprus	-	590.5
Czech Republic	-	1859.3
Denmark	-	263.4
Estonia	-	1754.1
Finland	487.2	376.0
France	318.5	237.1
Germany	-	336.9
Greece	-	579.0
Hungary	-	796.3
Ireland	835.4	235.2
Italy	395.0	346.0
Latvia	-	669.7
Lithuania	-	568.9
Luxembourg	-	379.3
Malta	758.0	597.6
Netherlands	490.0	343.1
Poland	-	1.2
Portugal	424.8	420.8
Romania	-	2.4
Slovak Republic	-	626.6
Slovenia	-	586.6
Spain	-	-
Sweden	-	153.1
United Kingdom	453.4	273.1

Main Messages:

- GDP data are for most Member States provided in 2000 prices as reference year
- High CO_2 intensity in the Czech Republic and Estonia can be explained by their low GDP compared to other Member States
- Low CO_2 intensity in Sweden is due to relatively low emissions for a high GDP. This may be due to a high share of biomass in combustion

Indicator	CO_2 intensity of passenger cars, kt/Mkm	
Indicator reference	Priority indicator 3, Projected Indicator 2	
Eurostat sector	TRANSPORT C0	
Numerator	CO_2 emissions from passenger cars, kt	
Denominator	Number of kilometres by passenger cars, Mkm	
Availability 1990	14 of EU-27	10 of EU-15
Availability 2007	21 of EU-27	12 of EU-15
Availability 2010	17 of EU-27	10 of EU-15
Availability 2020	17 of EU-27	10 of EU-15





Intensity	1990	2007	2010	2020
Austria	0.21	0.17	0.16	0.14
Belgium	-	0.15	0.00	0.00
Bulgaria	-	-	-	-
Cyprus	-	-	-	-
Czech Republic	-	0.26	0.25	0.21
Denmark	-	0.18	0.18	0.17
Estonia	0.16	0.18	-	-
Finland	0.19	0.16	-	-
France	0.20	0.17	0.15	0.12
Germany	0.22	0.17	-	-
Greece	-	-	0.21	0.23
Hungary	-	0.13	-	-
Ireland	0.19	0.18	-	-
Italy	0.19	0.17	0.18	0.18
Latvia	-	-	0.00	0.00
Lithuania	-	0.15	0.15	0.15
Luxembourg	-	-	-	-
Malta	0.00	0.00	-	-
Netherlands	0.20	-	0.19	0.18
Poland	-	1.76	-	-
Portugal	0.20	0.20	-	-
Romania	-	5.33	7.55	8.88
Slovak Republic	0.19	0.18	0.17	0.17
Slovenia	0.20	0.19	0.16	0.13
Spain	0.20	0.17	0.16	0.15
Sweden	-	0.19	0.24	0.18
United Kingdom	0.21	0.18	-	-

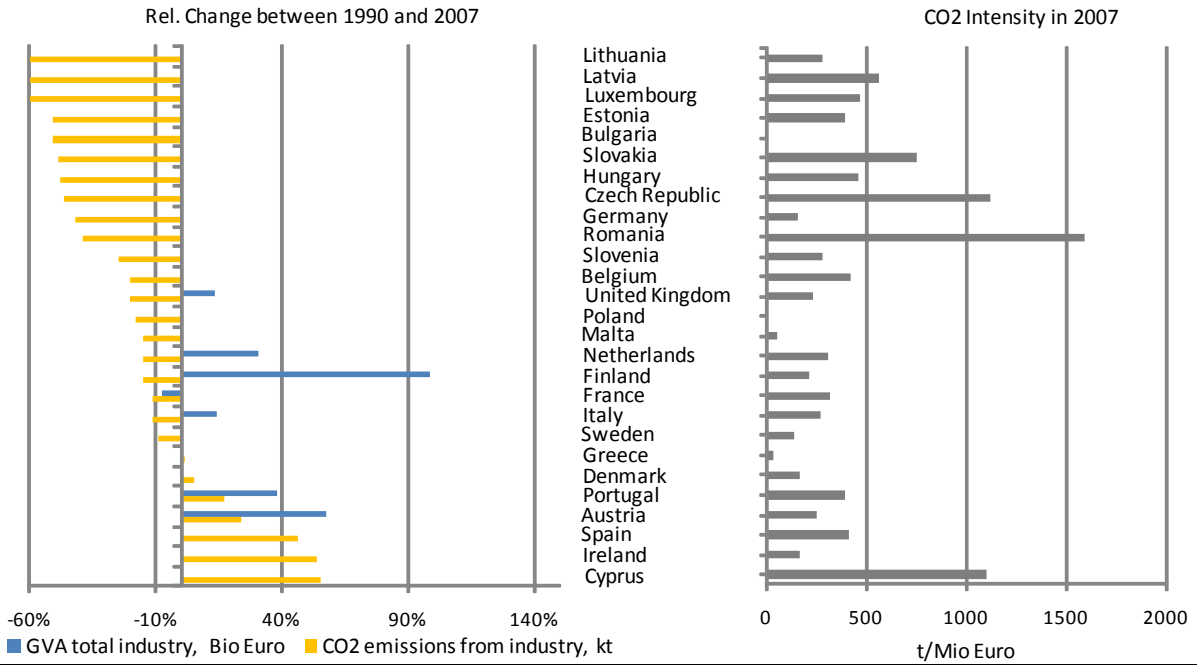
Main Messages 1990–2007:

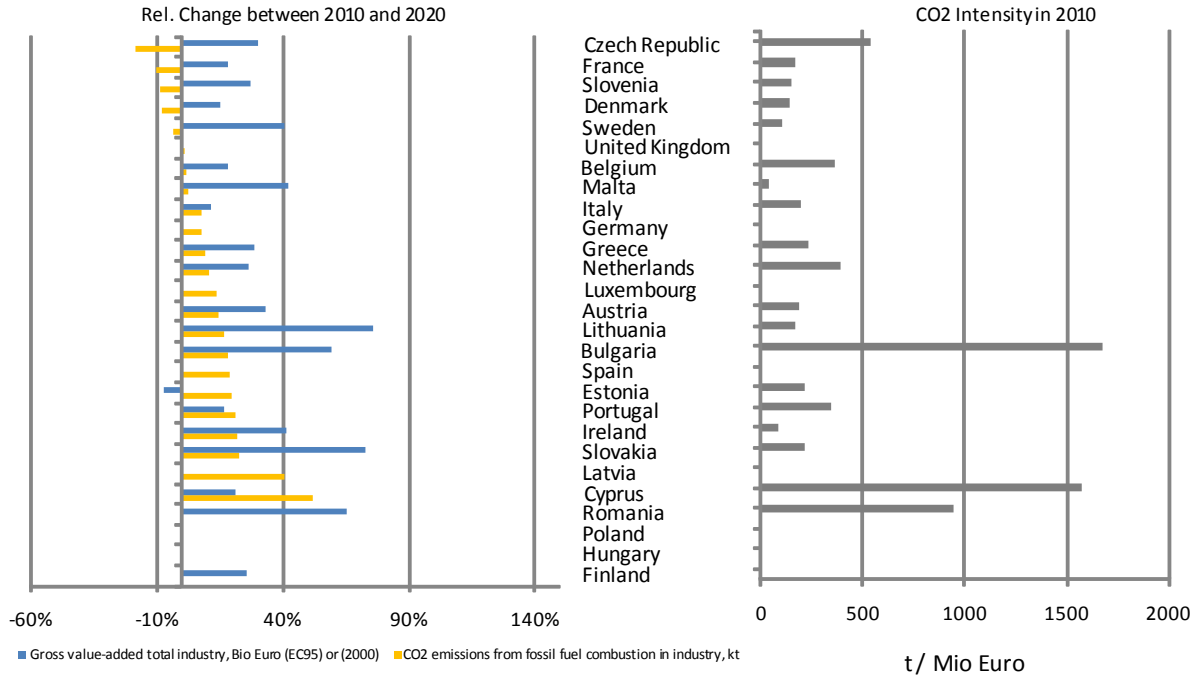
- data availability is limited, especially for new EU Member States
- Romania has the lowest number of km by passenger cars, followed by Estonia and Poland
- CO_2 emissions increased in all reporting countries except Germany
- Number of kilometres by passenger car was converted to Mkm for Belgium.

Main Messages 2010–2020:

- All reporting Member States project a further increase of kilometres driven by 2010.
- Despite improved efficiency of passenger cars, CO_2 emissions are projected to increase between 2010 and 2020 in all reporting Member States, except in France and Slovenia.

Indicator	**Energy related CO_2 intensity of industry, t/Mio Euro**	
Indicator reference	Priority indicator 4, Projected Indicator 4	
Eurostat sector	INDUSTRY A1	
Numerator	CO_2 emissions from industry, kt	
Denominator	Gross value-added total industry, Bio Euro (EC95)	
Availability 1990	7 of EU-27	7 of EU-15
Availability 2007	25 of EU-27	15 of EU-15
Availability 2010	20 of EU-27	11 of EU-15
Availability 2020	20 of EU-27	11 of EU-15





Intensity	1990	2007	2010	2020
Austria	316.58	248.51	220.41	189.58
Belgium	-	418.62	418.89	359.31
Bulgaria	-	-	2256.93	1670.40
Cyprus	-	1100.27	1252.03	1572.71
Czech Republic	-	1119.07	852.71	535.75
Denmark	-	160.78	177.00	140.93
Estonia	-	387.98	163.40	211.38
Finland	488.55	209.05	0.00	0.00
France	328.02	313.39	220.34	166.78
Germany	-	150.31	-	-
Greece	-	355.00	278.35	236.74
Hungary	-	453.39	-	-
Ireland	-	159.37	102.90	88.50
Italy	348.43	270.96	202.24	195.83
Latvia	-	560.02	-	-
Lithuania	-	274.94	254.73	168.76
Luxembourg	-	462.96	-	-
Malta	-	52.22	52.32	37.83
Netherlands	461.77	300.57	450.26	393.70
Poland	-	-	-	-
Portugal	461.81	390.57	327.08	340.12
Romania	-	1586.37	701.5	946.0
Slovak Republic	-	745.34	309.44	219.21
Slovenia	-	273.34	214.36	152.96
Spain	-	410.86	-	-
Sweden	-	129.31	145.97	100.10
United Kingdom	329.97	232.57	-	-

Main Messages 1990–2007:

- In most reporting countries CO_2 emissions decreased between 1990 and 2007
- France is the only reporting country where GVA from industry decreased

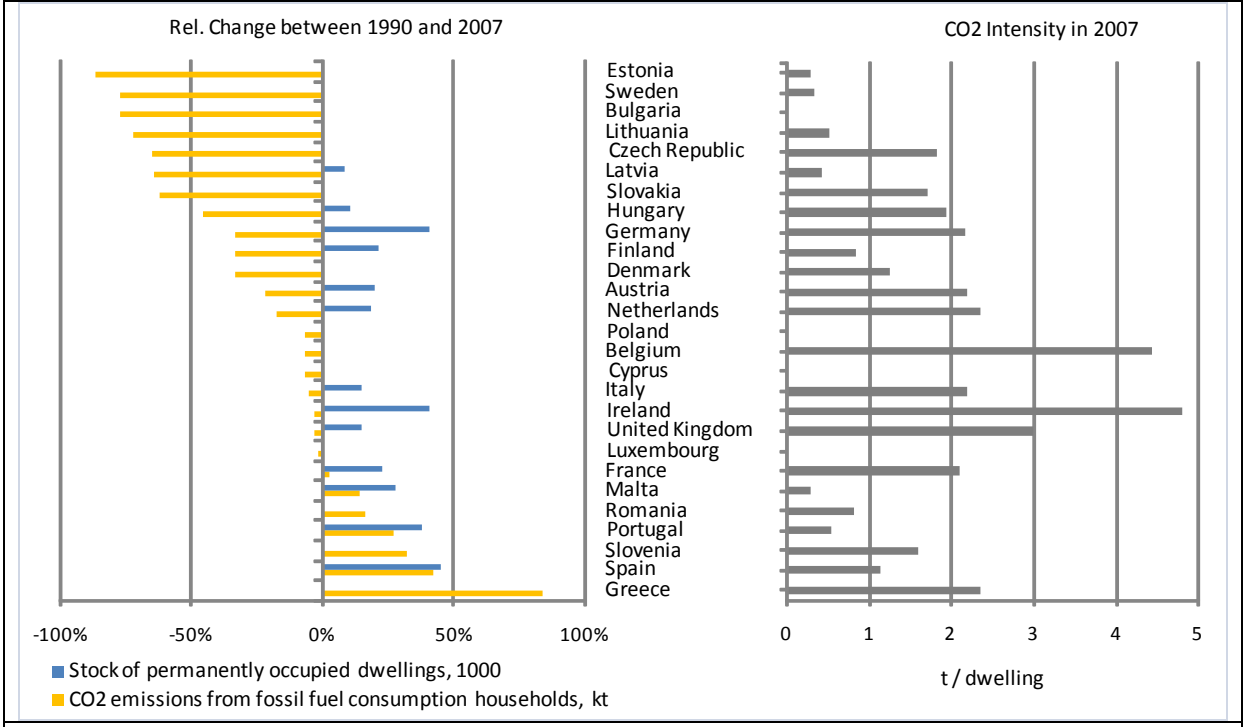
Main Messages 2010–2020:

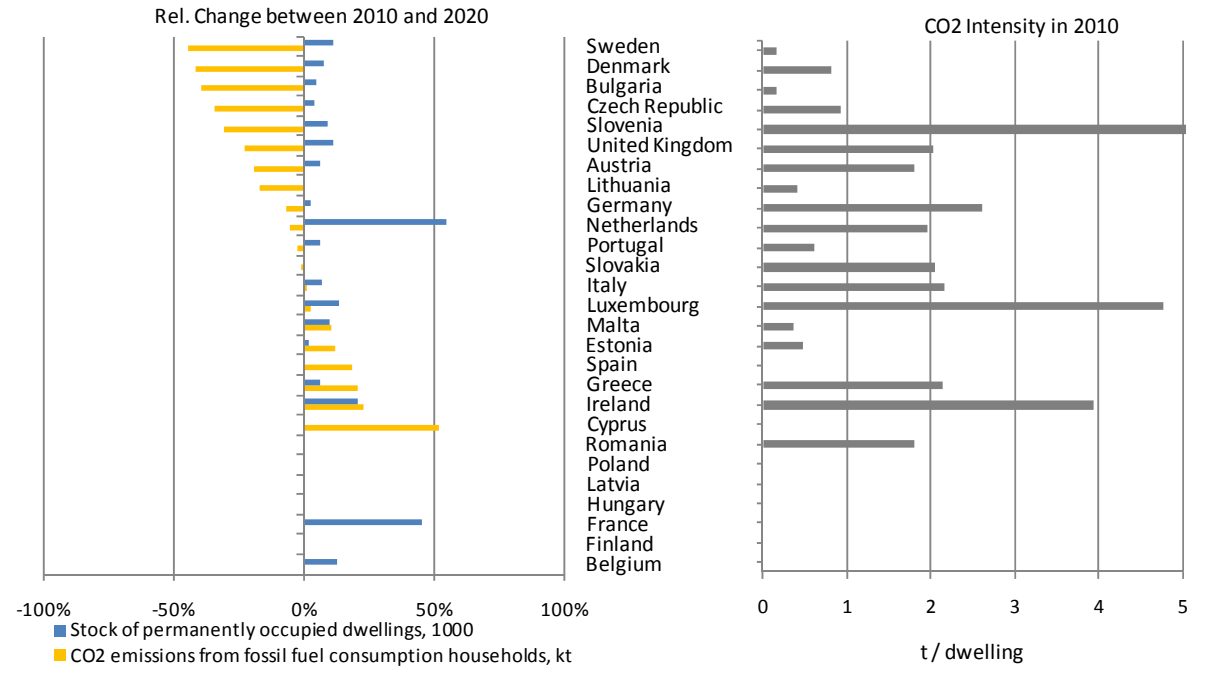
- Most countries expect increasing CO_2 emissions from industry and increasing GVA

Note:

- GVA data converted to Bio Euro for Romania.
- Estonia, Ireland and Portugal 's GVA were converted to billion of Euro

Indicator	Specific CO_2 emissions of households, t/dwelling	
Indicator reference	Priority indicator 5, Projected Indicator 5	
Eurostat sector	HOUSEHOLDS A1	
Numerator	CO_2 emissions from fossil fuel consumption households, kt	
Denominator	Stock of permanently occupied dwellings, 1000	
Availability 1990	17 of EU-27	11 of EU-15
Availability 2007	23 of EU-27	14 of EU-15
Availability 2010	21 of EU-27	13 of EU-15
Availability 2020	21 of EU-27	13 of EU-15





Intensity	1990	2007	2010	2020
Austria	3.36	2.18	2.38	1.80
Belgium	-	4.42		
Bulgaria	-	-	0.28	0.16
Cyprus	1.41	-	-	-
Czech Republic	-	1.82	1.47	0.93
Denmark	-	1.25	1.48	0.81
Estonia	-	0.28	0.44	0.48
Finland	1.51	0.82	-	-
France	2.50	2.09	0.00	0.00
Germany	4.60	2.16	2.87	2.61
Greece	-	2.35	1.87	2.14
Hungary	3.98	1.94	-	-
Ireland	6.99	4.80	3.88	3.94
Italy	2.64	2.19	2.29	2.16
Latvia	1.24	0.41	0.00	0.00
Lithuania	-	0.51	0.48	0.40
Luxembourg	6.38	-	5.30	4.77
Malta	0.31	0.28	0.35	0.36
Netherlands	3.38	2.35	3.20	1.96
Poland	3.09	-	-	-
Portugal	0.57	0.53	0.67	0.61
Romania	-	0.80	1.50	1.80
Slovak Republic	-	1.71	2.04	2.04
Slovenia	-	1.59	1309.25	833.07
Spain	1.16	1.13	-	-
Sweden	-	0.32	0.33	0.17
United Kingdom	3.54	2.99	2.92	2.02

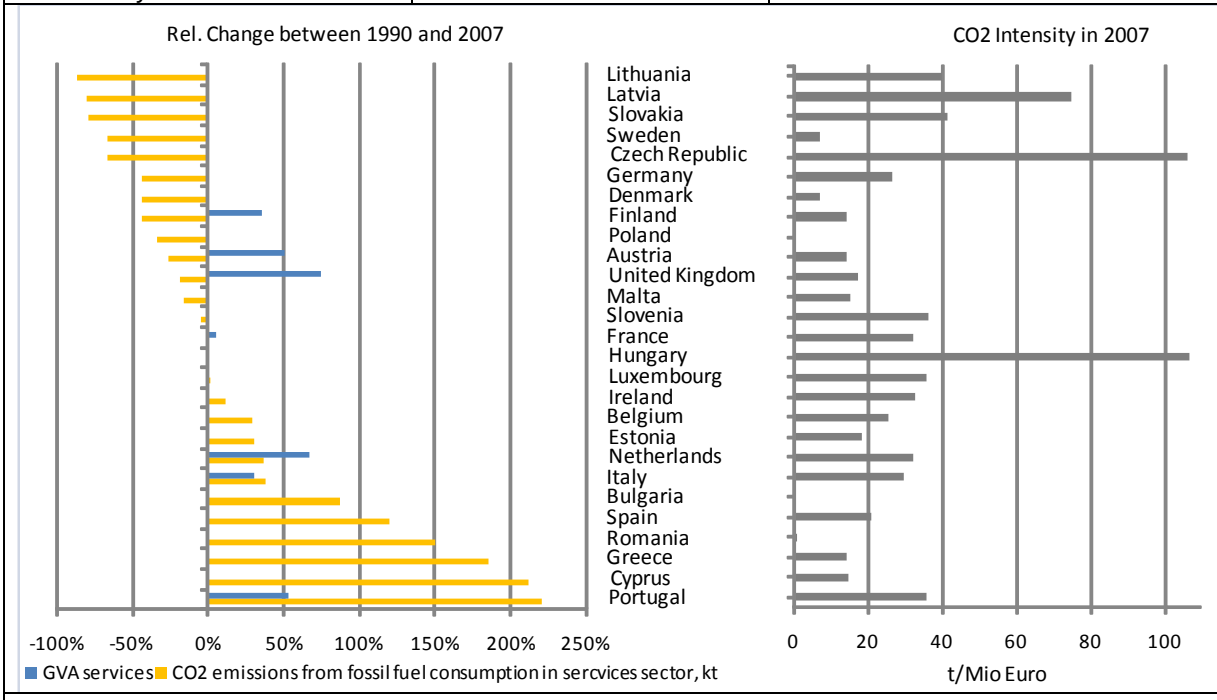
Main Messages 1990–2007:

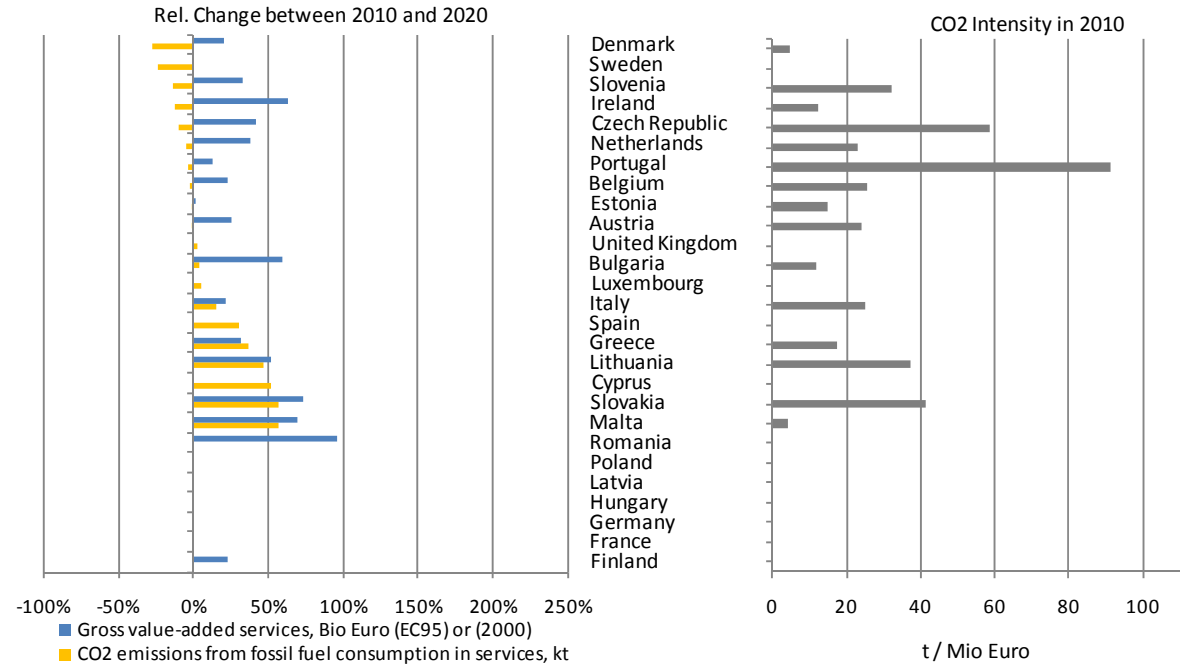
- Changes in numbers of households and CO_2 emissions resulting from fuel combustion in households are decoupled in most countries
- Belgium and Ireland show the highest emission intensity; Belgium having rather high emissions and Ireland having a rather low number of households

Main Messages 2010–2020:

- All countries project an increase in permanently occupied dwellings
- Half of the reporting countries project decreasing emissions from fuel combustion in households despite the increasing number of households. This indicates a further decoupling of emissions from the number of dwellings.

