EN01 Energy related greenhouse gas emissions

Key message

More than 80 % of total greenhouse gas emissions in the EU-27 are caused by energy production, energy use by the industry, services and households, and transport. Reductions in energy related emissions since 1990 have occurred at a slower rate than emissions as a whole. However, an increasing trend in energy related emissions between 1999 and 2003 has recently been turned around and reductions are once again occurring, partly due to higher hydropower electricity generation and to fuel switches from solid to gaseous fuels. As such, current climate change policies will need to be extended and enhanced and new emission reduction measures will be required if the reductions needed in the long term are to be realised, particularly in the transport sector, the only sector to have shown growth in emissions between 1990 and 2005.

Rationale

This indicator analyses past and projected trends in energy and non-energy related greenhouse gas emissions in the EU-27, EU-15 and the new Member States (new EU-12). Total EU-27 greenhouse gas emissions fell by 7.9 % between 1990 and 2005. During the same period, energy-related emissions fell considerably less (- 4.4 %). Between 1999 and 2003, energy related emissions increased by 4.2%, but have fallen by 0.8% since 2003. The reduction in energy-related greenhouse gas emissions since 1990 was achieved largely in the energy supply, services and industry sectors, but was to a large extent offset by growth in transport emissions. The increase observed between 1999 and 2003 was mainly due to growing electricity production from thermal power plants, particularly those using coal.

There is growing evidence that global emissions of greenhouse gases are causing global temperatures to increase, resulting in climate change. While efforts to reduce or limit the effects of climate change are focused on limiting the emissions of all greenhouse gases, particular attention is being paid to reducing emissions arising from energy production and consumption which account for 80% of total emissions:

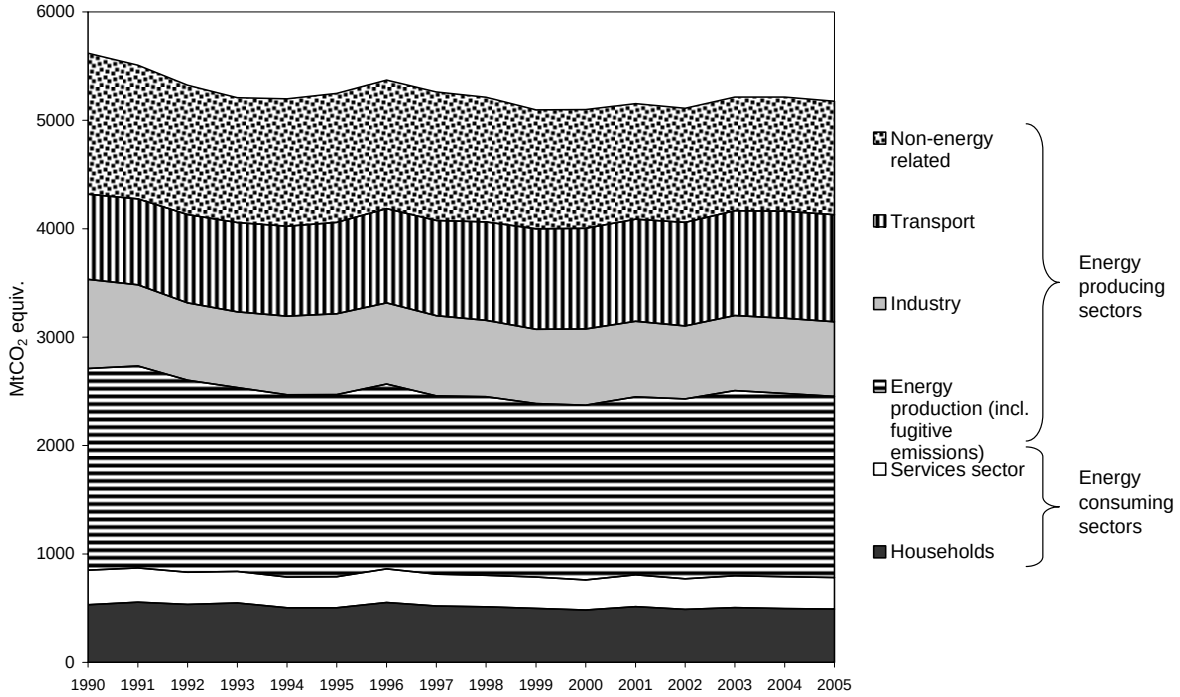
- At an UN conference in August 2007 it was agreed that an emission reduction in the range of 25-40 % below 1990 levels is necessary to avoid the most catastrophic forecasts.
- In order to maintain concentrations of CO_2 close to 2005 levels and therefore minimise temperature increase and sea level rise, it is necessary for global GHG emissions to peak in the 2000-2015 period and decrease by 50-85% between 2000 and 2050.[1]
- Under the Kyoto Protocol, the pre-2004 EU-15 Member States agreed to reduce their total GHG emissions by 8 % from 1990[2] levels by 2008–2012 (with differentiated national emission targets), while new Member States have individual targets[3].
- The European Commission has recently announced proposals to cut GHG emissions by 20% by 2020 compared to 1990 or 30% by 2020 if a global climate deal is struck.