Indicator	**CO_2 intensity of the commercial and institutional sector, t/Mio Euro**	
Indicator reference	Priority indicator 6, Projected Indicator 6	
Eurostat sector	SERVICES A0	
Numerator	CO_2 emissions from fossil fuel consumption in commercial and institutional sector, kt	
Denominator	Gross value-added services, Bio Euro (EC95)	
Availability 1990	7 of EU-27	7 of EU-15
Availability 2007	25 of EU-27	15 of EU-15
Availability 2010	21 of EU-27	13 of EU-15
Availability 2020	21 of EU-27	13 of EU-15





Intensity	1990	2007	2010	2020
Austria	28.75	14.04	30.25	24.07
Belgium	-	25.43	32.47	25.64
Bulgaria	-	-	18.65	12.07
Cyprus	-	14.70	-	-
Czech Republic	-	106.05	92.86	58.80
Denmark	-	6.61	7.65	4.61
Estonia	-	18.02	15.04	14.84
Finland	33.85	14.12	0.00	0.00
France	34.09	31.91	-	-
Germany	-	26.54	-	-
Greece	-	13.92	16.76	17.38
Hungary	-	106.32	-	-
Ireland	-	32.27	22.96	12.29
Italy	27.93	29.65	26.29	25.02
Latvia	-	74.65	-	-
Lithuania	-	39.82	38.57	37.23
Luxembourg	-	35.82	-	-
Malta	-	15.26	4.39	4.08
Netherlands	39.05	31.89	33.72	23.24
Poland	-	-	-	-
Portugal	17.07	35.71	107.20	91.14
Romania	-	0.27	0.00	0.00
Slovak Republic	-	41.20	45.70	41.41
Slovenia	-	36.14	49.21	32.16
Spain	-	20.45	-	-
Sweden	-	6.61	-	-
United Kingdom	37.18	17.18	-	-

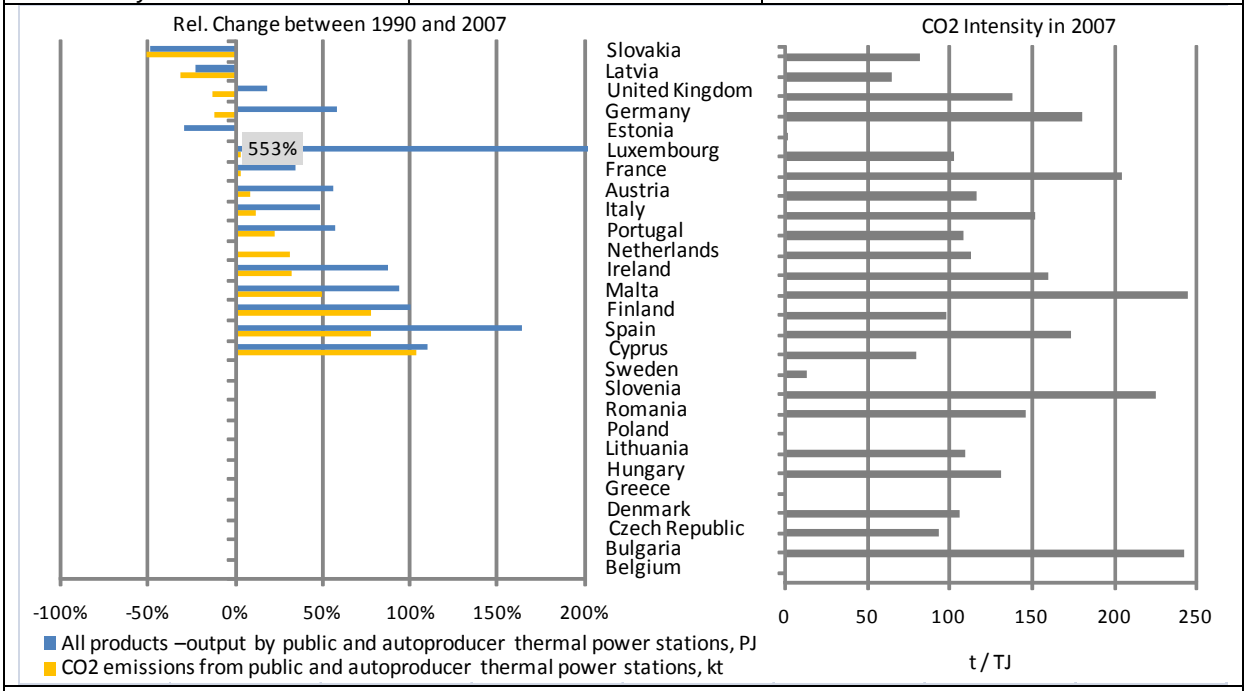
Main Messages 1990–2007:

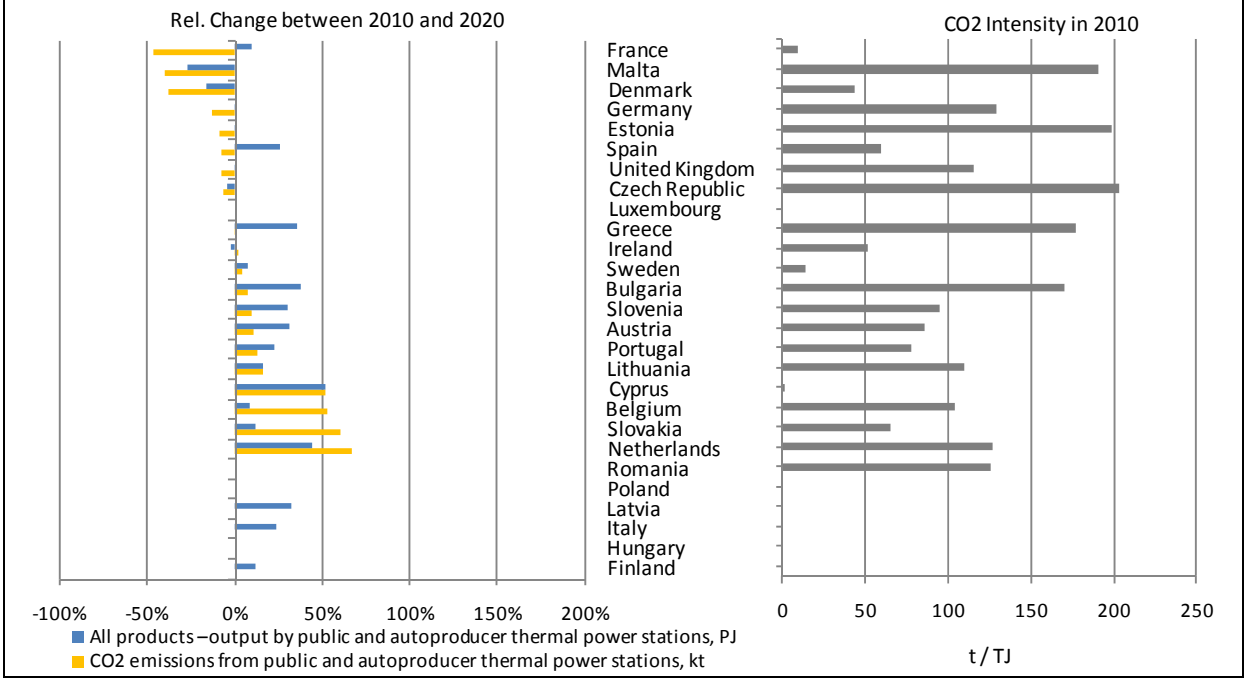
- In Finland, Austria, the United Kingdom and France changes in emissions were decoupled from fossil fuel consumption in the commercial and institutional sector
- The low intensities in Denmark, Finland and Sweden are due to high shares of district heating or biomass combustion.
- In the Netherlands, Italy and Portugal emissions and fuel consumption in services increased
- In Cyprus and Portugal emissions increased by more than 200%.

Main Messages 2010–2020:

- Most countries expect increases in GVA, but not all of them an increase in emissions.
- Portugal and Ireland's GDP were converted to billion of Euro

Indicator	**Specific CO_2 emissions of public and autoproducer power plants, t / TJ**	
Indicator reference	Priority indicator 7, Projected Indicator 7	
Eurostat sector	TRANSFORMATION B0	
Numerator	CO_2 emissions from public and autoproducer thermal power stations, kt	
Denominator	All products –output by public and autoproducer thermal power stations, PJ	
Availability 1990	15 of EU-27	10 of EU-15
Availability 2007	24 of EU-27	13 of EU-15
Availability 2010	22 of EU-27	13 of EU-15
Availability 2020	22 of EU-27	13 of EU-15





Intensity	1990	2007	2010	2020
Austria	166.83	116.56	102.27	86.14
Belgium	-	-	73.76	103.95
Bulgaria	-	242.07	219.66	170.82
Cyprus	81.79	79.01	0.74	0.74
Czech Republic	-	93.57	208.85	203.88
Denmark	-	105.88	58.47	43.68
Estonia	302.46	426.33	218.98	199.02
Finland	109.86	97.17	0.00	0.00
France	265.70	204.08	20.04	9.72
Germany	324.12	180.65	148.21	128.69
Greece	-	-	239.08	177.57
Hungary	-	131.19	-	-
Ireland	225.95	159.55	49.37	51.43
Italy	200.16	151.26	0.00	0.00
Latvia	72.25	64.42	0.00	0.00
Lithuania	-	109.22	110.00	110.00
Luxembourg	646.83	102.18	-	-
Malta	316.05	244.00	230.13	191.22
Netherlands	-	112.09	109.39	126.79
Poland	-	-	-	-
Portugal	138.48	108.59	85.78	78.35
Romania	-	146.29	114.60	125.60
Slovak Republic	86.18	81.98	45.10	64.85
Slovenia	-	224.98	113.2	95.3
Spain	257.27	173.08	81.97	60.10
Sweden	-	12.60	14.24	13.76
United Kingdom	187.14	137.34	125.99	115.93

Main Messages 1990–2007:

- This indicator is the ratio between CO_2 emissions from public and autoproducer thermal power stations[39], and the output[40] by these stations. Significant decoupling took place between 1994 and 1997 and between 2003 and 2007
- Low intensities observed in northern Europe may be explained by: (1)high shares of biomass combustion in public electricity and heat production (e.g. Sweden, Denmark, and Finland), (2) high shares of CHP (Denmark, Finland, Latvia), (3) high shares of gaseous fuels (e.g. Latvia, Lithuania, the United Kingdom).
- several new Member States have no 1990 data available
- Estonia's CO_2 emissions from public and autoproducer thermal power stations are converted to kt
- Bulgaria, Malta, Slovenia and France have intensities higher than 200t/TJ

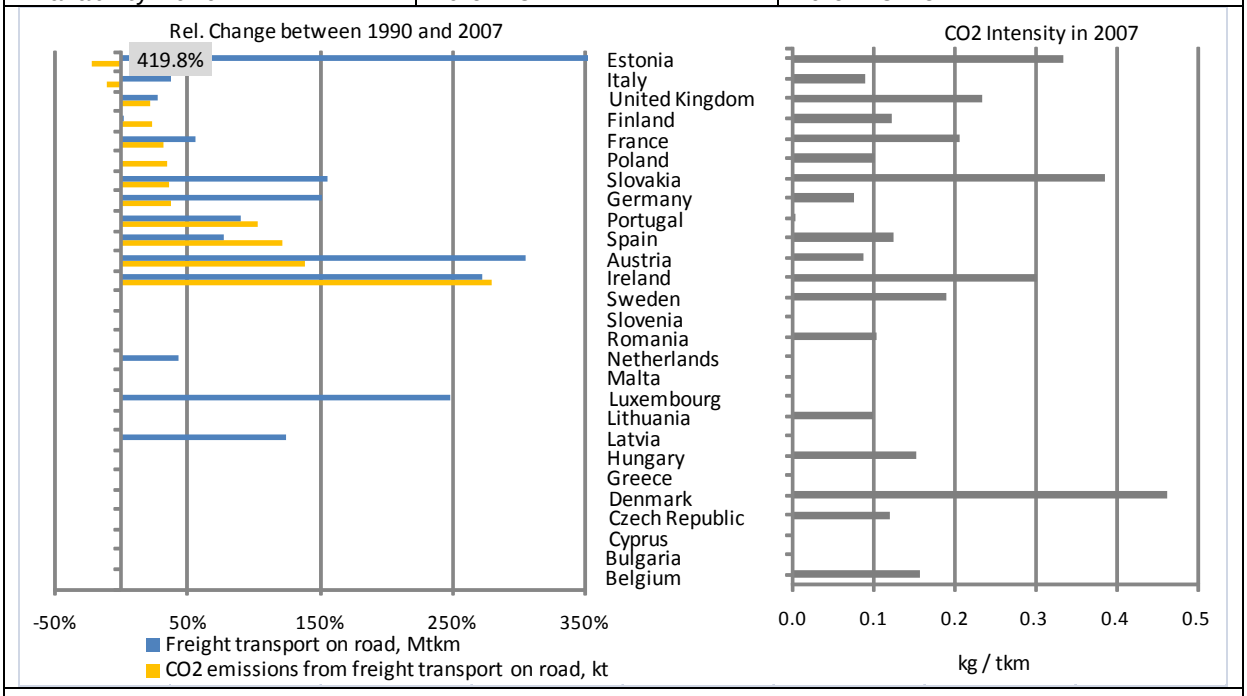
Main Messages 2010–2020:

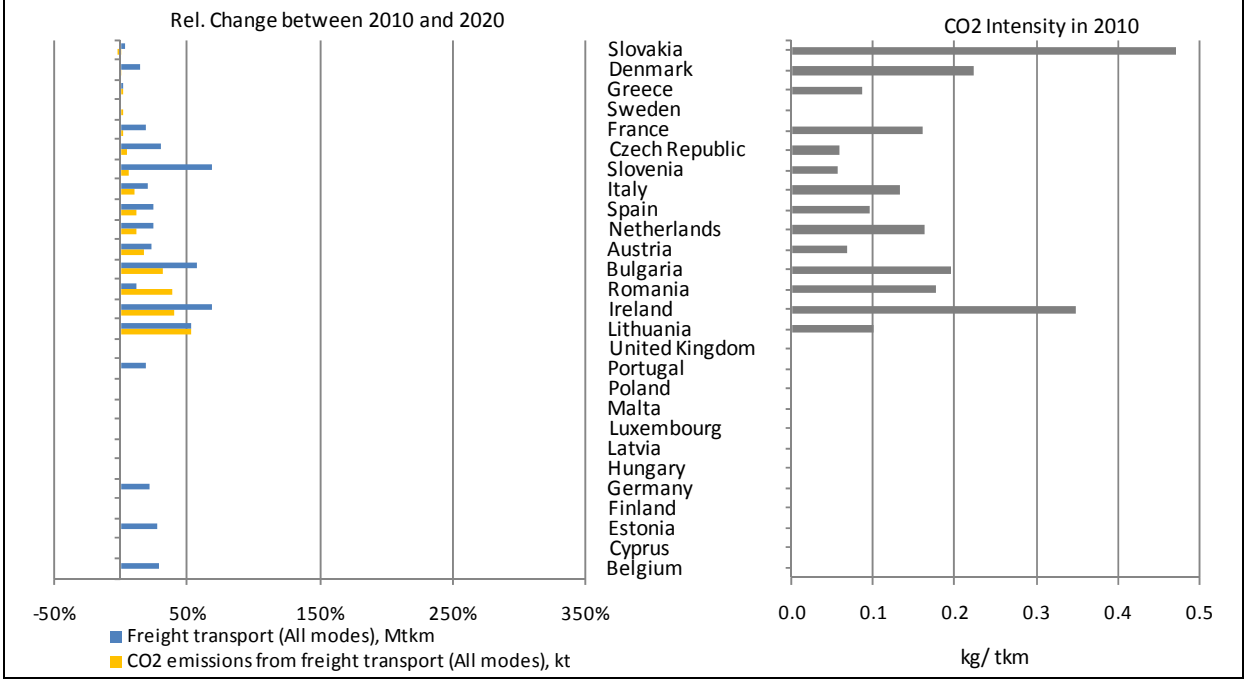
- Most countries project an increase in output from the respective power stations except for Malta, the Czech Republic, Ireland and Denmark
- Intensities show in most countries a decreasing trend

[39] 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.

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

Indicator	Specific CO_2 emissions of freight transport, kt / Mtkm	
Indicator reference	Additional Priority indicator 1, Projected Indicator 3	
Eurostat sector	TRANSPORT D0	
Numerator	CO_2 emissions from freight transport on road, kt	
Denominator	Freight transport on road, Mtkm	
Availability 1990	12 of EU-27	10 of EU-15
Availability 2007	19 of EU-27	12 of EU-15
Availability 2010	16 of EU-27	10 of EU-15
Availability 2020	16 of EU-27	10 of EU-15





Intensity	1990	2007	2010	2020
Austria	0.15	0.09	0.07	0.07
Belgium	-	0.16	0.00	0.00
Bulgaria	-	-	0.23	0.20
Cyprus	-	-	-	-
Czech Republic	-	0.12	0.07	0.06
Denmark	-	0.46	0.26	0.22
Estonia	2.25	0.33	0.00	0.00
Finland	0.10	0.12	-	-
France	0.24	0.20	0.19	0.16
Germany	0.14	0.07	0.00	0.00
Greece	-	-	0.09	0.09
Hungary	-	0.15	-	-
Ireland	0.30	0.30	0.42	0.35
Italy	0.14	0.09	0.14	0.13
Latvia	-	-	-	-
Lithuania	-	0.10	0.10	0.10
Luxembourg	-	-	-	-
Malta	-	-	-	-
Netherlands	0.35	-	0.18	0.16
Poland	-	0.10	-	-
Portugal	0.00	0.00	0.00	0.00
Romania	-	0.10	0.14	0.18
Slovak Republic	0.72	0.38	0.50	0.47
Slovenia	-	-	0.09	0.06
Spain	0.10	0.12	0.11	0.10
Sweden	-	0.19	-	-
United Kingdom	0.25	0.23	-	-

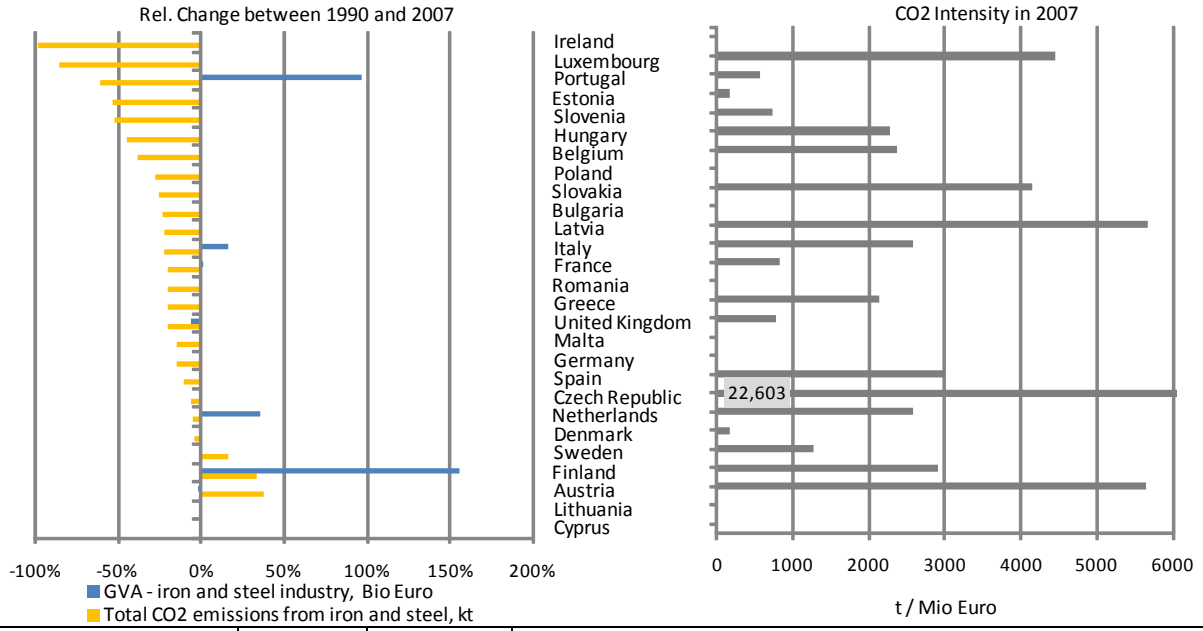
Main Messages 1990–2007:

- Freight transport increased in Austria, Estonia, Ireland and Luxembourg by more than 200%
- Decreases in CO_2 emissions are reported by Italy and Estonia
- No common intensity change between 1990 and 2007 can be seen
- 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

Main Messages 2010–2020:

- It has to be noted that comparability between the respective past and projected indicator is of limited significance as the past indicator only refers to light and heavy duty vehicles and the projected to all modes of transport
- Freight transport is projected to increase in all reporting countries, so are CO_2 emissions except for the Slovak Republic and Denmark
- Only in Romania intensity is projected to increase between 2010 and 2020

Indicator	Total CO_2 intensity - iron and steel industry, t/Mio Euro	
Indicator reference	Additional Priority indicator 2	
Eurostat sector	INDUSTRY A1.1	
Numerator	Total CO_2 emissions from iron and steel, kt	
Denominator	Gross value-added - iron and steel industry, Bio Euro (EC95)	
Availability 1990	7 of EU-27	7 of EU-15
Availability 2007	19 of EU-27	13 of EU-15

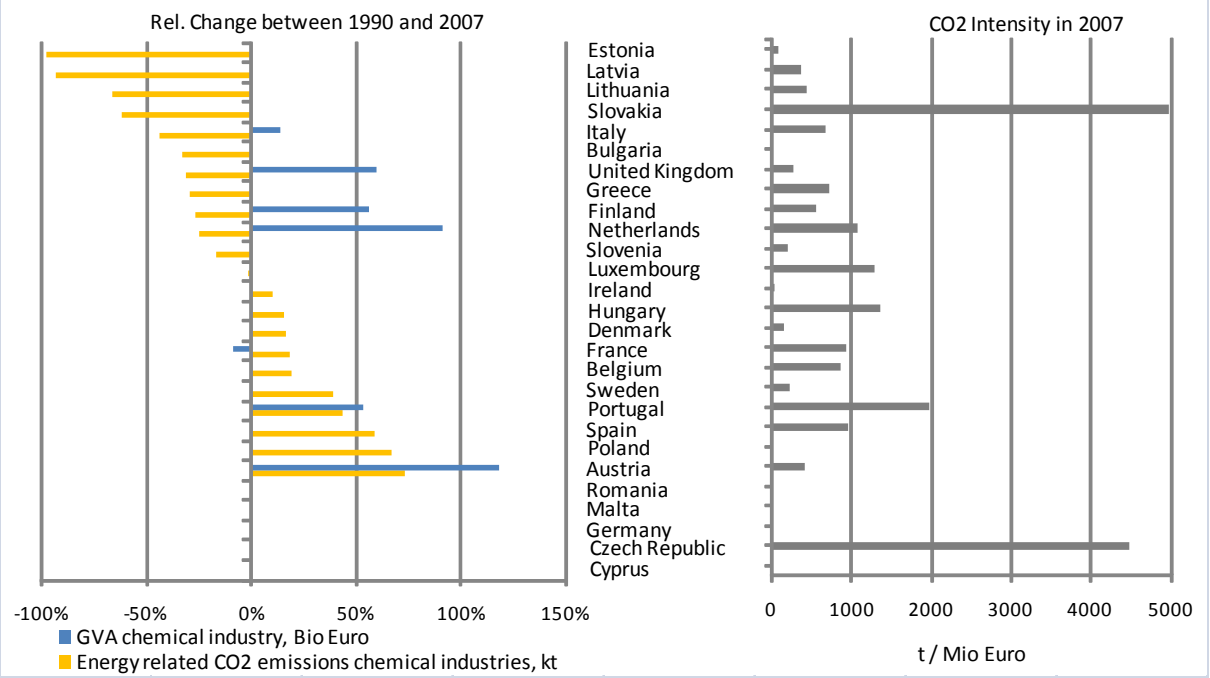


Intensity	1990	2007
Austria	4022.20	5640.78
Belgium	-	2377.28
Bulgaria	-	-
Cyprus	-	-
Czech Republic	-	22602.87
Denmark	-	167.81
Estonia	-	161.45
Finland	5583.55	2900.03
France	1043.56	824.86
Germany	-	-
Greece	-	2130.00
Hungary	-	2270.76
Ireland	-	-
Italy	3876.04	2589.22
Latvia	-	5658.72
Lithuania	-	-
Luxembourg	-	4462.24
Malta	-	-
Netherlands	3716.86	2591.79
Poland	-	-
Portugal	2839.13	557.75
Romania	-	-
Slovak Republic	-	4144.99
Slovenia	-	739.02
Spain	-	2992.61
Sweden	-	1262.86
United Kingdom	902.08	775.09

Main Messages:

- CO_2 emissions decreased in all countries except for in Austria, Finland and Sweden; in Finland also the GVA increased (+156%)
- Availability of GVA data for 1990 is very limited
- Denmark and Estonia show the lowest intensity in 2007; Estonia having one of the lowest GVA. For some countries (e.g. Denmark and Slovenia), the denominator may include more activities than for other countries, because no disaggregated information is available.
- Note: Cyprus, Lithuania and Malta do not produce iron and steel.

Indicator	Energy related CO_2 intensity - chemical industry, t / Mio Euro	
Indicator reference	Additional Priority indicator 3	
Eurostat sector	INDUSTRY A1.2	
Numerator	Energy related CO_2 emissions chemical industries, kt	
Denominator	Gross value-added chemical industry, Bio Euro (EC95)	
Availability 1990	6 of EU-27	6 of EU-15
Availability 2007	20 of EU-27	13 of EU-15

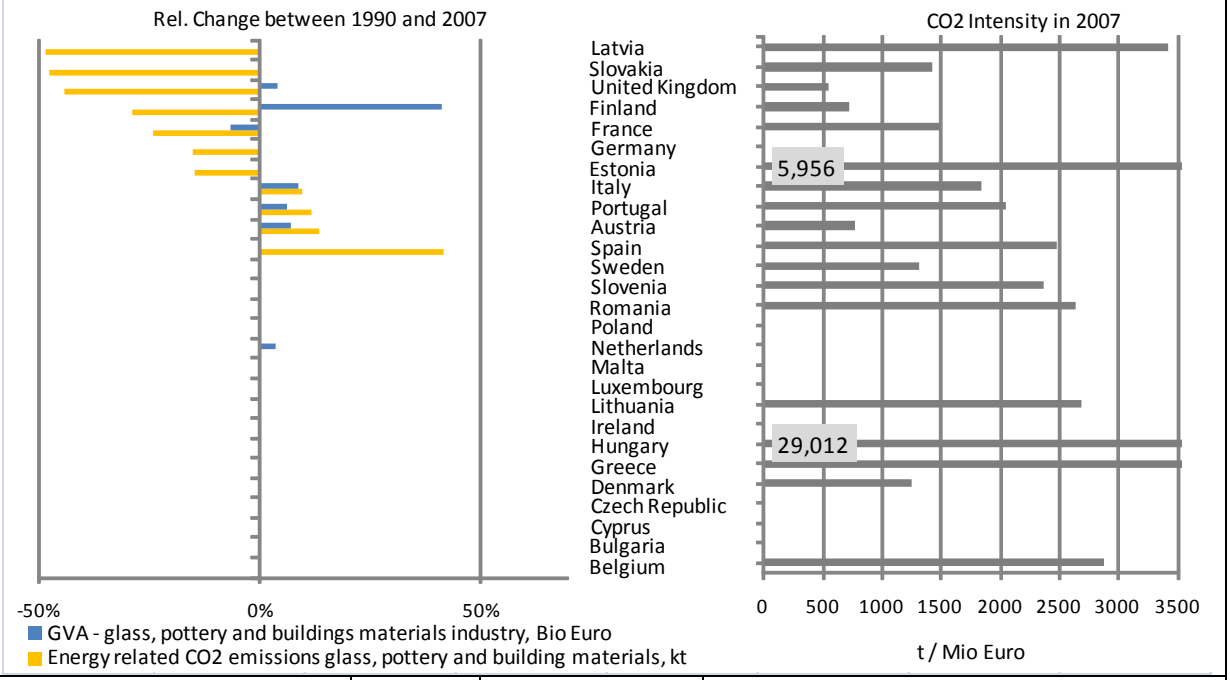


Intensity	1990	2007
Austria	519.49	412.77
Belgium	-	850.87
Bulgaria	-	-
Cyprus	-	-
Czech Republic	-	4469.93
Denmark	-	158.59
Estonia	-	78.18
Finland	1173.35	549.92
France	715.99	929.79
Germany	-	-
Greece	-	726.00
Hungary	-	1361.01
Ireland	-	30.55
Italy	1361.86	679.06
Latvia	-	360.84
Lithuania	-	424.00
Luxembourg	-	1276.80
Malta	-	-
Netherlands	2756.74	1077.94
Poland	-	-
Portugal	2092.98	1958.95
Romania	-	-
Slovak Republic	-	4977.81
Slovenia	-	189.83
Spain	-	955.99
Sweden	-	230.81
United Kingdom	629.97	270.44

Main Messages:

- Intensities show a large variation (from 30 to almost 5000 t per Mio €)
- The United Kingdom, France, Ireland and Italy have the highest GVA from chemical industries in 2007
- France is the only Member State to report that gross value added decreased while CO_2 emissions increased.
- The Czech Republic, the Slovak Republic and Greece show a much higher CO_2 intensity compared to other countries.
- Note: Comparisons of absolute intensities are only of limited significance as data are not always consistent across countries. The Czech Republic (1990–2002), Germany, Malta, Romania and the United Kingdom include emissions under source category 1A2f 'other'. In Cyprus (1990–2007) chemical industry is not occurring.

Indicator	Energy related CO_2 intensity - glass, pottery and building materials industry, t/Mio Euro	
Indicator reference	Additional Priority indicator 4	
Eurostat sector	INDUSTRY A1.3	
Numerator	Energy related CO_2 emissions glass, pottery and building materials, kt	
Denominator	Gross value-added - glass, pottery and buildings materials industry, Bio Euro (EC95)	
Availability 1990	6 of EU-27	6 of EU-15
Availability 2007	18 of EU-27	11 of EU-15

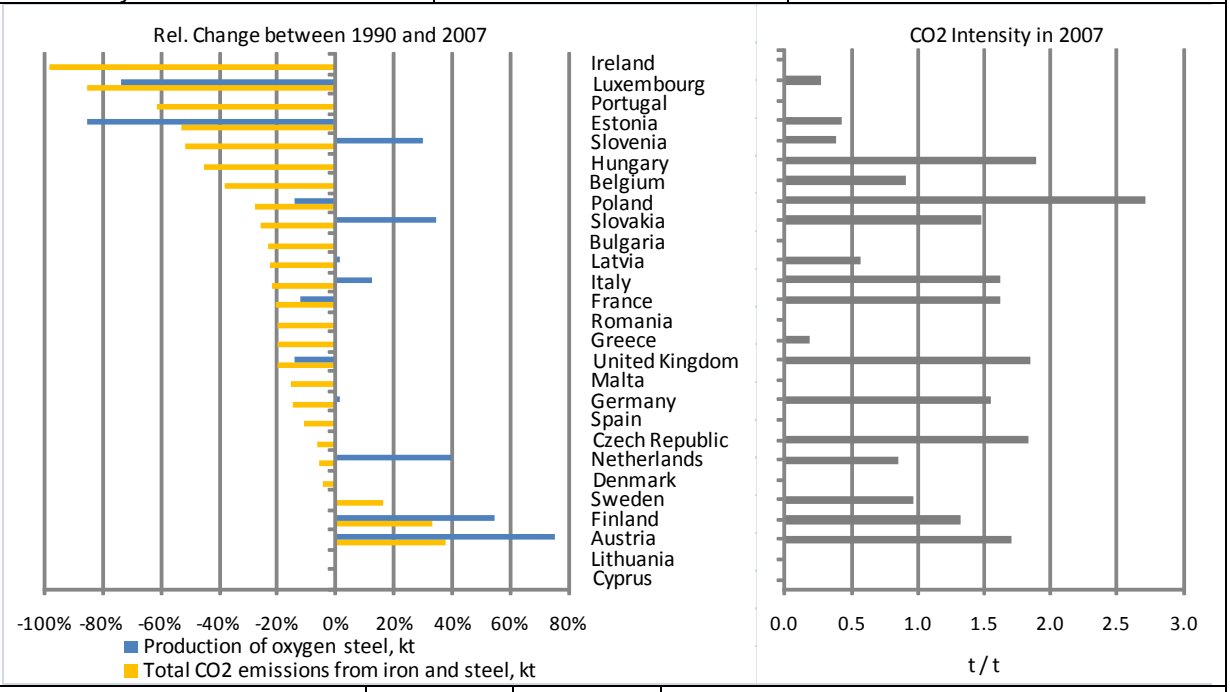


Intensity	1990	2007
Austria	730.24	773.55
Belgium	-	2882.12
Bulgaria	-	-
Cyprus	-	-
Czech Republic	-	-
Denmark	-	1250.86
Estonia	-	5955.71
Finland	1449.44	728.02
France	1837.27	1488.85
Germany	-	-
Greece	-	3719.00
Hungary	-	29011.6
Ireland	-	-
Italy	1814.40	1832.71
Latvia	-	3413.47
Lithuania	-	2688.27
Luxembourg	-	-
Malta	-	-
Netherlands	-	-
Poland	-	-
Portugal	1945.73	2047.06
Romania	-	2640.56
Slovak Republic	-	1428.20
Slovenia	-	2369.93
Spain	-	2475.55
Sweden	-	1317.82
United Kingdom	1033.46	552.30

Main Messages:

- 1990 GVA data are of limited availability
- Italy, France, Spain and the United Kingdom have the highest GVA from glass, pottery and buildings industry in 2007
- Latvia, Lithuania, Slovenia and Estonia report the lowest CO_2 emissions in 2007
- 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.

Indicator	Specific CO_2 emissions of iron and steel industry, t/t	
Indicator reference	Additional Priority indicator 5	
Eurostat sector	INDUSTRY C0.1	
Numerator	Total CO_2 emissions from iron and steel, kt	
Denominator	Production of oxygen steel, kt	
Availability 1990	13 of EU-27	9 of EU-15
Availability 2007	17 of EU-27	11 of EU-15

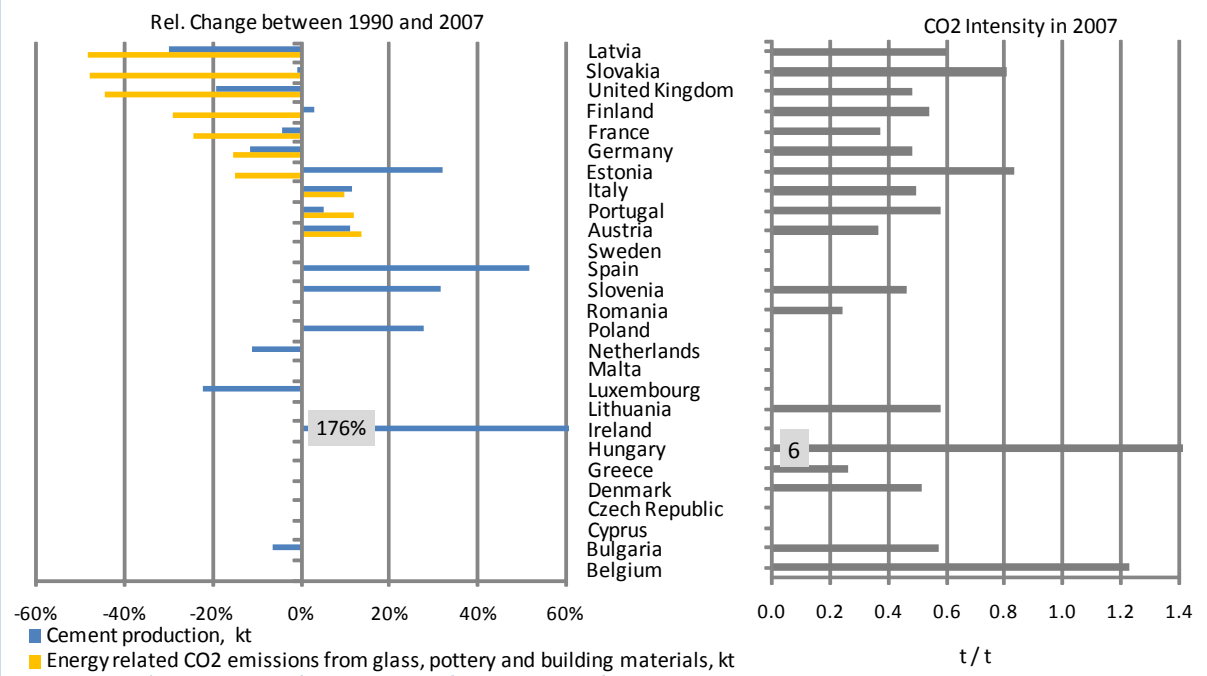


Intensity	1990	2007
Austria	2.17	1.71
Belgium	-	0.91
Bulgaria	-	-
Cyprus	-	-
Czech Republic	-	1.84
Denmark	-	-
Estonia	0.13	0.43
Finland	1.54	1.33
France	1.79	1.63
Germany	1.86	1.55
Greece	-	0.19
Hungary	-	1.90
Ireland	-	-
Italy	2.34	1.62
Latvia	0.75	0.57
Lithuania	-	-
Luxembourg	0.47	0.27
Malta	-	-
Netherlands	1.26	0.85
Poland	3.22	2.71
Portugal	117.50	-
Romania	-	-
Slovak Republic	2.68	1.48
Slovenia	1.06	0.39
Spain	-	-
Sweden	-	0.96
United Kingdom	1.97	1.85

Main Messages:

- Belgium, France, Germany and Italy report the highest production of oxygen steel in 2007
- Austria, Finland, the Netherlands, the Slovak Republic and Slovenia had a strong increase in steel production between 1990 and 2007, visble also in CO_2 emissions in Austria and Finland
- In Germany, Italy, Latvia, Netherlands, the Slovak Republic and Slovenia emissions decreased and production of oxygen steel increased
- For Slovenia the value for gross value added includes non-ferrous metal industry. This might cause the low CO_2 intensities.
- 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.
- In Lithuania (1990–2007) production of oxygen steel is not occurring. In Bulgaria (1990–2007), Romania (2007), and Spain (1990–2006) production of oxygen steel is confidential.

Indicator	Specific energy related CO_2 emissions of cement industry, t/t	
Indicator reference	Additional Priority indicator 6	
Eurostat sector	INDUSTRY C0.2	
Numerator	Energy related CO_2 emissions from glass, pottery and building materials, kt	
Denominator	Cement production, kt	
Availability 1990	14 of EU-27	8 of EU-15
Availability 2007	21 of EU-27	12 of EU-15

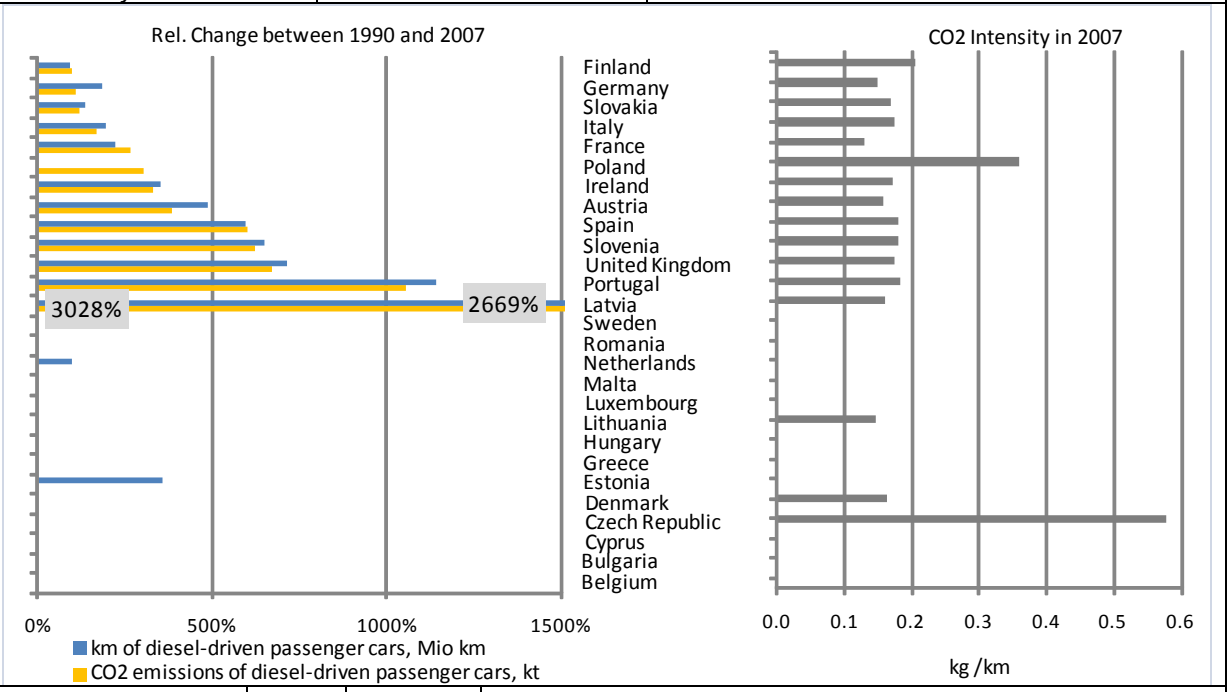


Intensity	1990	2007
Austria	0.36	0.36
Belgium	-	1.23
Bulgaria	0.00	0.57
Cyprus	-	-
Czech Republic	-	-
Denmark	-	0.51
Estonia	1.29	0.83
Finland	0.79	0.54
France	0.47	0.37
Germany	0.50	0.48
Greece	-	0.26
Hungary	-	6.00
Ireland	-	-
Italy	0.50	0.50
Latvia	0.82	0.60
Lithuania	-	0.58
Luxembourg	-	-
Malta	-	-
Netherlands	-	-
Poland	0.00	0.00
Portugal	0.54	0.58
Romania	-	0.24
Slovak Republic	1.53	0.81
Slovenia	0.00	0.46
Spain	0.00	0.00
Sweden	-	0.00
United Kingdom	0.70	0.48

Main Messages:

- 1990 GVA data are of limited availability
- Bulgaria's and Poland's production data of cement converted to kt (as reported in t)
- Only in Estonia and Finland changes in of cement production and resulting CO_2 emissions are showing opposite trends
- Cement production in Ireland increase by 176%
- 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.
- Some countries (Ireland, Netherlands, the Czech Republic, Luxembourg, the United Kingdom) do not report emission values, as they are probably included elsewhere or not available.

Indicator	**Specific diesel related CO_2 emissions of passenger cars, g/100km**	
Indicator reference	Supplementary indicator 1	
Eurostat sector	TRANSPORT B0	
Numerator	CO_2 emissions of diesel-driven passenger cars, kt	
Denominator	Number of kilometres of diesel-driven passenger cars, Mio km	
Availability 1990	15 of EU-27	10 of EU-15
Availability 2007	18 of EU-27	10 of EU-15

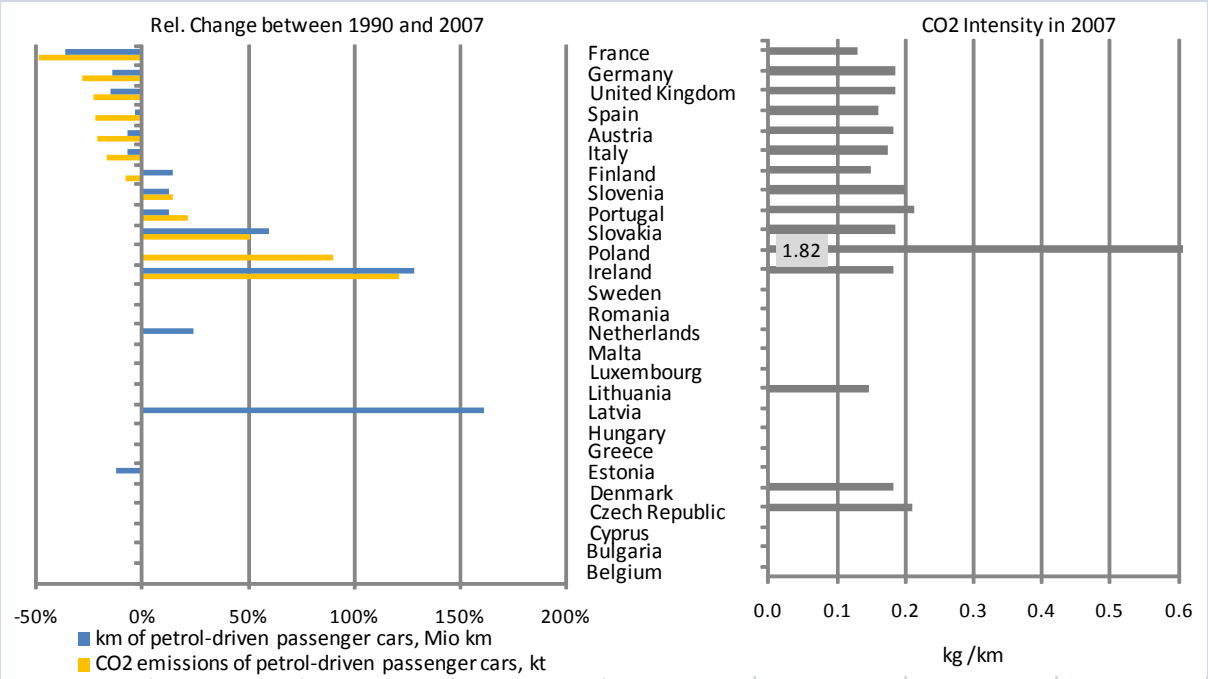


Intensity	**1990**	**2007**
Austria	0.19	0.16
Belgium	-	-
Bulgaria	-	-
Cyprus	-	-
Czech Republic	-	0.58
Denmark	-	0.16
Estonia	0.00	0.00
Finland	0.20	0.20
France	0.11	0.13
Germany	0.20	0.15
Greece	-	-
Hungary	-	-
Ireland	0.18	0.17
Italy	0.19	0.17
Latvia	0.14	0.16
Lithuania	-	0.15
Luxembourg	-	-
Malta	0.00	0.00
Netherlands	0.21	-
Poland	-	0.36
Portugal	0.19	0.18
Romania	-	-
Slovak Republic	0.18	0.17
Slovenia	0.19	0.18
Spain	0.18	0.18
Sweden	-	-
United Kingdom	0.18	0.17

Main Messages:

- All reporting countries report increases in diesel driven kilometres, the highest in Latvia (>3000%), Portugal (>1000%), the United Kingdom (700%), Slovenia (600%) and Spain (600%)
- In Finland, France, Spain and Latvia diesel-driven km increased stronger than CO_2 emissions; in all other reporting countries this is not the case
- Higest intensity in 2007 is reported by the Czech Republic and Poland
- 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.