[1] IPCC (2007).

[2] The base-year level of greenhouse gas emissions for the EU-15 is calculated by using 1990 emissions for carbon dioxide, methane and nitrous oxide for all EU-15 Member States, and 1995 emissions for fluorinated gases for all EU-15 Member States, except Austria France and Italy which selected 1990 as base-year for these gases. See the annual EC GHG inventory report (EEA, 2007a) and the EC Initial Report (EEA, 2007b) for more details on the base-year emissions and the individual EU Member States targets.

[3] Except for Cyprus and Malta, which do not have a Kyoto target.

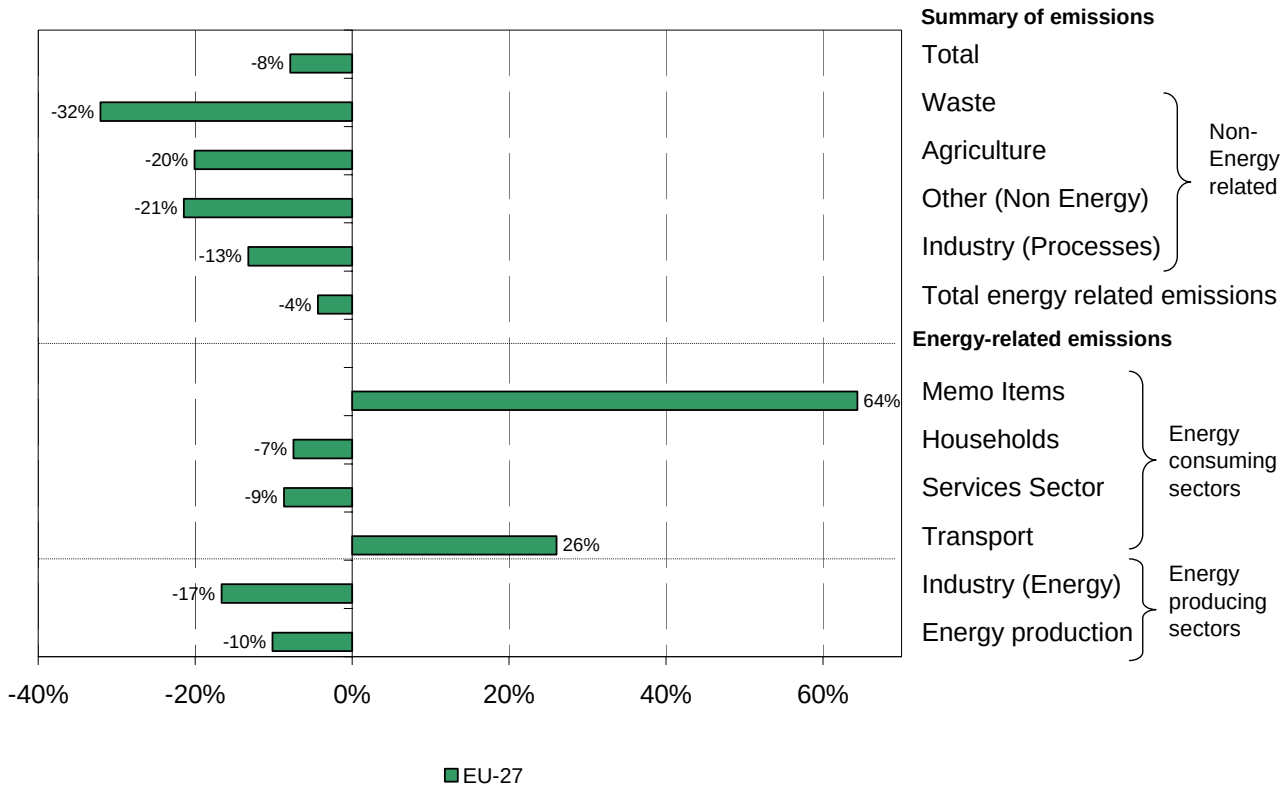
Fig. 1: Total energy and non-energy related greenhouse gas emissions by sector, EU-27