Indicator	Specific petrol related CO_2 emissions of passenger cars, g/100km	
Indicator reference	Supplementary indicator 2	
Eurostat sector	TRANSPORT B0	
Numerator	CO_2 emissions of petrol-driven passenger cars, kt	
Denominator	Number of kilometres of petrol-driven passenger cars, Mio km	
Availability 1990	14 of EU-27	10 of EU-15
Availability 2007	17 of EU-27	10 of EU-15

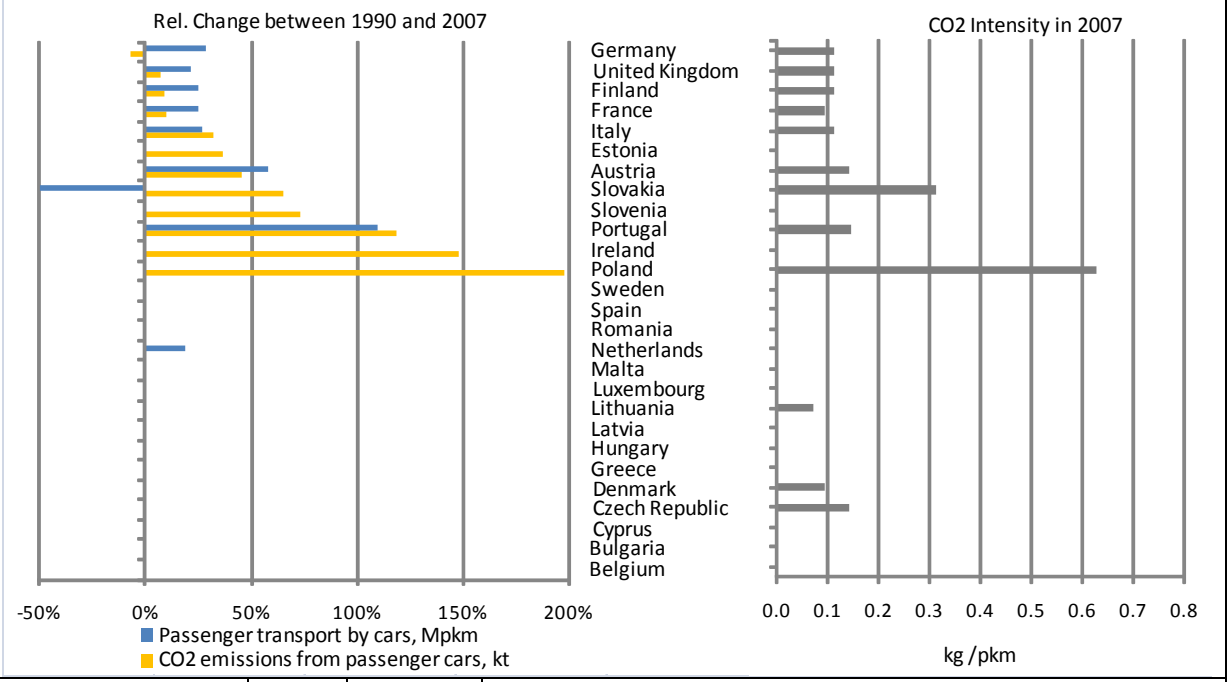


Intensity	1990	2007
Austria	0.22	0.18
Belgium	-	-
Bulgaria	-	-
Cyprus	-	-
Czech Republic	-	0.21
Denmark	-	0.18
Estonia	0.00	0.00
Finland	0.19	0.15
France	0.16	0.13
Germany	0.22	0.18
Greece	-	-
Hungary	-	-
Ireland	0.19	0.18
Italy	0.20	0.17
Latvia	-	-
Lithuania	-	0.15
Luxembourg	-	-
Malta	0.00	0.00
Netherlands	0.20	-
Poland	-	1.82
Portugal	0.20	0.21
Romania	-	-
Slovak Republic	0.20	0.18
Slovenia	0.20	0.20
Spain	0.20	0.16
Sweden	-	-
United Kingdom	0.21	0.19

Main Messages:

- More countries report decreases in petrol driven km than increases
- In all reporting countries the growth in emissions is smaller than the growth in petrol driven km, except for in Portugal and Slovenia
- In Finland CO_2 emissions decreased while petrol driven km increased
- Poland reports the highest intensity, due to a very low number of petrol driven km
- Latvia reports an increase in petrol driven km of >160%, and emissions are included elsewhere
- Decreasing numbers of petrol driven cars may reflect a shift from petrol to diesel-driven cars, as observed in Germany and Austria.
- 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
- Data from Luxembourg are reported as not estimated

Indicator	Specific CO_2 emissions of passenger cars, t/pkm	
Indicator reference	Supplementary indicator 3	
Eurostat sector	TRANSPORT C0	
Numerator	CO_2 emissions from passenger cars, kt	
Denominator	Passenger transport by cars, Mpkm	
Availability 1990	9 of EU-27	8 of EU-15
Availability 2007	12 of EU-27	8 of EU-15

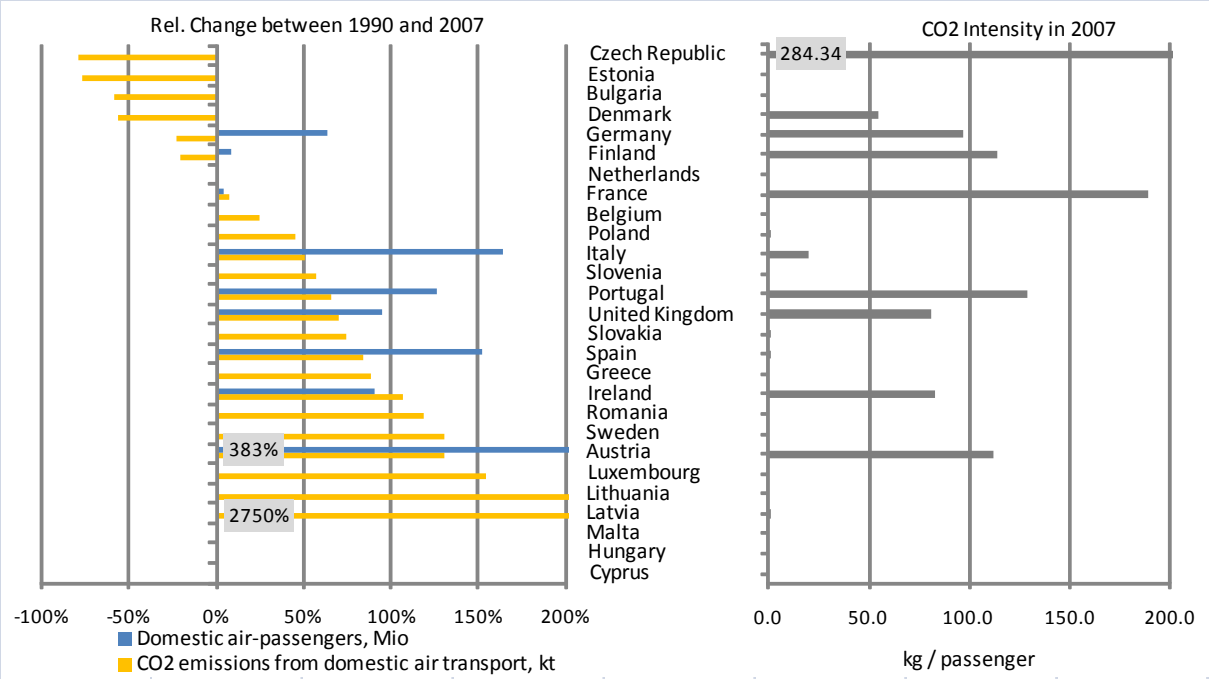


Intensity	1990	2007
Austria	0.16	0.14
Belgium	-	-
Bulgaria	-	-
Cyprus	-	-
Czech Republic	-	0.14
Denmark	-	0.10
Estonia	-	-
Finland	0.13	0.11
France	0.11	0.10
Germany	0.16	0.11
Greece	-	-
Hungary	-	-
Ireland	-	-
Italy	0.11	0.11
Latvia	-	-
Lithuania	-	0.07
Luxembourg	-	-
Malta	-	-
Netherlands	0.13	-
Poland	-	0.63
Portugal	0.14	0.14
Romania	-	-
Slovak Republic	0.10	0.31
Slovenia	-	-
Spain	-	-
Sweden	-	-
United Kingdom	0.13	0.11

Main Messages:

- Availability of this indicator is rather low
- growth in passenger transport is bigger than the growth in emissions, except for Portugal and Italy
- The Slovak Republic's passenger transport decoupled completely from emissions
- Highest intensity is reported by Poland
- Latvia and Luxembourg report emissions as not estimated
- Ireland reports passenger transport as not available and Slovenia as not estimated

Indicator	Specific air-transport emissions, t/passenger	
Indicator reference	Supplementary indicator 4	
Eurostat sector	TRANSPORT E1	
Numerator	CO_2 emissions from domestic air transport, kt	
Denominator	Domestic air-passengers, Mio	
Availability 1990	11 of EU-27	9 of EU-15
Availability 2007	15 of EU-27	10 of EU-15

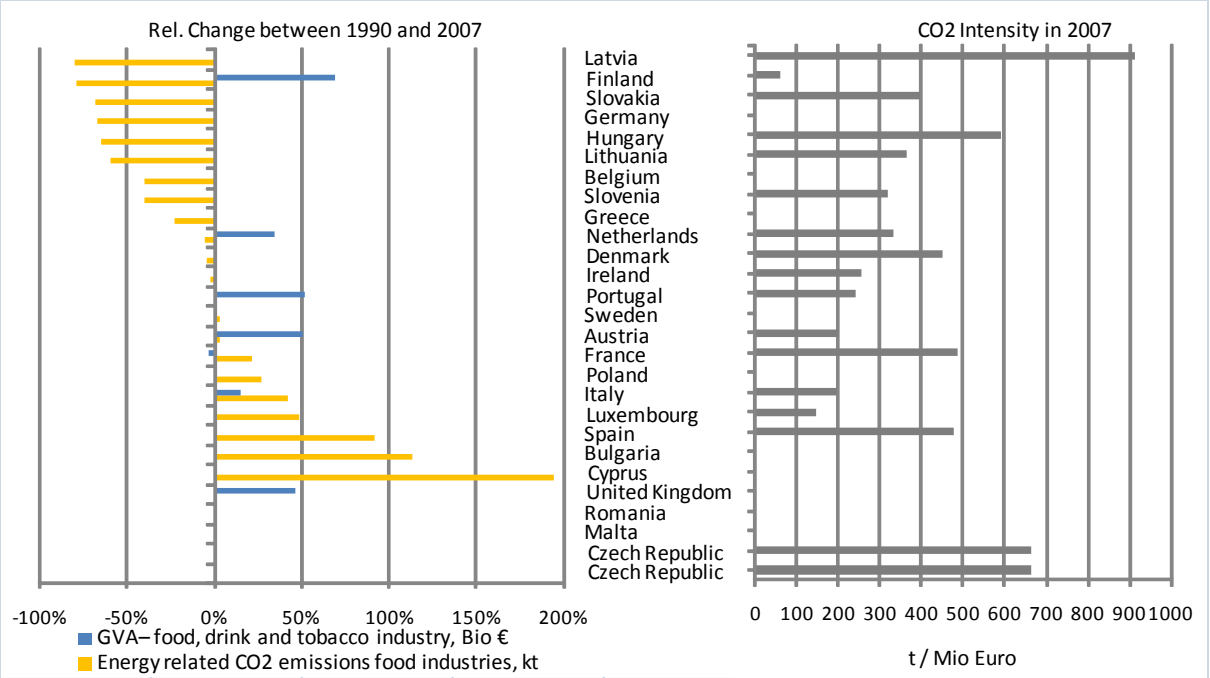


Intensity	1990	2007
Austria	234.05	111.52
Belgium	-	-
Bulgaria	-	-
Cyprus	-	-
Czech Republic	-	284.34
Denmark	-	54.77
Estonia	-	-
Finland	155.11	114.02
France	183.07	188.87
Germany	205.11	96.75
Greece	-	-
Hungary	-	-
Ireland	76.41	83.05
Italy	34.63	19.76
Latvia	0.03	0.85
Lithuania	-	-
Luxembourg	-	-
Malta	-	-
Netherlands	-	-
Poland	-	0.00
Portugal	175.66	128.66
Romania	-	-
Slovak Republic	-	0.02
Slovenia	-	-
Spain	0.00	0.00
Sweden	-	-
United Kingdom	92.80	81.13

Main Messages:

- Passenger transport increased in all reporting countries stronger than emissions except for France and Ireland
- Intensities show a large range from below 1 up to almost 300, which can partly be explained by the country size
- 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 emission decrease observed seems to be partly due to different allocation (domestic versus international) methods used in 1990 and in 2006
- Cyprus (1990–2007), Hungary (1990–1999, 2002–2005, 2007). Lithuania (1996–1999) and Malta (1990–2002) reported that CO_2 emissions from civil aviation as not occurring or not available. Luxembourg (1990–2007), the Netherlands(1990–2007) and Slovenia (2003–2006) reported for domestic air passengers not occurring or not available.

Indicator	Energy related CO_2 intensity - food, drink and tobacco industry, t / Mio Euro	
Indicator reference	Supplementary indicator 5	
Eurostat sector	INDUSTRY A14	
Numerator	Energy related CO_2 emissions food industries, kt	
Denominator	Gross value-added – food, drink and tobacco industry, Bio Euro (EC95)	
Availability 1990	6 of EU-27	6 of EU-15
Availability 2007	17 of EU-27	10 of EU-15

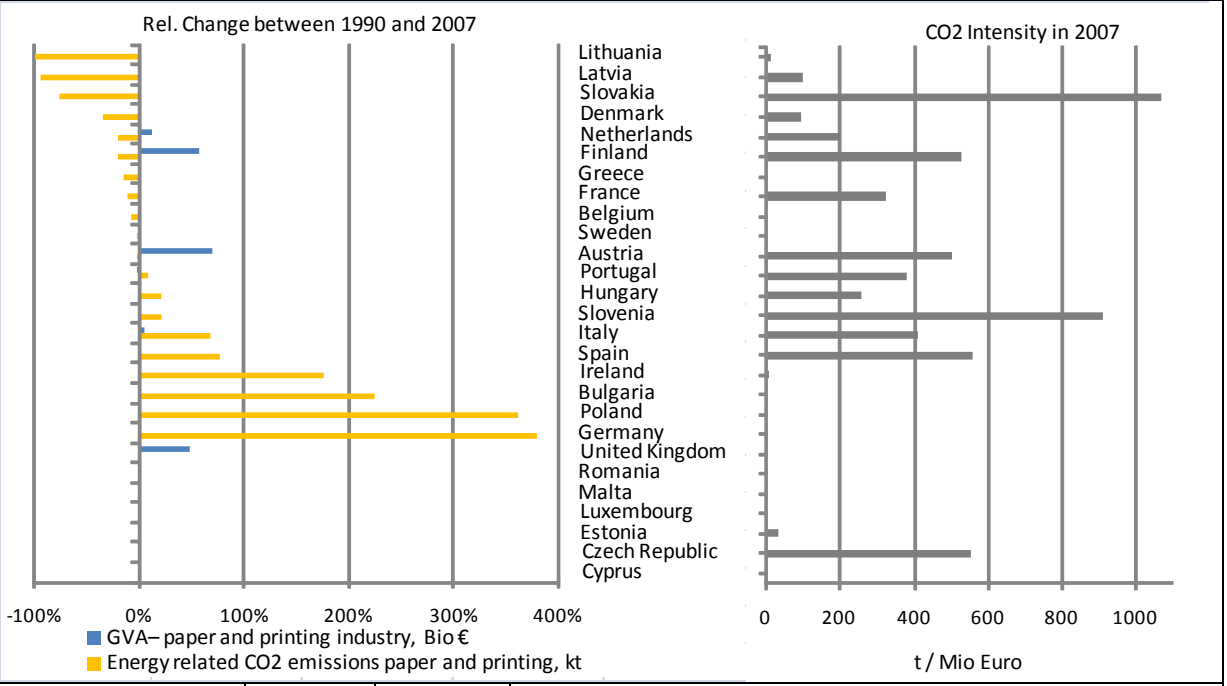


Intensity	1990	2007
Austria	292.92	200.48
Belgium	-	-
Bulgaria	-	-
Cyprus	-	-
Czech Republic	-	665.55
Denmark	-	452.22
Estonia	-	49.68
Finland	506.42	62.00
France	386.93	485.77
Germany	-	-
Greece	-	-
Hungary	-	592.45
Ireland	-	255.47
Italy	159.11	196.49
Latvia	-	911.31
Lithuania	-	364.06
Luxembourg	-	147.99
Malta	-	-
Netherlands	475.17	332.10
Poland	-	-
Portugal	363.00	241.44
Romania	-	-
Slovak Republic	-	397.90
Slovenia	-	317.98
Spain	-	477.02
Sweden	-	-
United Kingdom	-	-

Main Messages:

- Data availability for 1990 very limited
- All countries reoport stronger emission decreases than GVA increases, except for France and Italy
- Portugal's GVA converted to billions as reported in million Euro.
- Romania, Malta and the United Kingdom include emissions under source category 1A2f 'other'. The Czech Republic (1990–2002) report emissions as not occurring.

Indicator	Energy related CO_2 intensity - paper and printing industry, t / Mio Euro	
Indicator reference	Supplementary indicator 6	
Eurostat sector	INDUSTRY A1.5	
Numerator	Energy related CO_2 emissions paper and printing, kt	
Denominator	Gross value-added – paper and printing industry, Bio Euro (EC95)	
Availability 1990	6 of EU-27	6 of EU-15
Availability 2007	16 of EU-27	9 of EU-15

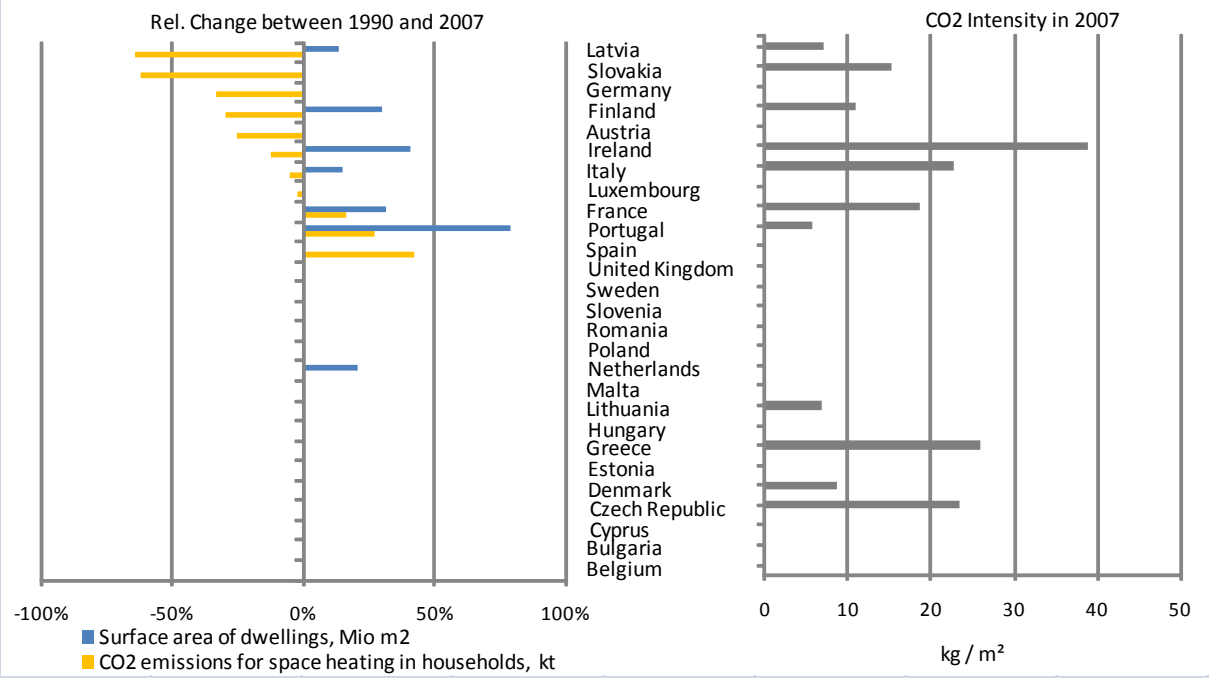


Intensity	1990	2007
Austria	861.10	503.40
Belgium	-	-
Bulgaria	-	-
Cyprus	-	-
Czech Republic	-	551.66
Denmark	-	95.20
Estonia	-	34.65
Finland	1034.34	527.76
France	357.17	320.89
Germany	-	-
Greece	-	-
Hungary	-	255.06
Ireland	-	7.82
Italy	255.46	411.11
Latvia	-	97.60
Lithuania	-	13.26
Luxembourg	-	-
Malta	-	-
Netherlands	280.69	199.88
Poland	-	-
Portugal	341.99	377.27
Romania	-	-
Slovak Republic	-	1070.23
Slovenia	-	908.50
Spain	-	560.10
Sweden	-	-
United Kingdom	-	-

Main Messages:

- Intensities vary from below 10 to over a 1000
- GVA data for 1990 are of limited availability
- CO_2 emissions in Germany (380%), Poland (362%), Bulgaria (224%) and Ireland (176%) increased most
- The Slovak Republic's final energy consumption was converted to PJ (as reported in TJ)
- Portugal's GVA converted to billions as reported in million €
- Sweden and Austria report a -1% for CO_2 emissions, therefore hardly visible in the graph
- Romania and the United Kingdom include emissions under source category 1A2f 'other'. Germany includes only emissions from other fuels (eg waste paper). Estonia (1990, 1991, 1996), Luxembourg (1990–2007) and Malta (1990–2007) report emissions as not occurring.

Indicator	Specific CO_2 emissions of households for space heating, kg / m²	
Indicator reference	Supplementary indicator 7	
Eurostat sector	HOUSEHOLDS A0	
Numerator	CO_2 emissions for space heating in households, kt	
Denominator	Surface area of permanently occupied dwellings, Mio m2	
Availability 1990	8 of EU-27	6 of EU-15
Availability 2007	11 of EU-27	7 of EU-15

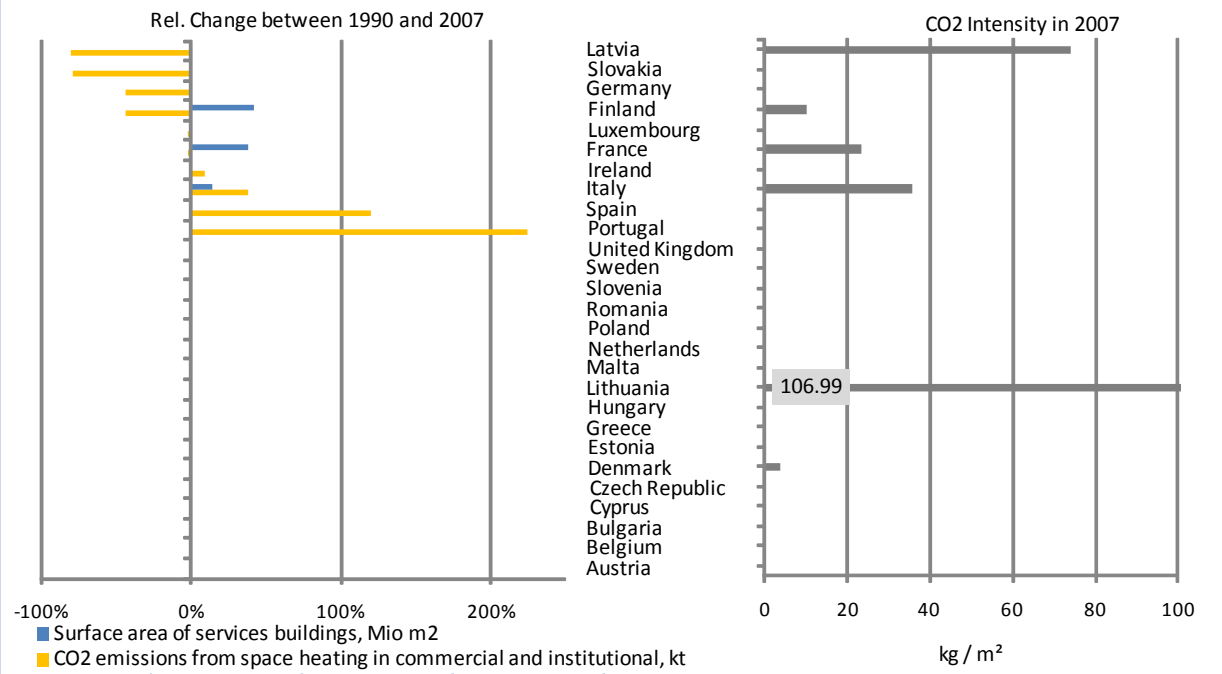


Intensity	1990	2007
Austria	35.78	-
Belgium	-	-
Bulgaria	-	-
Cyprus	-	-
Czech Republic	-	23.38
Denmark	-	8.75
Estonia	-	0.00
Finland	20.27	10.96
France	21.16	18.76
Germany	-	-
Greece	-	26.00
Hungary	-	-
Ireland	62.47	38.75
Italy	27.50	22.76
Latvia	22.41	7.06
Lithuania	-	6.93
Luxembourg	-	-
Malta	-	-
Netherlands	-	-
Poland	0.0	-
Portugal	8.14	5.80
Romania	-	-
Slovak Republic	-	15.29
Slovenia	-	-
Spain	-	-
Sweden	-	-
United Kingdom	-	-

Main Messages:

- Data for Surface of permanently occupied dwelling are of limited availability
- Estonia's and Poland's surface of dwellings converted to millions m² as reported in 1000m²
- In all countries except for in France, Portugal and Spain CO_2 emissions decreased between 1990 and 2007
- The high CO_2 intensity in the Slovak Republic can be explained by the inclusion of fuel sales for individual consumers.

Indicator	Specific CO_2 emissions of commercial and institutional sector for space heating, kg / m²	
Indicator reference	Supplementary indicator 8	
Eurostat sector	SERVICES B0	
Numerator	CO_2 emissions from space heating in commercial and institutional, kt	
Denominator	Surface area of services buildings, Mio m2	
Availability 1990	3 of EU-27	3 of EU-15
Availability 2007	6 of EU-27	4 of EU-15

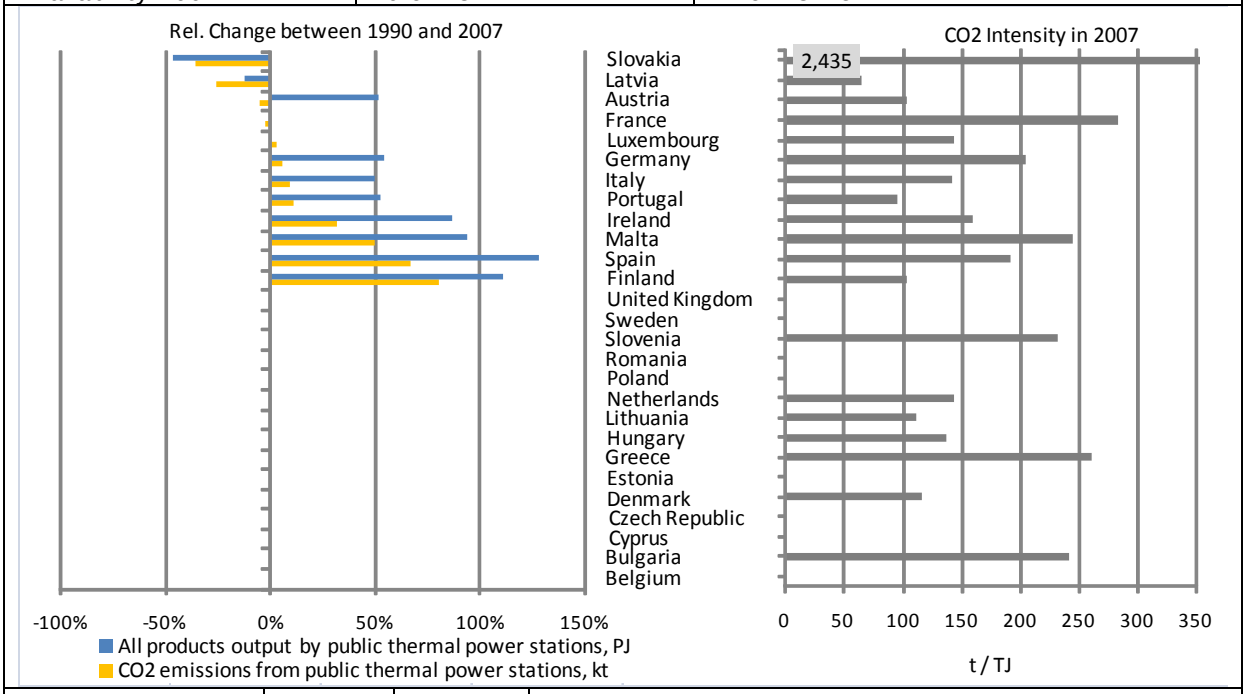


Intensity	1990	2007
Austria	-	-
Belgium	-	-
Bulgaria	-	-
Cyprus	-	-
Czech Republic	-	-
Denmark	-	3.95
Estonia	-	-
Finland	26.20	10.37
France	33.26	23.49
Germany	-	-
Greece	-	-
Hungary	-	-
Ireland	-	-
Italy	29.24	35.51
Latvia	-	74.25
Lithuania	-	106.99
Luxembourg	-	-
Malta	-	-
Netherlands	-	-
Poland	-	-
Portugal	-	-
Romania	-	-
Slovak Republic	-	-
Slovenia	-	-
Spain	-	-
Sweden	-	-
United Kingdom	-	-

Main Messages:

- Data availability is very limited
- In Ireland, Italy, Portugal and Spain CO_2 emissions increased between 1990 and 2007
- In all reporting countries (Finland, France, Italy) surface in services buildings increased

Indicator	Specific CO_2 emissions of public power plants, t/TJ	
Indicator reference	Supplementary indicator 9	
Eurostat sector	TRANSFORMATION D0	
Numerator	CO_2 emissions from public thermal power stations, kt	
Denominator	All products output by public thermal power stations, PJ	
Availability 1990	11 of EU-27	7 of EU-15
Availability 2007	20 of EU-27	12 of EU-15

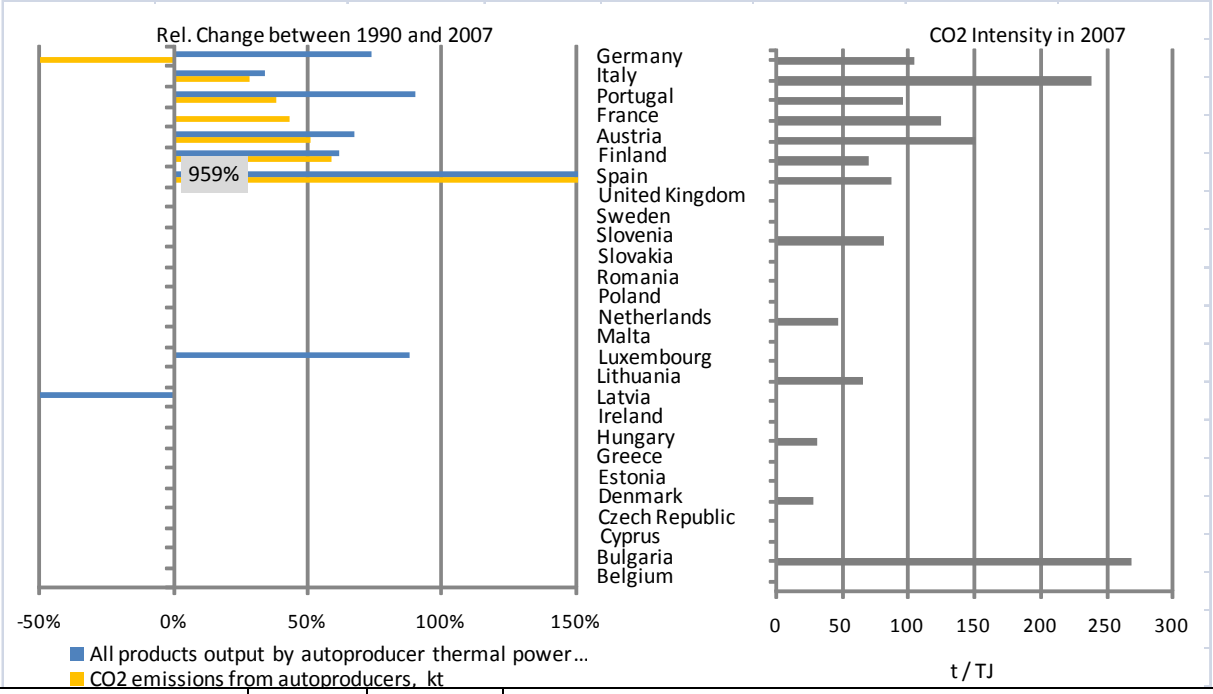


Intensity	1990	2007
Austria	166.39	103.93
Belgium	-	-
Bulgaria	-	240.62
Cyprus	-	-
Czech Republic	-	-
Denmark	-	116.06
Estonia	-	-
Finland	119.93	102.61
France	-	282.10
Germany	297.01	203.79
Greece	-	260.90
Hungary	-	136.73
Ireland	225.95	159.55
Italy	194.51	142.28
Latvia	75.81	63.97
Lithuania	-	111.51
Luxembourg	-	143.56
Malta	316.05	244.00
Netherlands	-	143.12
Poland	-	-
Portugal	131.00	95.40
Romania	-	-
Slovak Republic	2050.23	2435.20
Slovenia	-	230.93
Spain	261.63	191.49
Sweden	-	-
United Kingdom	-	-

Main Messages:

- Realtive change in output from public thermal power station is bigger than in CO_2 emissions, except for the Slovak Republic, where output from public thermal power station decreased more than emissions
- Data availability for 1990 is limited
- France's denominator has been converted to PJ as reported in TJ
- The high value for the Slovak Republic, is explaind by the fact that most power plants work on solid fuels (Slovak Republic's comment)

Indicator	Specific CO_2 emissions of autoproducer plants, t/TJ	
Indicator reference	Supplementary indicator 10	
Eurostat sector	TRANSFORMATION E0	
Numerator	CO_2 emissions from autoproducers, kt	
Denominator	All products output by autoproducer thermal power stations, PJ	
Availability 1990	7 of EU-27	6 of EU-15
Availability 2007	14 of EU-27	9 of EU-15

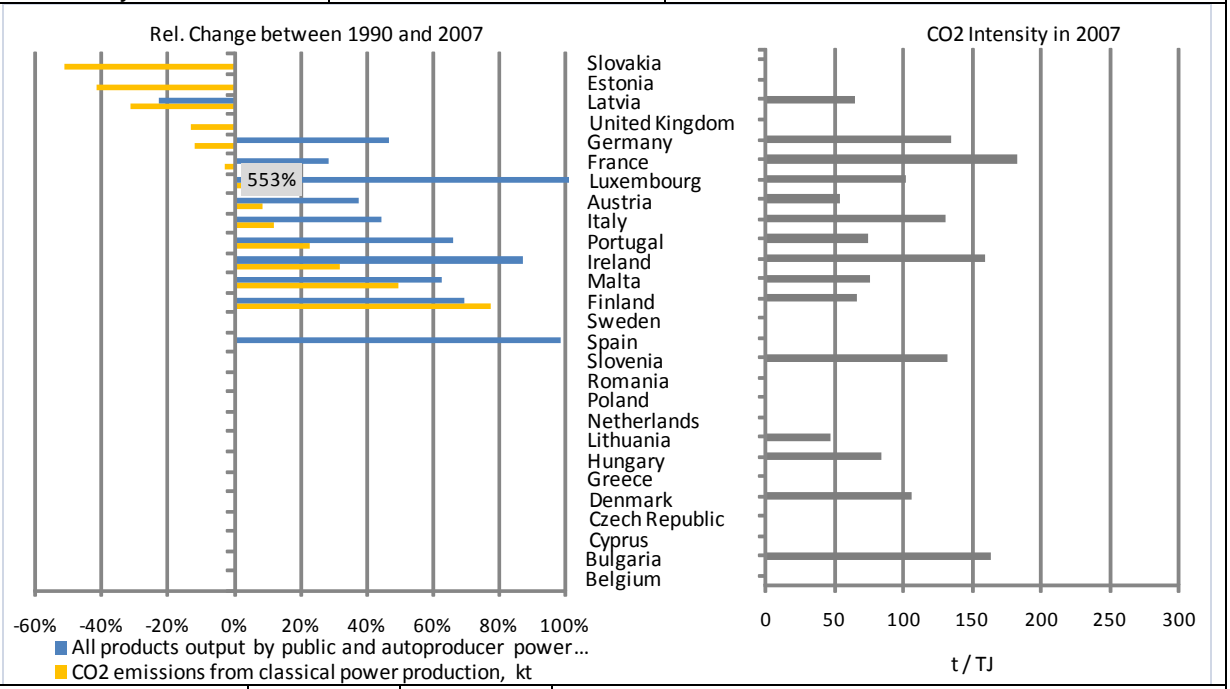


Intensity	1990	2007
Austria	168.18	151.17
Belgium	-	-
Bulgaria	-	268.48
Cyprus	-	-
Czech Republic	-	-
Denmark	-	28.50
Estonia	-	-
Finland	71.92	70.50
France	-	124.43
Germany	423.91	104.98
Greece	-	-
Hungary	-	31.06
Ireland	-	-
Italy	247.89	237.68
Latvia	-	-
Lithuania	-	65.64
Luxembourg	-	-
Malta	-	-
Netherlands	-	46.92
Poland	-	-
Portugal	131.00	95.40
Romania	-	-
Slovak Republic	-	-
Slovenia	-	80.82
Spain	162.68	87.03
Sweden	-	-
United Kingdom	-	-

Main Messages:

- Growth in output from public thermal power station is bigger than in CO_2 emissions for all reporting countries
- Data availability for 1990 is limited
- France's denominator has been converted to PJ as reported in TJ
- Latvia is the only country reporting a decrease in output by autoproducer thermal power stations

Indicator	Carbon intensity of total power generation, t/TJ	
Indicator reference	Supplementary indicator 11	
Eurostat sector	TRANSFORMATION	
Numerator	CO_2 emissions from classical power production, kt	
Denominator	All products output by public and autoproducer power stations, PJ	
Availability 1990	12 of EU-27	9 of EU-15
Availability 2007	17 of EU-27	10 of EU-15

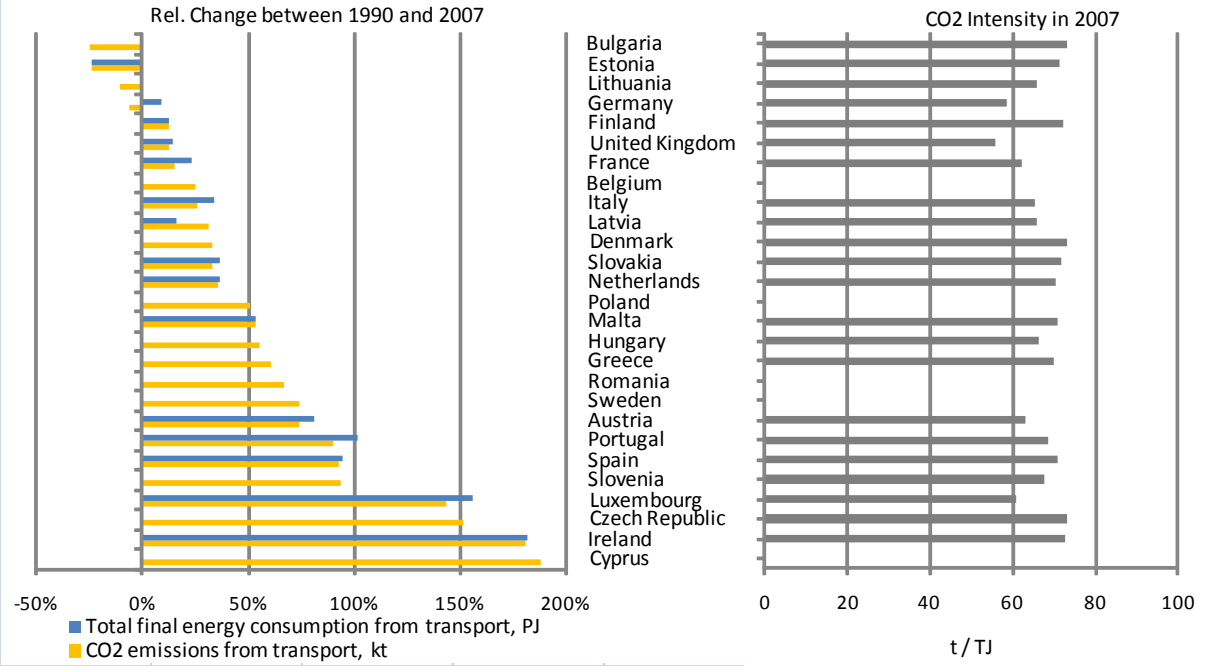


Intensity	1990	2007
Austria	68.37	54.13
Belgium	-	-
Bulgaria	-	163.83
Cyprus	-	-
Czech Republic	-	-
Denmark	-	105.88
Estonia	-	-
Finland	63.63	66.60
France	241.14	182.47
Germany	222.62	133.97
Greece	-	-
Hungary	-	84.50
Ireland	225.95	159.55
Italy	167.45	129.92
Latvia	72.25	64.42
Lithuania	-	46.60
Luxembourg	646.83	102.15
Malta	83.06	76.36
Netherlands	-	-
Poland	-	-
Portugal	99.66	73.69
Romania	-	-
Slovak Republic	-	-
Slovenia	-	131.16
Spain	0.00	0.00
Sweden	-	-
United Kingdom	-	-

Main Messages:

- Only in Finland growth of CO_2 emissions is higher than growth of output from power stations
- All countries except for Latvia had an increase in output from classical power stations
- Spain reports an increase in output from classical power stations of almost 100% and Luxembourg of over 500% (due to a start of a new electrical gas-heat cogeneration power plant in 2002)

Indicator	Carbon intensity of transport, t/TJ	
Indicator reference	Supplementary indicator 12	
Eurostat sector	TRANSPORT	
Numerator	CO_2 emissions from transport, kt	
Denominator	Total final energy consumption from transport, PJ	
Availability 1990	15 of EU-27	11 of EU-15
Availability 2007	22 of EU-27	13 of EU-15

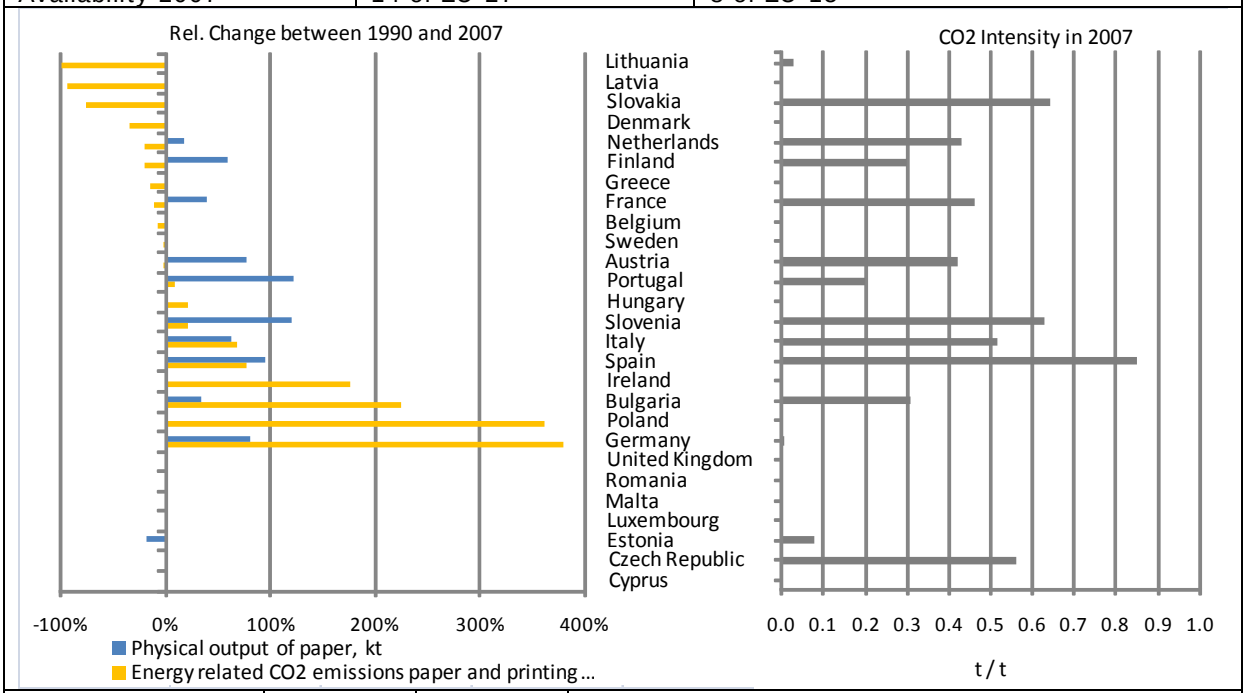


Intensity	1990	2007
Austria	65.93	63.17
Belgium	-	-
Bulgaria	-	73.19
Cyprus	-	-
Czech Republic	-	73.34
Denmark	-	73.11
Estonia	71.50	71.44
Finland	72.63	72.33
France	66.64	62.33
Germany	68.37	58.46
Greece	-	69.80
Hungary	-	66.28
Ireland	73.03	72.78
Italy	70.03	65.55
Latvia	58.34	65.79
Lithuania	-	65.76
Luxembourg	64.09	60.97
Malta	70.71	70.83
Netherlands	71.22	70.42
Poland	-	-
Portugal	72.89	68.61
Romania	-	-
Slovak Republic	73.68	71.82
Slovenia	-	67.56
Spain	71.09	70.72
Sweden	-	-
United Kingdom	56.64	55.79

Main Messages:

- Germany, Lithuania, Estonia and Bulgaria reported decreasing CO_2 emissions, but only Estonia also had a decrease in final energy consumption from transport
- Germany is the only country reporting a decrease in emissions although energy consumption from transport increased
- Intensities are all within the same range

Indicator	Specific energy related CO_2 emissions of paper industry, t/t	
Indicator reference	Supplementary indicator 13	
Eurostat sector	INDUSTRY C0.3	
Numerator	Energy related CO_2 emissions paper and printing industries, kt	
Denominator	Physical output of paper, kt	
Availability 1990	11 of EU-27	8 of EU-15
Availability 2007	14 of EU-27	8 of EU-15

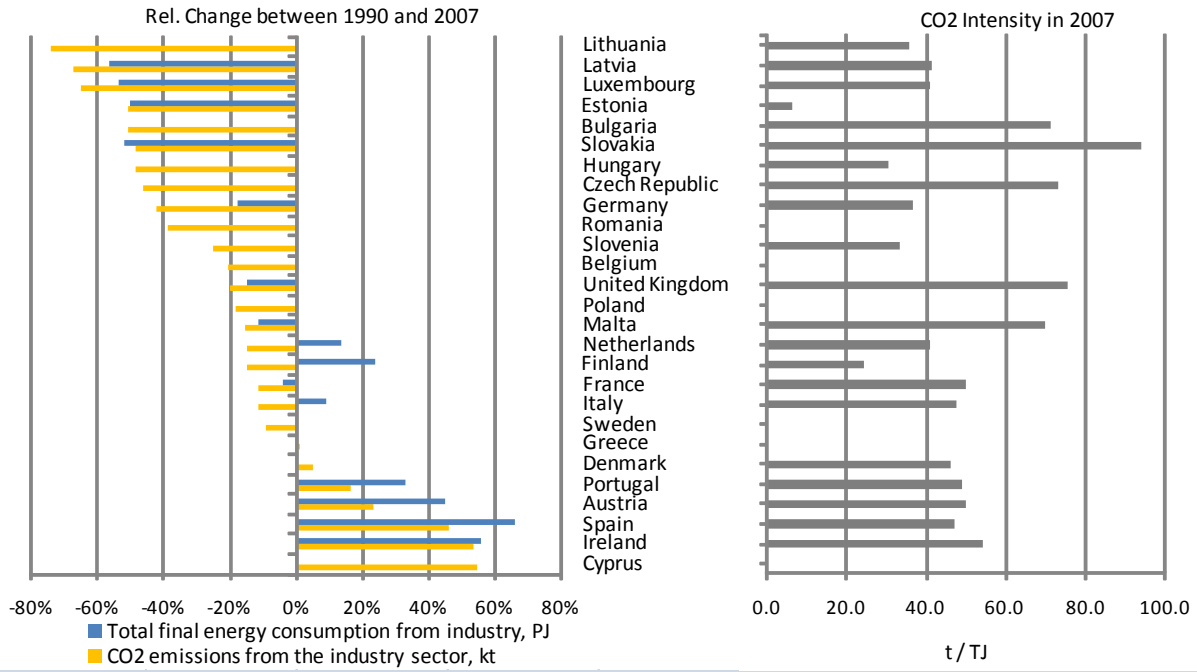


Intensity	1990	2007
Austria	0.75	0.42
Belgium	-	-
Bulgaria	0.13	0.31
Cyprus	-	-
Czech Republic	-	0.56
Denmark	-	-
Estonia	-	0.08
Finland	0.60	0.30
France	0.72	0.46
Germany	0.00	0.00
Greece	-	-
Hungary	-	-
Ireland	-	-
Italy	0.50	0.51
Latvia	-	-
Lithuania	-	0.03
Luxembourg	-	-
Malta	-	-
Netherlands	0.64	0.43
Poland	-	-
Portugal	0.41	0.20
Romania	-	-
Slovak Republic	-	0.64
Slovenia	1.15	0.63
Spain	0.93	0.85
Sweden	-	-
United Kingdom	-	-

Main Messages:

- Bulgaria's paper production was converted to kt as reported in t
- Paper production increased in all reporting countries except Estonia
- Increase in CO_2 emissions is high for Germany (380%), Poland (362%), Bulgaria (224%) and Ireland (176%)
- In eleven countries emission decreased and in eight countries emission increased
- Intensity is lowest in Germany and Lithuania
- Romania and the United Kingdom include emissions under source category 1A2f 'other'. Germany includes only emissions from other fuels. Estonia (1990, 1991, 1996), Luxembourg (1990–2007) and Malta (1990–2004) report emissions as not occurring.