Sources: Historic emissions: EEA (2007a) as reported by countries to UNFCCC and under the EU GHG Monitoring Mechanism Decision
Notes:

1. Greenhouse gas emissions are those covered by the Kyoto Protocol and include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and three fluorinated gases, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6).
2. For the period 1990-2005 the greenhouse gas emissions have been calculated in t CO_2-equivalent using the following global warming potentials (GWP) as specified in the Kyoto Protocol: 1 t CH_4 = 21 t CO_2-equivalent, 1 t N_2O = 310 t CO_2-equivalent, 1 t SF_6 = 23 900 t CO_2-equivalent. HFCs and PFCs have a wide range of GWPs depending on the gas and emissions are already reported in t CO_2-equivalent.
3. Emissions from international marine and aviation bunkers are not included in national total emissions but are reported separately to the UNFCCC and are therefore not included in the graph.
4. The energy production sector includes public electricity and heat production, refineries and the manufacture of solid fuels. Energy-related fugitive emissions include releases of gases from exploration, production, processing, transmission, storage and use of fuels. The vast majority of energy-related fugitive emissions are connected with activities of the energy production sector. Only a very small percentage of fugitive emissions are connected with activities of the transport sector. All energy-related fugitive emissions have therefore been attributed to the energy production sector.
5. 'Services sector' also includes military and energy-related emissions from agriculture.

Fig. 2: Changes (%) in greenhouse gas emissions by source category, 1990-2005



Source: EEA (2007a)

Notes:
1. 'Services sector' also includes military and energy-related emissions from agriculture.
2. 'Memo items' include emissions from international marine and aviation bunkers. These are not included in national total emissions but are reported separately to the UNFCCC.

1. Indicator assessment[4]

Energy production and consumption are the largest sources of greenhouse gas emissions in the EU-27, accounting for 80 % of the total. Energy-related greenhouse gas emissions in the EU-27 decreased by 4.4 % between 1990 and 2005. This was much less than the 20.0 % reduction observed for non-energy related emissions, which resulted in total GHG emissions being 7.9 % below 1990 levels. Between 2003 and 2005 energy-related greenhouse gas emissions in the EU-27 decreased by 0.8 %, while they increased by 4.2 % between 1999 and 2003 mainly due to increases in thermal power production (see EN27, EN16).

The decrease between 2003 and 2005 is partly due to higher electricity generation from hydropower in Northern European countries and lower thermal power production. Warmer winters were also partly responsible for lower emissions from households and services in Germany and the Netherlands.

Examining energy-related carbon dioxide, methane, and nitrous oxide emissions separately shows marked differences in their shares trends:

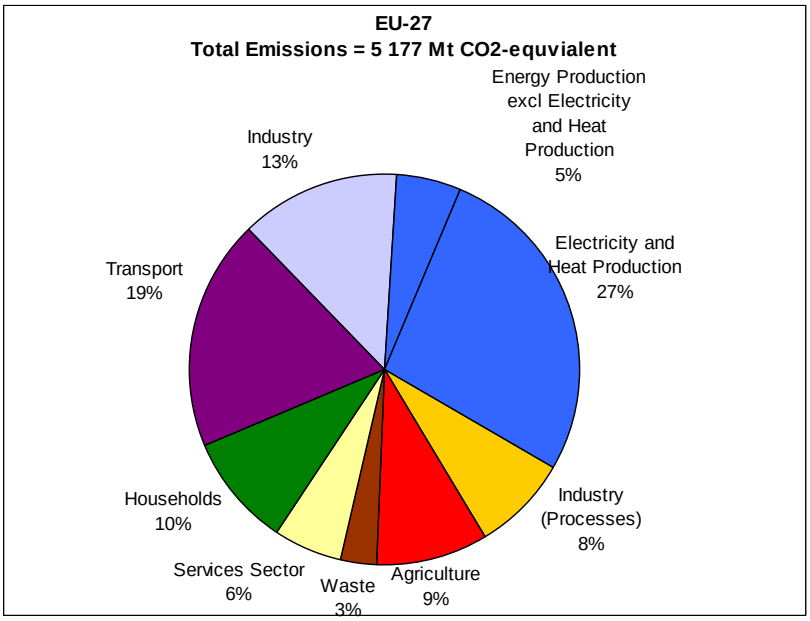
- Carbon dioxide is by far the most significant energy-related greenhouse gas, with a share of 96.4 %. In the EU-27, energy related emissions of carbon dioxide decreased by 3.3 % over the period 1990 to 2005; most EU-15 Member States saw a rise but this was offset by a decrease in emissions from most new Member States.
- Methane (CH_4) and nitrous oxide (N_2O) emissions are only a small fraction of total energy-related emissions (2.1 % and 1.5 %, respectively). N_2O emissions increased by 31.9 %, while methane emissions decreased by 44.4 %. More than 80 % of methane emissions arise from fugitive emissions from the extraction, production and distribution of fossil fuels.