Indicator	CO_2 emissions from industry per final energy consumption for industry, kt/PJ	
Indicator reference	Supplementary indicator 14	
Eurostat sector	INDUSTRY	
Numerator	CO_2 emissions from the industry sector, kt	
Denominator	Total final energy consumption from industry, PJ	
Availability 1990	15 of EU-27	11 of EU-15
Availability 2007	21 of EU-27	12 of EU-15

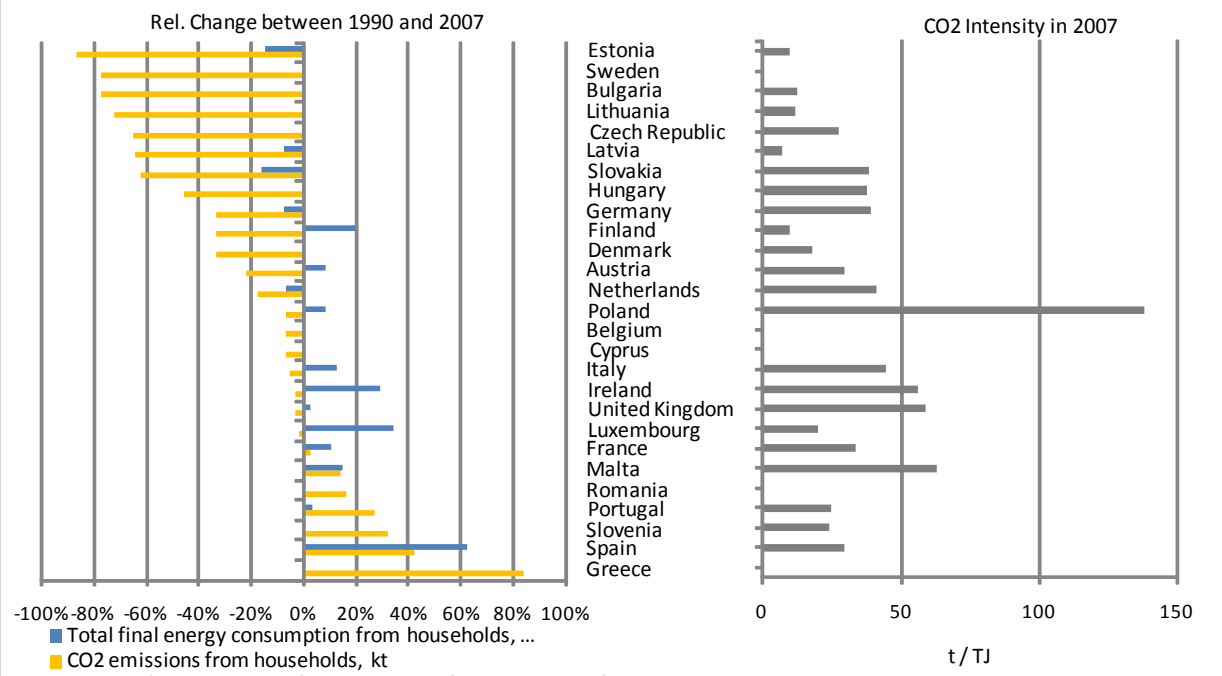


Intensity	1990	2007
Austria	58.58	49.88
Belgium	-	-
Bulgaria	-	71.40
Cyprus	-	-
Czech Republic	-	72.89
Denmark	-	46.10
Estonia	6.19	6.09
Finland	35.09	24.06
France	54.12	49.89
Germany	51.89	36.45
Greece	-	-
Hungary	-	30.40
Ireland	55.02	54.04
Italy	58.31	47.50
Latvia	55.19	41.50
Lithuania	-	35.43
Luxembourg	53.59	40.66
Malta	72.56	69.64
Netherlands	54.45	40.63
Poland	-	-
Portugal	55.53	48.80
Romania	-	-
Slovak Republic	87.89	93.90
Slovenia	-	33.17
Spain	53.47	47.07
Sweden	-	-
United Kingdom	80.30	75.25

Main Messages:

- In most countries CO_2 emissions decreased
- Increases in final energy consumption can be seen in Finland, the Netherlands, Italy, Portugal, Austria, Spain and Ireland
- A few countries (Italy, the Netherlands, Finland) report decreases in emissions, while energy consumption from industry increased
- In the Netherlands, Luxembourg and Latvia the intensity decreased most between 1990 and 2007

Indicator	CO_2 emissions per final energy consumption for households, kt/PJ	
Indicator reference	Supplementary indicator 15	
Eurostat sector	HOUSEHOLDS	
Numerator	CO_2 emissions from households, kt	
Denominator	Total final energy consumption from households, PJ	
Availability 1990	16 of EU-27	11 of EU-15
Availability 2007	22 of EU-27	12 of EU-15

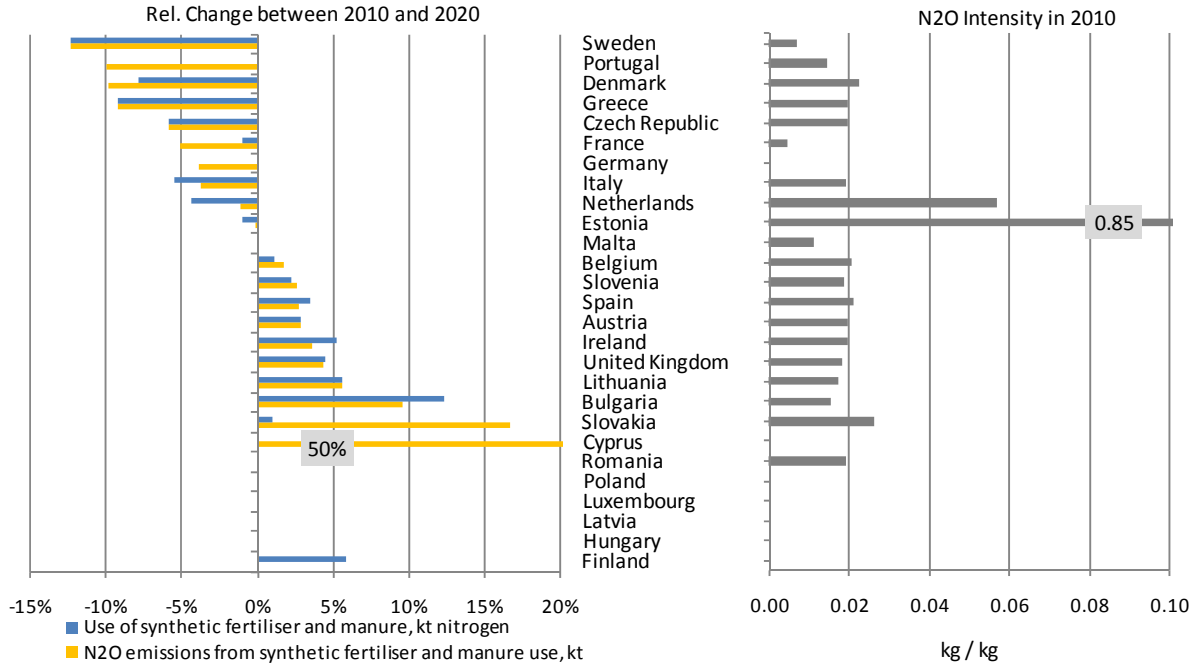


Intensity	1990	2007
Austria	40.86	29.35
Belgium	-	-
Bulgaria	-	12.56
Cyprus	-	-
Czech Republic	-	27.45
Denmark	-	17.82
Estonia	62.16	9.70
Finland	17.52	9.72
France	35.99	33.28
Germany	54.33	39.03
Greece	-	-
Hungary	-	37.70
Ireland	74.66	55.82
Italy	53.04	44.77
Latvia	17.77	6.89
Lithuania	-	11.72
Luxembourg	27.18	19.98
Malta	63.29	62.80
Netherlands	46.91	41.34
Poland	161.1	137.90
Portugal	20.19	24.91
Romania	-	-
Slovak Republic	85.27	38.66
Slovenia	-	23.84
Spain	33.54	29.39
Sweden	-	-
United Kingdom	62.55	58.91

Main Messages:

- In Luxembourg, the United Kingdom, Ireland, Italy, Poland, Austria, Finland emissions and energy consumption in households show opposite trends
- Final Energy consumption in households is only decreasing in Estonia, Germany, Latvia, the Netherlands and the Slovak Republic
- Finland and Latvia have both the lowest intensity in 1990 and 2007. Estonia and the Slovak Republic show the strongest change in emission intensity between 1990 and 2007.

Indicator	Specific N_2O emissions of fertiliser and manure use, kg / kg	
Indicator reference	Projected Indicator 8	
Eurostat sector	AGRICULTURE	
Numerator	N_2O emissions from synthetic fertiliser and manure use, kt	
Denominator	Use of synthetic fertiliser and manure, kt nitrogen	
Availability 2010	21 of EU-27	13 of EU-15
Availability 2020	21 of EU-27	13 of EU-15

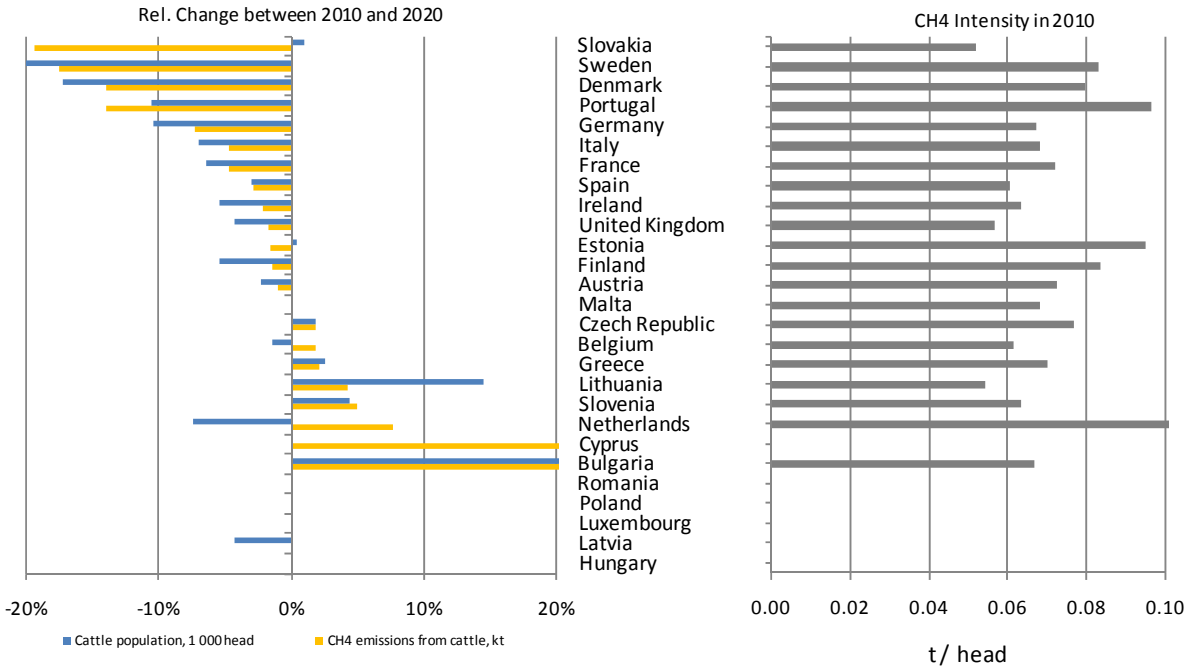


Intensity	2010	2020
Austria	0.02	0.02
Belgium	0.02	0.02
Bulgaria	0.02	0.02
Cyprus	-	-
Czech Republic	0.02	0.02
Denmark	0.02	0.02
Estonia	0.85	0.85
Finland	0.00	0.00
France	0.00	0.00
Germany	-	-
Greece	0.02	0.02
Hungary	-	-
Ireland	0.02	0.02
Italy	0.02	0.02
Latvia	0.00	-
Lithuania	0.02	0.02
Luxembourg	-	-
Malta	0.01	0.01
Netherlands	0.06	0.06
Poland	-	-
Portugal	0.02	0.01
Romania	0.02	0.02
Slovak Republic	0.02	0.03
Slovenia	0.02	0.02
Spain	0.02	0.02
Sweden	0.01	0.01
United Kingdom	0.02	0.02

Main Messages:

- In approximately half of the reporting Member States N_20 emissions and use of synthetic fertilzer and manure increased
- The high intensity of Estonia is caused by the relatively low use of fertiliser
- The use of fertiliser shows a wide range, from below 100 kt nitrogen (Lativa, Estonia, Malta) up to almost 4000 kt nitrogen (France)

Indicator	Specific CH_4 emissions of cattle production, t/head	
Indicator reference	Projected Indicator 9	
Eurostat sector	AGRICULTURE	
Numerator	CH_4 emissions from cattle, kt	
Denominator	Cattle population, 1 000 head	
Availability 2010	23 of EU-27	14 of EU-15
Availability 2020	23 of EU-27	14 of EU-15

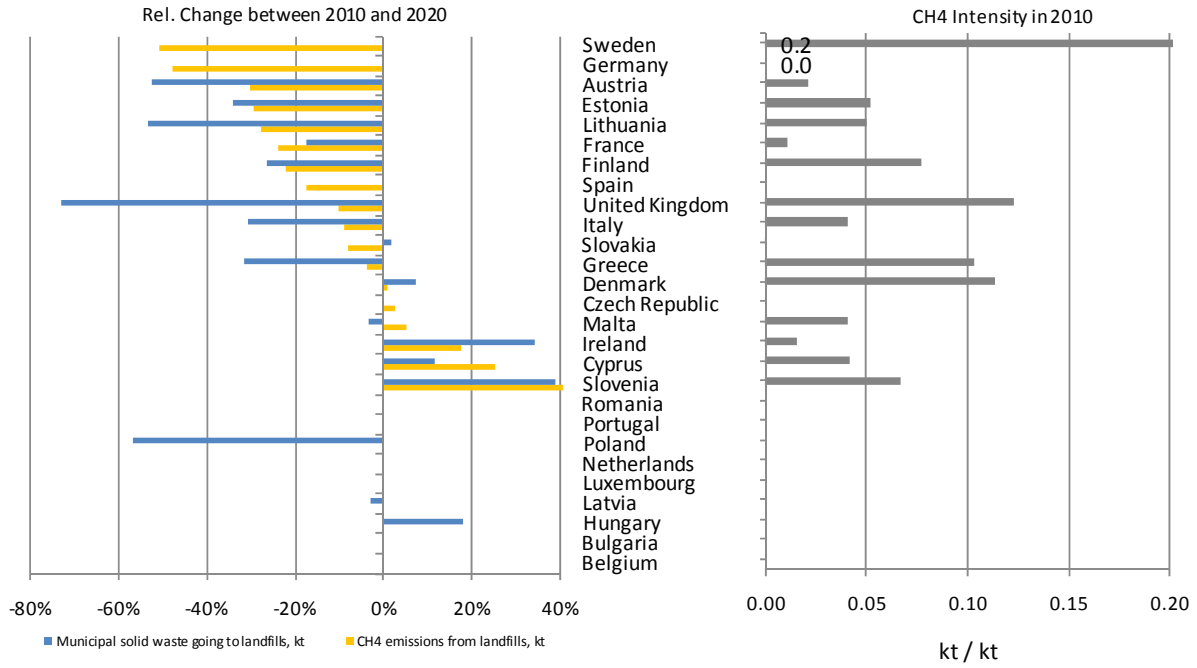


Intensity	2010	2020
Austria	0.07	0.07
Belgium	0.06	0.06
Bulgaria	0.07	0.07
Cyprus	-	-
Czech Republic	0.08	0.08
Denmark	0.08	0.08
Estonia	0.10	0.09
Finland	0.08	0.08
France	0.07	0.07
Germany	0.07	0.07
Greece	0.07	0.07
Hungary	-	-
Ireland	0.06	0.06
Italy	0.07	0.07
Latvia	0.00	0.00
Lithuania	0.06	0.05
Luxembourg	-	-
Malta	0.07	0.07
Netherlands	0.11	0.13
Poland	-	-
Portugal	0.10	0.10
Romania	-	-
Slovak Republic	0.07	0.05
Slovenia	0.06	0.06
Spain	0.06	0.06
Sweden	0.08	0.08
United Kingdom	0.06	0.06

Main Messages:

- Intensities show a very good accordance across countries
- Most countries project that cattle population decreases stronger than CH_4 emissions
- The Czech Republic, Greece and Lithuania project an increase of numerator and denominator

Indicator	Specific CH_4 emissions from landfills, kt / kt	
Indicator reference	Projected Indicator 10	
Eurostat sector	WASTE	
Numerator	CH_4 emissions from landfills, kt	
Denominator	Municipal solid waste going to landfills, kt	
Availability 2010	23 of EU-27	15 of EU-15
Availability 2020	23 of EU-27	15 of EU-15



Intensity	2010	2020
Austria	-	-
Belgium	0.03	0.01
Bulgaria	0.08	0.08
Cyprus	0.06	0.07
Czech Republic	0.04	0.04
Denmark	0.12	0.11
Estonia	0.05	0.05
Finland	0.07	0.08
France	0.01	0.01
Germany	0.41	0.20
Greece	0.07	0.10
Hungary	-	-
Ireland	0.04	0.04
Italy	0.03	0.04
Latvia	0.00	0.00
Lithuania	0.03	0.05
Luxembourg	0.02	0.02
Malta	0.02	0.02
Netherlands	-	-
Poland	-	-
Portugal	0.00	0.00
Romania	-	-
Slovak Republic	0.00	0.00
Slovenia	0.03	0.05
Spain	-	-
Sweden	15.12	5.20
United Kingdom	0.04	0.12

Main Messages:

- Most countries project that disposal of municipal waste is decreasing at a faster rate than emissions; this is caused by the time lag in the release of CH_4 emissions after waste disposal.
- The range of the amount of disposed waste varies widely across countries from 100 to above 200 000 kt waste; this also affects the range of intensities
- Denominator data was not consistent with activity data from CRF sector 6A in several countries.

7 Reporting and analysis of Member States' submissions

7.1 Methodological issues

7.1.1 Greenhouse gas emissions reporting categories

The sector categories (Table 7.1) submitted and used in this report are based on 'UNFCCC guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part II, document FCCC/CP/1999/7' and the reporting guidelines provided by the IPCC[41]. This nomenclature is used by all countries for reporting national greenhouse gas emissions to the UNFCCC.

Table 7.1 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.
Energy supply	IPCC sector (1A1+1B): Emissions from fuels combusted by the fuel extraction or energy-producing industries and thereby emerging fugitive emissions
Energy use	IPCC sector 1A2+1A4+1A5: Emissions from combustion of fuels in industry including combustion for the generation of electricity and heat and emission from combustion activities in commercial and institutional buildings in households, in agriculture, forestry, or fishing and all remaining emissions from non-specified fuel combustion.
Transport	IPCC source category 1.A.3 'Transport'. It includes mainly road transport, but also rail and domestic aviation and navigation.
Agriculture	IPCC sector 4 'Agriculture'. It includes mainly enteric fermentation and soils, and excludes 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 excludes energy-related emissions from industry.
Waste	IPCC sector 6 'Waste'. It includes mainly emissions from landfills. It excludes 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.
International Bunkers	This includes emissions from international shipping and international aviation, which are not included in national inventories as they are not considered domestic.

[41] 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

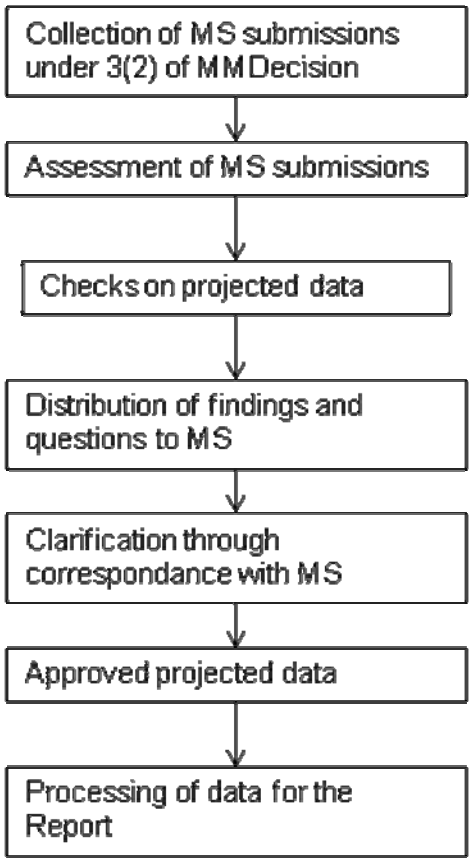
7.1.2 QA/QC activities

Under current EU legislation, Member States report projections of their greenhouse gas emissions in two scenarios:

- projections 'with existing measures' (WEM), which represent a 'business-as-usual' scenario where only policies and measures that have been already adopted or implemented are considered;
- projections 'with additional measures' (WAM), which represent a scenario where all the planned measures are considered to be fully implemented in a timely fashion.

The information submitted by Member States and used in this year's report follows the following quality assurance procedure (Figure 7.1):

Figure 7.1 Process for assessing projections from Member States



7.1.3 Adjustments by EEA of Member States' projections

The UNFCCC guidelines for National Communications (1999) indicate that the starting point for the 'with existing measures' and 'with additional measures' projections should be the last year of inventory data (i.e. 2007 for the 5th National Communication). The starting point for EU projections is variable due to the aggregation of Member State projections. Member States present projections relative to historic data; it may be assumed that the latest year of historic data presented is the starting point for the projections. The so-called 'reference year' for projections presented by each Member State is detailed in Table 7.2. Many Member States

were unable to use the 2007 inventory data as the starting point to generate projections due to the cut off date used to prepare the report (15 May 2009). EU-15 and EU-27 projections for the 'with existing measures' and 'with additional measures' scenarios are however presented relative to the latest inventory data available, as reported in 2009.

Table 7.2 Projections reference year presented by countries

Country	Reference year
Croatia, Iceland, Liechtenstein, Norway, Switzerland	1990
Bulgaria	2000
Hungary	2001
Turkey	2003
Austria, Germany, Latvia, Poland, Portugal, Sweden	2005
Belgium, Denmark, Estonia, Finland, France, Luxembourg, Netherlands, Romania, the Slovak Republic, Spain, the United Kingdom	2006
Cyprus, the Czech Republic, Greece, Ireland, Italy, Lithuania, Malta, Slovenia	2007

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, do not always match the data used in this report for the assessment of historic trends (1990–2007 emissions from the latest 2009 greenhouse gas inventories and base year emissions as fixed after UNFCCC review of initial reports under the Kyoto Protocol). In order to ensure consistency between projected emissions reported by countries and past emission trends reported in 2009 an adjustment is used. Projected emissions are adjusted, if the emission value of the reference year deviates by more than 3 % to the corresponding inventory year. For Member States where this applies, the proportion that the emission deviates by is calculated for each sector and applied to the reported projection by using the following formula:

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

The adjustment ensures that the relative progress between the reference year and the year for which projections are reported remains constant. The adjustment has only been applied to German and Bulgarian projections.

7.1.4 Gap filling procedures for projections

Gap filling of Member States' emissions projections 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 measures' scenario and 'with additional measures' scenario emission projection value;
- Sectoral and gas breakdown for reference year and scenarios;
- 2015 and 2020 projection value.

The gap filling procedures applied are as follows:

- If projections were not submitted at all, then data from last year's Trends and Projections report are used (EEA, 2008a).

Complete gap filling	PL, HU, IS, TR, LI, HR

- If projections under a 'with additional measures' scenario are not provided, then they are gap filled by 'with existing measures' scenario projections[42].

2010 WAM gap filling	DK, LT, NL, PL, UK
2015 and 2020 WAM gap filling	DK, HU, NL, PL, UK,
2020 WAM gap filling	DK, HU, NL, PL, UK

- If sectoral and/or gas breakdowns are not provided, then
    - (1) the breakdown of another known scenario is applied if the total of the scenario to be gap filled is available or
    - (2) the breakdown from 2007 inventory data is applied, if only total projections are available.

Sectoral or gas gap filling	FI, BG, HU, PL

7.1.5 Estimation by EEA of emission projections during the full commitment period 2008–2012

The commitment period covers five years from 2008 to 2012. Assessing compliance therefore requires knowing as precisely as possible annual emissions or annual projections during this five-year period. Member States report projections in different ways:

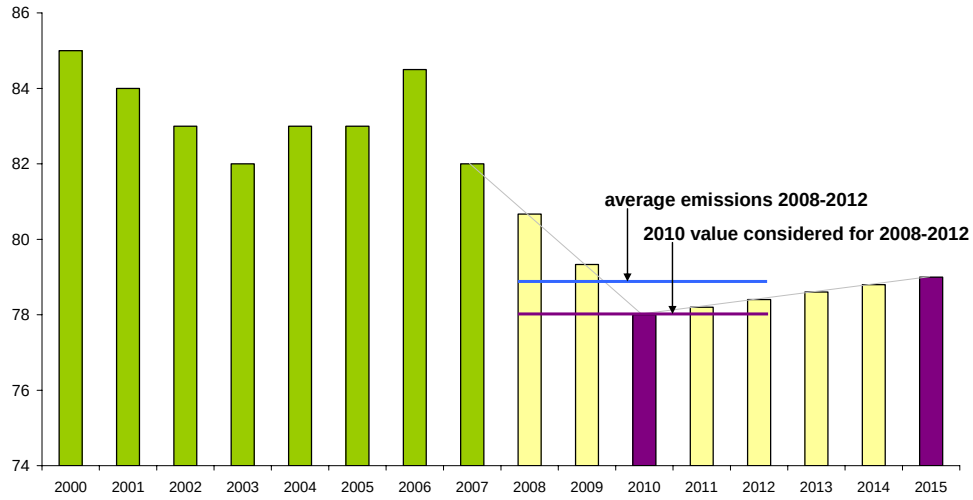
- projections of average emissions for the full period 2008–2012 (Belgium, Iceland, Ireland, Italy, the Netherlands, Slovenia, Switzerland);
- projections of annual emissions during the 2008–2012 period: 2008, 2009, 2010, 2011, 2012 (Denmark, Finland [WAM projections], Spain);
- projections of emissions for the following individual years: 2010, 2015, 2020 – as required under the EU Monitoring Mechanism (all other countries).

In the first two cases, obtaining average 2008-2012 emissions is straightforward. In the third case (the large majority of countries), annual emissions during the 2008–2012 period were estimated by EEA, based on a linear interpolation between 2007 emissions (or estimates of 2008 emissions, when available from countries), 2010 projections and 2015 projections (or 2020 projections if no 2015 projections were available). This method was used for both projection scenarios WEM and WAM (Figure 7.2).

[42] This list only includes Member States within the EU-27. All WAM projections reported by HR, IS, LI, NO, CH and TR were gapfilled apart from 2010 projection reported by HR.

For the EU-15, annual emission projections during the commitment period were calculated as the sum of each EU-15 Member State's projected emissions (either as directly reported or after estimation by EEA), except for 2008 where the EEA independent estimate of EU-15 emissions was used. Consequently, there is a minor discrepancy between the EU-15 projected emissions for 2008-2012 and the sum of EU-15 Member States' projections for that period. This minor difference (less than 0.2 %) has no effect on the validity of the results at Member States and at EU-15 levels.

Figure 7.2 Adjustment of 2010 projections to average 2008–2012 projections



Source: EEA

7.1.6 Estimation by EEA of emissions in the sectors not covered by the EU ETS

Twelve EU-15 Member States provided projections of emissions in the sectors covered by the EU ETS, consistent with the overall projections, from which emissions not covered by the EU ETS were derived.

The projected emissions in the sectors not covered by the EU ETS, on which the assessment of Member States' progress towards their Kyoto and burden-sharing targets was done, are based on projections of total emissions and estimates of EU ETS emissions during 2008–2012 provided by 12 EU-15 Member States (all except France, Greece and Portugal) and Norway (which also participates to the EU ETS) ([43]). These projections were deducted from projections of total emissions to estimate non-ETS emission projections. Information on the projected role of the EU ETS is missing for France, Greece and Portugal in the EU-15, and for most EU-12 Member States. This implies that the EU ETS effect on the EU-15's assigned amount as estimated here assumes that ETS operators in France, Greece and Portugal will exactly achieve their emission caps through domestic action only.

([43]) In the case of Germany, projections of ETS emissions initially reported were above the EU ETS cap. Similarly to what was done with total and sectoral emissions reported by Germany, these ETS emission projections were adjusted by EEA in order to achieve consistency between projections and historic trends. After adjustment, ETS projections were slightly lower than the ETS cap. This underlines the certain degree of uncertainty that should be kept in mind when considering the projections reported here.

Non-ETS projections for EU-12 Member States and at EU-27 level is not possible due to the missing information from a number of EU-12 Member States. Similarly to projections of total or sectoral GHG emissions, ETS projections were derived by Member States using their own projection models. Member States have reported limited information to what extent their projections factor in the recession.

7.2 Completeness of reporting

7.2.1 Greenhouse gas inventories (1990–2007)

For the preparation of this report, EU-27 greenhouse gas inventories as compiled under the EU Monitoring Mechanism Decision (Commission Decision 280/2004/EC) and submitted by the European Commission to the UNFCCC (May 2008) have been used (EEA, 2009a). All Member States reported data for 2007. Data availability has improved over previous years. Table 7.3 shows data gaps for the EU-27 Member States by May 2009. For the second time, all EU-15 Member States reported complete inventories in time, but also the reporting by new Member States improved significantly.

Table 7.3 Gaps in reporting for the EU-27 Member States

Member State	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6
Bulgaria					1990–2007	
Malta					1990–2007	

As there is no primary aluminium production in Bulgaria or Malta no gap filling was carried out for the EC greenhouse gas inventory 1990–2007 (EEA, 2009a).

Data on CO_2, CH_4 and N_2O emissions used in this report do not include emissions and removals from LULUCF.

7.2.2 Submissions under Art. 3(2) of the Monitoring Mechanism Decision

In 2009, all EU-27 Member States except Hungary and Poland provided new submissions of Policies and Measures and Projected Emissions required under Article 3(2) of the Monitoring Mechanism and elaborated in Articles 8, 9 and 10 of the Implementing Provisions (Commission Decision 2005/166/EC) and UNFCCC reporting guidelines for national communications (FCCC/CP/1999/7).

Twenty Member States submitted the questionnaire on Kyoto mechanisms and 14 submitted the questionnaire on the use of carbon sinks.

For detailed information on the sources used, see Main Report Chapter 'Sources of Information'.

7.2.3 Past and Projected indicators

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 the Monitoring Mechanism (Art. 3(1)(j) and Art. 3(2)(a)(iv)) and Implementing Provisions (Annex II). Priority indicators shall be reported and additional priority as well as

supplementary indicators should be reported. The Member State submissions are checked for completeness, consistency with CRF data and compared across time series and Member States. Projected indicators are compared with equivalent past indicators. Issues for clarification are then sent to Member States, for reviewing and correction purposes.

Table 7.4 shows the availability of information on indicators for the EU-27 Member States. All Member States reported at least some of the past indicators: 18 out of 27 Member States reported all priority indicators, 12 reported all additional priority indicators and only three countries reported all of the supplementary indicators. The reporting of projected indicators is less complete: while 14 countries submitted values for all ten required indicators, four countries did not submit any indicators (see Table 7.5).

Table 7.4 Reporting on past indicators under the EC greenhouse gas Monitoring Mechanism

	Priority Indicators (max. 7)	Additional Priority Indicators (max. 6)	Supplementary Indicators (max.15)
Austria	7/7 for 1990–2007	6/6 for 1990–2007	14/15 for 1990–2007
Belgium	6/7 for 2007	6/6 for 2007	no
Bulgaria	1/7 for 2007	1/6 for 2007	7/15 for 2007
Czech Republic	7/7 for 2006–2007	4/6 for 2006–2007	11/15 for 2006–2007
Cyprus	5/7 for 2007	0/6	0/15
Denmark	7/7 for 2004–2007	6/6 for 2004–2007	14/15 for 2004–2007
Estonia	6/7 for 2007 (3/7 for 1995–2007, 1/7 for 1994–2007, 2/7 for 1990–2007)	6/6 for 2007 (3/7 for 1990–2007, 3/7 for 1995–2007)	6/15 for 2007 (4/15 for 1990–2007, 2/15 for 1995–2007)
Finland	7/7 for 1990–2007	6/6 for 1990–2007	15/15 for 1990–2007
France	7/7 for 1990–2007	6/6 for 1990–2007	15/15 for 1990–2007
Germany	7/7 for 1991–2007	4/6 for 1990–2007, 2/6 for 1991–2006	11/15 for 1990–2007, 2/15 for 1991–2005; 1/15 1993,1998,2002
Greece	4/7 for 2007	4/6 for 2007	4/15 for 2007
Hungary	7/7 for 2007 (2/7 1995–2007, 3/7 for 2000–2007, 2/7 for 2003–2007)	6/6 for 2007 (3/6 for 2003–2007, 2/7 for 2000–2007, 1/7 for 2004–2007)	8/15 for 2007 (2/15 for 2000–2007, 6/15 for 2003–2007)
Ireland	7/7 for 2007 (5/7 for 1990–2007; 2/7 for 1995–2007)	6/6 for1990– 2007; (Ind. 5 NA)	11/15 for 1990–2007 (3 NA. 1 confidential)
Italy	7/7 for 1990–2007	6/6 for 1990–2007	15/15 for 1990–2007
Latvia	6/7 for 2007 (2/7 for 1990–2007, 1/7 for 2000–2007; 3/7 for 1995–2007)	5/7 for 2007 (3/7 for 2000–2007, 2/7 for 1990–2007)	12/15 for 1990–2007 (8/15 1990–2007, 4/15 for 2000–2007)
Lithuania	7/7 for 2004–2007	4/6 for 2004–2007	14/15 for 2004–2007
Luxembourg	5/7 for 2007 ((4 of 7 for 1995–2007, 1/7 for 1990–2006, 1/7 for 1990–2007)	2/6 for 2007 (1/6 for 1995–2007, 1/6 for 1990–2007)	5/15 for 2007 (1/15 for 1991–2007, 4/15 for 1990–2007)
Malta	7/7 for 2007 (5/7 for 1990–2007, 2/7 for 1995–2007)	0/6 for 1990–2007	7/15 for 2007 (5/7 for 1990–2007, 2/7 for 1995–2007)
Netherlands	6/7 for 2007 (4/7 for 1990–2007, 1/7 for 1990–2006, 1/7 for 1995–2007)	3/6 for 2007 (3/7 for 1990–2007, 1/7 for 1990–2006)	8/15 for 2007 (6/15 for 1990–2007; 2/15 for 1995–2007, 3/15 for 1990–2006)
Poland	3/7 for 2007 (2/7 for 1999–2007)	2/6 for 2007 (1/6 for 1990–2007, 1/6 for 2006–2007)	5/15 for 2007
Portugal	7/7 for 1990–2007	6/6 for 1990–2007	14/15 for 1990–2007
Romania	7/7 for 2007	6/6 for 2007 (2/6 numerator and denominator confidental)	
Slovak Republic	7/7 for 2007 (2/7 for 1994–2007; 2/7 for 1990–2007; 3/7 for several single years)	6/6 for 2007 (3/6 for 1990–2007; 3/6 for 1995–2007)	12/15 for 2007 (7/15 for 1990–2007; 1/15 for 1993–2007; 2/15 for 1995–2007; 1/15 1991–2007)
Slovenia	7/7 for 2007 (1/7 for 1990–2007; 4/7 for 1995–2007, 2/7 for 2003–2007)	5/6 for 2007: 2/6 for 1995–2007; 2/6 for 2003–2007, 1/6 for 1990–2007)	11/15 for 2007 (6/15 for 2003–2007, 2/15 for 1995–2007, 3/15 for 1990–2007)

Spain	7/7 for 2007 (4/7 for 1995–2007, 3/7 for 1990–2007)	5/6 for 2007 (2/7 for 1990–2007, 3/7 for 1995–2007)	12/15 for 2007 (10/15 for 1990–2007, 2/15 for 1995–2007)
Sweden	7/7 for 2007	6/6 for 2007	
United Kingdom	7/7 for 1990–2007	6/6 for 1990–2007	9/15 for 1990–2007

Note: The reporting of an indicator is considered complete when a numerator and denominator are available. For certain indicators numerators are extracted from CRF. For further detailed analysis of indicators refer to Annex 6.

Table 7.5 Reporting on projected indicators under the EC greenhouse gas Monitoring Mechanism

	Projected Indicators (max. 10)
Austria	10/10 for 2010, 2015, 2020 (1 not applicable)
Belgium	8/10 for 2010, 2015, 2020
Bulgaria	10/10 for 2005, 2010, 2015, 2020
Cyprus	4/10 for 2010, 2015, 2020
Czech Republic	10/10 for 2010,2015,2020
Denmark	10/10 for 2005, 2010, 2015, 2020, 2025
Estonia	9/10 for 2010, 2015, 2020
Finland	6/10 for 2010, 2015, 2020
France	9/10 for 2010, 2015, 2020
Germany	5/10 for 2010, 2015, 2020
Greece	10/10 for 2010, 2015, 2020
Hungary	0/10 for 2010, 2015, 2020
Ireland	9/10 for av 2008–2012, 2015, 2020
Italy	9/10 for 2010, 2015, 2020
Latvia	0/10 for 2010, 2015, 2020
Lithuania	10/10 for 2007, 2015, 2020
Luxembourg	2/10 for years 2005/10/15/20 (also WAM provided)
Malta	8/10 for 2010, 2015, 2020
Netherlands	9/10 for 2010, 2015, 2020
Poland	0/10 for 2010, 2015, 2020
Portugal	08/10 for 2010/15/20
Romania	10/10 for 2010, 2015, 2020
Slovak Republic	10/10 for 2010, 2015, 2020 (also WAM provided)
Slovenia	10/10 for 2010, 2015, 2020
Spain	7/10 for 2010, 2015, 2020
Sweden	8/10 for 2010, 2015, 2020
United Kingdom	6/10 for 2010/15/20

Note: The reporting of an indicator is considered complete when a numerator and denominator are available. For certain indicators numerators are extracted from CRF. For further detailed analysis of indicators refer to Annex 6.

7.3 Quality of reporting

This section analyses the quality and completeness of the 2009 reports based on the following five categories of information (see Table 7.6):

- **Information on national policies and measures:** policy names, objectives of policies, types of policy instrument, greenhouse gas affected, status of implementation, implementation body, quantitative assessment of emission reduction effect and cost of policies, interaction with other policies, and measures implementing community legislation.
- **Information on the use of Kyoto flexible mechanisms:** arrangements for use of flexible mechanisms, and balance between domestic actions and flexible mechanisms.
- **Information on projection scenarios:** projection scenarios reported (WOM, WEM, WAM), and policies included in each projection scenarios.
- **Information on projections:** projections expressed relative to historic emissions, starting year for projections, split of projections (gases, sectors, years), and presentation of results.
- **Information on modelling:** description of methodologies, sensitivity analysis, discussion of uncertainty, details of parameters and assumptions, and indicators for projections.

For each category of information listed above an analysis of the completeness and quality of the Member States reporting is provided using the following scores:

- Information not reported in 2009
- **(+)** Information on policies or projections reported but not clear and/or not to the level of detail expected as good practice
- **(++)** Information reported with clarity and to the level of detail expected as good practice

Table 7.6 Categories of information reported by the Member States and examples of good practice

Categories of information	Detail of information expected	Examples of good practice
Information on national policies and measures	Policy names	Clear names and description provided with a unique identifier.
	Objectives of policies	Clear and detailed description of objectives
	Types of policies	Type of policy instrument specified e.g. regulatory, fiscal
	Which greenhouse gases?	Specifies which gases each PAM affects
	Status of Implementation	Clear for each PAM: planned, adopted, implemented or expired
	Implementation body	Clear which authorities are responsible for implementation
	Quantitative assessment of emission reduction effect and cost of policies	Almost all PAMs are actually quantified. Total effect of all PAMs specified. WOM projection provided.

	Interaction with other national and EU level policies	Detailed discussion and analysis of policy interactions.
	Measures implementing community legislation	Submission details which national policies are implementing individual pieces of EU legislation.
Information on the use of Kyoto flexible mechanisms	Arrangements for flexible mechanisms	Clear and detailed information on the arrangements for use of flexible mechanisms.
	Balance between domestic action and flexible mechanisms	Regarding reductions required to meet Kyoto target, clear details of proportion to result from domestic action and flexible mechanisms.
Information on projection scenarios	Projection scenarios	'With existing measures' and 'with additional measures' projections required, 'without measures projection' optional.
	Policies included in each projection	Clear presentation of the policies included in each projections scenario.
Information on projections	Expressed relative to historic reference year data	Projections are presented alongside consistent historic emissions using 2007 as reference year
	Starting year	Starting year and emissions used as basis for projections is detailed.
	Split of projections	Projection split by all 6 gases (or F-gases together), all sectors and years
	Presentation of results	Clear, both tables and graphs provided and/or used excel reporting template.
Information on modelling	Description of methodologies	Description of approach, model and assumptions
	Sensitivity analysis	Was an analysis carried out to determine the sensitivity of projections to variance in the input parameters? Are high medium and low scenarios presented?
	Discussion of uncertainty	Is an uncertainty range for the projections provided?
	Details of parameters and assumptions	Are mandatory parameters as required under Monitoring Mechanism 280/2004/EC reported?
	Indicators for projections	Are indicators for projections as required under Monitoring Mechanism 280/2004/EC reported? Are details on numerator and denominator reported?

Figure 7.3 Analysis of quality of reporting by Member States

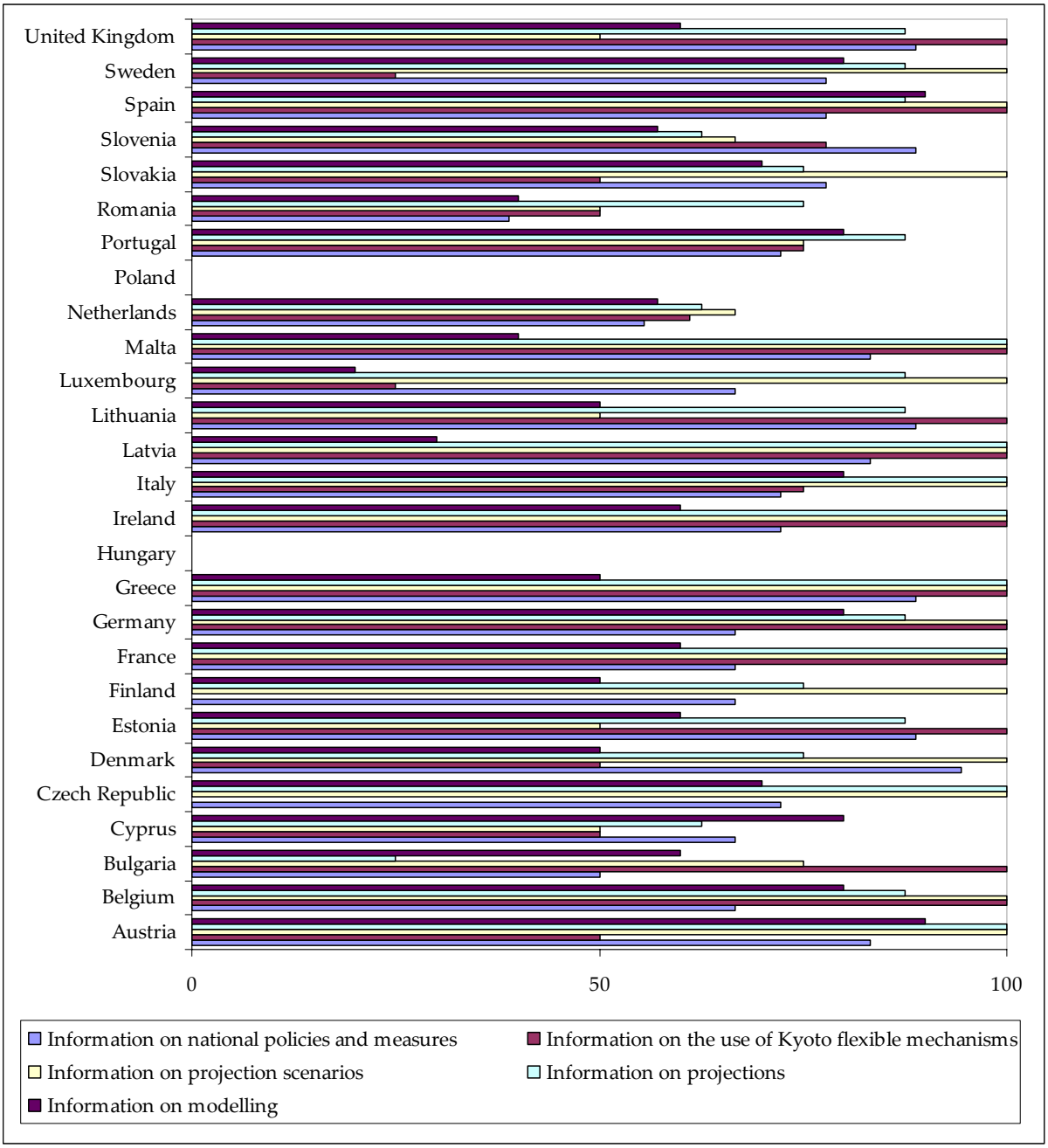


Figure 7.3 summarises the analysis of the quality and completeness of the 2009 submissions with regards to the five categories of information provided: national policies and measures, the use of Kyoto flexible mechanisms, projection scenarios, projections and modelling. The analysis shows the following:

- No countries presented a fully complete and quality set of information in 2009.
- Six countries provided excellent information (score ++) in three out of the five categories of information: France, Greece, Ireland, Italy, Latvia and Malta.
- Two countries (Hungary and Poland) have not submitted new information in 2009.

- Six countries (Bulgaria, Finland, Cyprus, Luxembourg, the Netherlands and Romania) provided submissions that were overall not to the level of detail and quality expected as good practice.

Figure 7.4 Analysis of quality of reporting by category of information

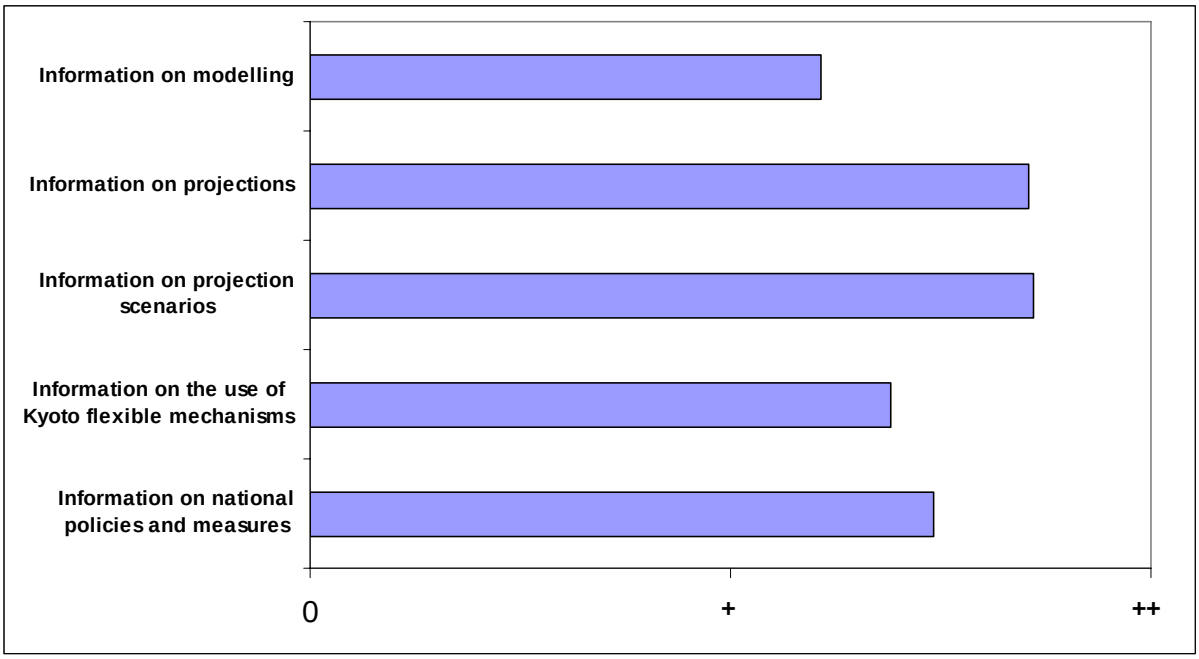


Figure 7.4 averages the quality and completeness of the 2009 submissions on all five different categories of information. The analysis shows the following key results:

- Information on modelling was typically far from the level of quality expected as good practice.
- Information on the use of Kyoto flexible mechanisms and information on national policies and measures were generally good but not to the level of quality expected as good practice.
- Information on projections and projection scenarios were provided to a very good quality, close to the level of quality expected as good practice.

7.4 Modelling approaches and QA/QC activities on projections in Member States

Table 7.7 provides a summary of information about the modelling approaches adopted by the Member States to build their projections and the QA/QC activities that they have put in place to check the quality of their data in 2009. No information is provided for Hungary and Poland because they did not submit a new report in 2009.

Table 7.7 Modelling approach and QA/QC activities

Country	Description of projections methodology	QA/QC activities
Austria	Projections are calculated based on models, sectoral forecasts (mainly activity data) and other projected parameters. Emission projections are generally calculated applying the same methodologies as for the national greenhouse gas inventory. These are reported in Austria's National Inventory Report 2009. The emission projections are based on the following sectoral forecasts: • Energy Forecast, based on the National Energy Balance of Statistics Austria and on a macro-economic model of the Austrian Institute of Economic Research (WIFO 2007a), supported by calculations with the bottom-up models BALMOREL, LEAP (AEA) and ERNSTL (EEG). • Transport Forecast, based on a bottom-up, national transport model GLOBEMI (Technical University of Graz). • Forecast of emissions from industrial processes, of solvent emissions and emissions of fluorinated gases are based on expert judgments of the Umweltbundesamt. • Agricultural Forecast, based on the PASMA model of the Austrian Institute of Economical Research (SINABELL & SCHMID 2005) and expert consultations with the Agricultural Research and Education Centre, Gumpenstein (PÖLLINGER 2005, 2008). • Waste Forecast, based on the forecast of quantity of waste deposited and wastewater handled of the Umweltbundesamt.	A questionnaire has been used for checking input data regarding the most important data quality requirements. The project strategy includes several data consistency checks. A fixed input form has been used for each sector. In general, data quality checks similar to the management system of the Austrian Air Emission Inventory have been performed in each sector. Often the person who is responsible for the sectoral emission is identical to the person who is responsible for the Inventory, and some sectors use emission methods based on the verified inventory methods. An output data check has been carried out by comparing the results of the sectors in detail and checking the plausibility of the emission trends. The report also presents sensitivity assessments for specific sectors, analysing increase and decrease of key factors such as gas price, electricity demand etc or combination of key factors. The variation of the chosen input parameters in the sensitivity analysis can be seen as an indicator of the overall uncertainty caused by changed input data.
Belgium	Projections are the sum of regional bottom-up projections which are calibrated on the regional energy balances. The bottom-up approach starts from the demand side and the consumption needs of different sectors. The calculations of the projections are based on the following models: • MARKAL aims to supply energy services at minimum loss of surplus by making decisions on equipment investment and operation energy supply and trade. The model can take into account price effects, policies, supply curves and different technologies to transform primary resources into energy services. • EPM explains energy consumptions and greenhouse gas emissions from activity variables and containing a detailed representation of emission sources and the main factors of the evolution of energy demand. • EBEEPM studies energy demand and atmospheric emissions from stationary sources (residential, tertiary, industry and energy sector). • TREMOVE studies the effects of different transport and environmental policies on the emissions of the transport sector (maritime not included).	As a first sensitivity analysis (of the WEM scenario) the compiled regional projections are compared with national projections calculated with the econometric model HERMES. In other words this is a comparison of the technological bottom-up approach with the macro-economic top-down approach. Furthermore sensitivity analyses are performed for some other important parameters such as number of degree-days, nuclear phase out, etc. without however taking indirect effects into account.
Bulgaria	The following program modules of ENPEP were used: MACRO, DEMAND, BALANCE, WASP and IMPACTS.	Information not available

Country	Description of projections methodology	QA / QC activities
Cyprus	The projections were made using the ETS verified electricity emissions from 2005 to 2008 in relation to the projections for the electricity production of the Electricity Authority of Cyprus to project the greenhouse gas emissions up-to 2020. Since the 2008 ETS verified report for electricity production shows a difference of approximately 30% when compared without the set-aside.	Information not available
Czech Republic	The largest source of greenhouse gas emissions in the Czech Republic are energy processes. Therefore, the projections of emissions were largely calculated using a complex EFOM/ENV energy management model. This model requires as input the technological database, database of fuels, energies and demand for energy. The projection of the population number is based on the CSO publication 'Projection of the Population of the Czech Republic until 2050 (publication code No. 4020-03)'. In terms of Economic Growth, there exists no official long-term prospect prediction of GDP trend. In view of current economic crisis, this projection holds a lot of uncertainties. Economic development is a dominant factor influencing results of the projection. In this situation, a sensitivity analysis of the projections would be most beneficial in terms of economic development as the influence of other factor will be significantly lower.	In view of current economic crisis, this projection holds a lot of uncertainties. Economic development is a dominant factor influencing results of the projection. Possible development varies from fast recovery from crisis to further crash and economic recession over several years. In this situation, a sensitivity analysis of the projections would be most beneficial in terms of economic development as the influence of other factors will be significantly lower.
Denmark	The emissions are projected to 2025 using basic scenarios together with the expected results of individual policy measures. Official Danish forecasts of activity rates are used in the models for those sectors for which the forecasts are available, i.e. the latest official forecast from the Danish Energy Agency.	The projections models are based on the same structure and methodology as the Danish emission inventories in order to ensure consistency. In the referenced Technical Report No. 703, 2009 'Projection of Greenhouse Gas Emissions 2007 to 2025' consistency checks of sums etc. have been performed by NERI. With NERI also being responsible for providing Denmark's annual greenhouse gas inventories, consistency with historic emissions is obtained. Other institutions being responsible for some of the activity data projection (in particular the Danish Energy Agency providing the energy projections) have many years of experience with projection work and fine tuning and validation of models etc. Occasionally historic trends have been compared with projections from the past. Taking into account unpredictable inter annual variations in temperature, net electricity imports (primarily due to unpredictable variations in precipitation in Norway and Sweden) and inventory time series recalculations due to new knowledge about emission factors etc., the trends projected in the past coincide quite well with historic trends.

Country	Description of projections methodology	QA / QC activities
Estonia	These projections are based on the use on energy supply development model NEEDS (or NEEDS/TIMES). The development work was carried out as an Integrated Project under the EU 6th Framework Programme addresses Priority 6.1: Sustainable Energy Systems and, more specifically, Sub-priority 6.1.3.2.5: Socio-economic tools and concepts for energy strategy. The main objective of the elaboration of the NEEDS was to evaluate the full costs and benefits of energy policies and of future energy systems, both at the level of individual countries and for the enlarged EU as a whole. This huge amount of work, related to the development of the model of a large region and a numbers of countries inside it had to give a tool for projection of and planning of the energy supply development as in the EU as whole so in each member country as well. The tool selected for this modelling is the Integrated MARKAL-EFOM System (TIMES). A long-term time horizon (2050, by 5-year step) is used to support the definition of long term strategies, taking into account different standards of energy devices and technologies development. The main source for the base year of all countries of the model is the Eurostat database. The section 'Energy and Environment' of this database provides all the energy flows for the base- year (2006), as well as the installed capacities for power plants and import/export figures. Methodological consistency with other important global energy modelling efforts (US-EIA) is maintained using the VEDA database system for the NEEDS/TIMES national and Pan-European models.	At the given state of the development of the NEEDS/TIMES model of the PanEU energy supply development model one of possible ways for the sensitivity analysis of a country model is to compare the differences of the electricity production and the CO_2 emission in 2020 depending on the electricity generated by different renewable energy sources.
Finland	The projections reported are based on the background calculations of the long-term climate and energy strategy for Finland. The baseline scenario is the basis for WM projections and the objective scenario for WAM projections. The key starting points for the projections are the development of national economy and its structure, population, energy prices in the world markets, the price of emission allowances in the baseline scenario and the development of the technology as well as various sector-specific issues.	The PAM-report has been prepared by an interministerial working group including members from all relevant ministries and Statistics Finland. The projections were prepared for the long-term climate and energy strategy. More information on the strategy preparation can be found in p.8 of the report.
France	The reference 1 to 4 describe the energy scenario and economical parameters. The methodology is described in the report made by CITEPA for the MEEDDAT; WEM includes all measures decided before January 1st 2008.	QA/DC activities have been carried out in all the process of development of projections. Our reference year is 2006. The methodology used for projection does not take into account all the detailed activities considered in the yearly emission inventory.
Germany	For the scenario development, an energy system model is deployed, with the help of which the results of detailed (and in part, model-based) sectoral analyses are consolidated to a consistent and comprehensive data set for the energy-economic development.	Inventory data is subject to quality controls as prescribed in article 12 as well as to documentation and archiving. Several ministries and agencies are involved.

Country	Description of projections methodology	QA / QC activities
Greece	The two main models used are TIMES / MARKAL for the energy sector simulates the energy market, and spreadsheet models for the non-energy sectors in which future changes in activity data are derived from statistical analysis and emissions factors based on the IPCC guidelines.	Information not available
Ireland	The projections for Ireland are underpinned by SEI's energy forecasts which are based on the Credit Crunch scenario from the ESRI's 2008 Medium-Term Review. This assumes a recession in the short term (2008–2009) but that the economy reverts back to where it otherwise would have been by 2020. Since these energy forecasts were prepared the economic outlook has deteriorated even further than anticipated. As a result an Economic Shock has been discussed as part of a sensitivity analysis. The Economic Shock was applied to two scenarios used to develop the Emissions projections. • With Measures is based on the Baseline energy forecast and includes existing policies and measures. • With Additional Measures includes existing measures and planned policies and measures and is based on the White Paper energy forecast. For Agriculture The methodology used to develop emissions projections for both CH_4 and N2O are consistent with those employed in compiling the greenhouse gas inventory.	It is most likely that the actual out-turn for future emissions of greenhouse gas emissions is best reflected in the Economic Shock analysis given the deterioration in the economic outlook in recent months. It is unlikely that the extent of the economic down-turn will be limited to a 0.5% contraction in GDP in 2008 and 2009 (which is the basis for ESRI's Credit Crunch scenario and hence the With Measures and With Additional Measures scenarios) but that a deeper recession is now underway. As more up-to-date economic analysis and energy forecasts become available, the EPA will update emissions projections accordingly.
Italy	The scenarios of greenhouse gas emissions from the combustion of energy sources are drawn from the Markal model. MARKAL provides energy services at minimum loss of surplus by making decisions on equipment investment and operation energy supply and trade. The evolution trend is based on a continuation of recent trends in the Italian economy and energy. The update consist in the use of 2007 final data and 2008 preliminary energy consumption data as an additional input to the model, with the objective to improve reliability of its results.	MS provided an uncertainty analysis. It is stated that QC procedures are also undertaken on the calculations of uncertainties in order to confirm the correctness of the estimates and that there is sufficient documentation to duplicate the analysis. The assumptions on which uncertainty estimations are based are documented for each category.
Latvia	Information provided in Latvian	Information provided in Latvian
Lithuania	greenhouse gas emission projections are based on the basic economic growth and forecast of basic energy demand scenarios.	The data used for projections of greenhouse gas emissions and corresponding calculations were checked and verified in accordance with the QA/QC plan aimed at improving transparency, consistency, comparability, completeness, and confidence in the national inventory of emissions estimates (see National greenhouse gas emissions inventory report 2008).
Luxembourg	The method for estimating greenhouse gas emission levels up to 2020 is making use of information on demographic, transport and housing developments in Luxembourg. Assumptions on future physical production in the various energy and industrial sectors is another input for the modelling tool used EPM. However, neither GDP growth nor carbon or energy prices have been taken into account while preparing the projections. For the latter, this is the result of the financial and time constraints indicated	Consequently, without explicit use of either GDP or energy and carbon prices, no sensitivity analysis could have been performed so far on the projections.

Country	Description of projections methodology	QA / QC activities
	above.	
Malta	The projections for Energy industries have been developed in collaboration with the state-owned utility Enemalta Corporation and take 2007 as the starting point. Projections on transport have been developed on the basis of historic trends in the period 1990 to 2007 using regression analysis. Qualitative and quantitative information on the different policies and measures was obtained directly from the entities responsible for implementing the measures and from a number of public documents which have been duly referenced.	To validate the greenhouse gas emissions projection thus obtained, it was compared to a projected trend based on a linear extrapolation of historic emissions for this sub-sector (1990 –2000). The deviation between the two projections was found to be minimal.
Netherlands	WEM emissions and indicators provided. Autonomous social developments are reflected in growth series for activity data. Furthermore, macro-economic and sectoral growth projections are performed. For the calculation of emission projections several sector specific models are deployed.	Information not available
Portugal	The projections for energy consumption and other sources of greenhouse gas for 2005–2020 are built on national macroeconomic scenarios with the evolution of the global and sectoral growth, GDP and Gross Value Added (GVA) respectively, housing, services and the needs of passengers and products mobility expansion. These prospective scenarios, developed by the Department of Prospective, Planning and International Relations (DPP), originate needs for goods and energy that will be supported towards the energy and industrial systems that simultaneously generate greenhouse gas emissions. These projections are coherent with the methodology used in the Portuguese National Inventory (APA, 2007) and, therefore, with the IPCC guidelines.	In order to consider the main sources of uncertainty associated with the modelling the sensitivity analysis was focused on the factors that have more impact in the energy sector: hydro potential for the production of electricity and primary energy prices. In the case of the primary energy prices, for the sensitivity analysis, the high scenario was based on the work of the International and of the USA Energy Agencies, which was validated by national experts. The prices for natural gas and coal assuming the relation among crude oil and other fossil fuels' prices equivalent to the scenario Hugh Growth defines in World Energy Outlook 2007 from International Energy Agency.
Romania	The projections are based on calculations carried out using the ENPEP (Energy and Power Evaluation Program) programs package, developed by Argonne National laboratory of US Department of Energy (DOE) and distributed to Romania by the International Atomic Energy Agency (IAEA). The main modules used for the greenhouse gas projections preparation are: • MAED (Model for Analyses of Energy Demand) – forecasts the energy demand considering the information on the macroeconomic indicators trend, etc. • ELECTRIC – determines the electricity power plants development programme considering the Romanian Government's adopted policies on renewable energy resources use, on ensuring the energy security, on technological evolution and on international market fuel prices. • BALANCE – determines the demand-supply energy equilibrium for each analyzed	A sensitivity analysis has been conducted for a complete characterisation of the solution for the development of the energy sector and the greenhouse gas emission projections. The analysis evaluated the effects of variation of different key parameters (technical or economic) on the adopted solution: electricity consumption, fuel prices, price of un-delivered energy, value of safety indicator and value of new groups' investments.

Country	Description of projections methodology	QA / QC activities
	year. • IMPACTS – estimates, for the energetic system determined using the BALANCE module and for the electro-energetic system determined using the ELECTRIC module, the impact on atmosphere, water, soil, the impact of the specific waste, the impact on materials and labour needed for the installations construction and exploitation, the impact on related employees risk and health. In order to allow the use of the modules package, a national energy balance has been prepared considering the available or imported primary energy resources.	
Slovenia	Regarding the modelling methodology, different approaches have been used for different sectors. For the Energy sector a set of different models were used, where the main tool is a reference energy ecological model called REES-SLO. This model was created in the MESAP environment. Besides the REES-SLO model (which comprises other models), a market penetration of energy saving final use technology assessment model (PET-SLO), a simulation of an electrical load curves model (ELAM-SLO) and a model for calculating the electricity generation balance in a free market (ELMAS) were used. Energy projections were made in the process of preparing long term energy balance for the Ministry of the economy. For the Transport sector the COPERT model was used for the emissions calculation and the assumptions on the development of the local and transit transport the activity data (growth of the freight transport was based on the growth of Slovenia's GDP and neighbouring countries' GDP). The projections from the industrial processes sector were calculated on the basis of the projected industrial production growth, using different emission factors for different activities. Solid waste, waste water and agricultural emission projections were made by using IPCC methodology. Activity data for the last three sectors were taken from Slovenian strategic documents.	Different projections were made, with different main assumptions and uncertainty analysis
Slovak Republic	The optimization model MESSAGE was used to develop projections, in all three options (WOM, WEM and WAM), of CO_2 emissions from the energy sector, combustion and transformation of fossil fuels. Emission projections in other sectors (e.g. agriculture, transport, etc.) were prepared based on development of macro-economic parameters and available expert analysis on production. We have also used specific forecasts and greenhouse gas emission projections as prepared directly by some of the major emitting companies.	Results of sensitivity analysis indicate possible impact of the EU ETS (the price of allowances) and increasing share of renewable energy sources in the energy balance of the SR have been followed by modelling the WEM and WAM scenarios. There is urgent need to diversify import of primary energy sources and to decrease our dependency on their imports by higher share of domestic RES (namely biomass).

Country	Description of projections methodology	QA / QC activities
Spain	The projections are based on the methodology developed by AEMA and the EPA.	To verify and store results they have developed a tool called EmiPro. The employed model shows improvements compared to the versions used for the calculation of projections for the 4th NC to the UN as well as submissions to the EC in previous years. Internally there are better quality controls and adjustments of input data with other national organisations. Beyond, a sectoral sensitivity analysis and an uncertainty analysis related to the WEM scenario based on the sensitivity analysis have been performed.
Sweden	Projections of greenhouse gas emissions in Sweden have been produces for the years 2010, 2015 and 2020. The projections are based on the policies and measures approved by the Swedish parliament up to the year 2008, which means that it is a projection 'with existing measures'. When producing the projections, model-based calculations and to some extent expert evaluations are used. The projections can be mainly regarded as a consequential analysis of the assumptions that have been made, all of which are characterised by uncertainty. The method for estimating the projections is mainly developed for a medium-term or long-term projections, which means that the projection for 2010 does not take into consideration variations on a short-term basis. The decision on the premises and assumptions used in the projection was made in June 2008, therefore before the economic downturn that occurred in the autumn of 2008.	In addition to the projections, two sensitivity scenarios have been estimated for the energy and transport sector, and one scenario has been estimated for the agricultural sector. A projection with 'additional measures' is also reported, although the measures are probably not needed to reach Sweden's commitment according to the Kyoto Protocol.
United Kingdom	The projections are based on the following models and assumptions: •The DECC Energy Model is a partial equilibrium model linked to a linear optimizing model of the electricity generating sector. It is primarily a top down model based around econometrically estimated relationships between energy demand, economic activity (income) and energy prices, and an optimizing model for the electricity supply industry. The projections provide a view of possible future levels of CO_2 emissions and composition of energy demand based on different scenarios for economic growth and world energy prices. The updated energy projections provide a with measures central baseline projection. • Non-CO_2 greenhouse gas projections have been calculated using a bespoke projections system which complements the national inventory system. The projections system includes spreadsheets to pre-process data, and to feed the projections database which is linked to the national greenhouse gas emissions database. This projections system calculates emissions based on forecast activity statistics, emissions factors and various other sector specific assumptions for each of the main sources of emissions. Greenhouse gas emission projections are disaggregated by sector and are calculated for each year from 2005 to 2050. These are then aggregated to provide an estimate of total projected emissions.	The projections of the United Kingdom greenhouse gas emissions are compiled from a range of organisations, each with their own documented QA and QC procedures. The main sources include the United Kingdom DECC (CO_2 projections - non LULUCF); AEA Technology (non CO_2 projections, compiled from own estimates and a variety of other external sources); CEH (LULUCF emissions); and IGER/ADAS (agricultural projections). AEA has taken responsibility for coordinating the projection QA/QC activities. The CO_2 projections are supplied directly to AEA. The United Kingdomr estimates of non-CO_2 projections are prepared via a central database of activity data and emission factors, from which the United Kingdomr projections are extracted and reported in a variety of formats. The QC within this system is still evolving, but AEA have a formal system of checking the projections, and the projections which are supplied to them. Numerous QA/QC procedures are built into the data processing system. These include checks before data are entered into the database of greenhouse gas projections, and when data are extracted from the database. The database contains much of the activity data and emission factors for all the sources necessary to construct the United Kingdomr greenhouse gas

Country	Description of projections methodology	QA / QC activities
	• Land use change emission estimates are from a model developed by the Centre for Ecology and Hydrology under contract to DECC. The model uses land use data derived from periodic surveys, supplemented by an annual census of agricultural land uses. The model is based on continuation of current patterns of land use change taking account of plans to expand the residential sector. It is combined with information on soil carbon density and dynamics to estimate annual gains and losses associated with the transitions involved. • Key assumptions for the projections are economic growth and a range of fossil fuel prices. Economic growth is consistent with the latest United Kingdom Treasury forecasts published in the Budget and fossil fuel price assumptions are provided through analysis by government. Other assumptions such as population and household forecasts are provided by National Statistical Office and Government Actuarial Service.	projections. AEA is currently accredited to BS EN ISO 9001:2000, and was last audited in January 2008 by Lloyds. Key checks include time series consistency checks. A final check is made on the projections before they are released comparing the latest sets of projections with those of the previous year, and a complete time-series check is also conducted for selected key sources.

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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
Base year	Under the Kyoto Protocol, the greenhouse gas emission level in the 'base year' is the relevant starting point against which a country's Kyoto target is set. For most EU Member States, the base year is 1990 for CO2, CH4 and N2O (except for five EU-12 countries with economies in transition), and 1995 for fluorinated gases (SF6, HFCs and PFCs).
CO_2-equivalent	a common unit used for CO_2 and non-CO_2 greenhouse gases, which represents the global warming effect of one tonne of carbon dioxide.
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, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, the Slovak Republic, Slovenia

EU-15	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, the 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
LULUCF	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
N_2O	nitrous oxide
NAP	National Allocation Plan
NMVOC	Non-methane volatile organic compounds
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 measures