[4] See for a more detailed analysis of past and projected emissions the annual EU GHG inventory report (EEA, 2007a) and the annual assessment of GHG emission trends and projections (EEA, 2007b).

The reductions in energy-related emissions since 1990 were helped by structural changes in the economies of the new Member States in central and eastern Europe in the early 1990s, combined with reductions within Germany due to economic restructuring in its new Länder and in the United Kingdom due to a switch from coal to gas (see EN27 and EN26). In addition, a range of specific policies and measures contributed to emission reductions in a number of EU Member States. However, the reductions achieved by the UK, Germany and Sweden were partly offset by increased emissions in other Member States, like Spain, Austria, Ireland, Greece and Portugal.

Energy sub-sectors showing the largest decreases in greenhouse gas emissions in the EU-27 between 1990 and 2005 were energy use by industry (-16.6 %), and energy use by services (-8.7 %).

Fig. 3: Total greenhouse gas emissions by sector, 2005



Source: EEA (2007a)

Notes:

1. Annual emissions of CO_2, CH_4, N_2O, HFC, PFC and SF_6 in the UNFCCC reporting format are converted to their global warming potential GWP (100 year time horizon) for addition and comparison with the Kyoto Protocol targets: 1 t CH_4 = 21 t CO_2-equivalent, 1 t N_2O = 310 t CO_2-equivalent, 1 t SF_6 = 23 900 t CO_2-equivalent. HFCs and PFCs have a wide range of GWPs depending on the gas and emissions are already reported in tonnes CO_2-equivalent.

2. If international transport (memo items) were added to the 'Total emission', emissions would increase by 6% to 5465 Mt.

Energy-related CO_2 emissions from **industry** (manufacturing and construction) fell by 16.6 % between 1990 and 2005. This was predominantly due to reduced emissions from this sector in the new Member States (-36.0 %) and in Germany (-33.5 %).

CO_2 emissions from **energy production** (including fugitive emissions) decreased by 7.5 % between 1990 and 2005, with some new Member States, the United Kingdom and Germany showing large decreases in absolute terms in their emissions, largely due to fuel switching and the introduction of more energy-efficient technologies, such as combined cycle gas turbines.

CO_2 emissions from **transport** in the EU-27 increased by almost 24.7 % between 1990 and 2005 as a result of a continuous increase in road transport demand (in particular freight), triggered by growing trade volumes and the sector's almost total reliance on fossil fuels. CO_2 emissions from transport increased in all EU-27 Member States, except Estonia, Lithuania and Bulgaria. An increase higher than 80 % is reported by Spain, Austria, Portugal, Cyprus, Czech Republic, Ireland and Luxembourg. The continued growth in the transport sector presents a problem for most Member States in terms of meeting their targets under the Kyoto Protocol.

Energy-related greenhouse gas emissions from **households and services sectors** decreased between 1990 and 2005 by 7.5 % and 8.7 %, respectively. Emissions are closely linked to outdoor temperature. Important factors influencing the emissions from this source are fuel switching from oil and coal to natural gas in space heating in the new German Länder following reunification, increased energy efficiency in buildings, and increased use of district heating particularly in the Northern countries. Greenhouse gas emissions of the services sector increased by 5.5 % between 2000 and 2003, but then decreased by 0.8 % until 2005.

In the EU-15, overall energy related and non-energy related emissions decreased by 1.5 % between 1990 and 2005, whereas energy-related emissions increased by 2.9 % and non-energy related emissions decreased by 16.1 %. As analysed and reported in the EEA report 'Greenhouse gas emission trends and projections 2007' (EEA, 2007b), on the basis of their 2010 projections, three Member States (Sweden, United Kingdom and Germany) were on track to achieve their burden-sharing targets in 2010 using only existing domestic policies and measures. Nine more countries (Netherlands, Portugal, France, Finland, Belgium, Ireland, Austria, Greece, Luxembourg) anticipate to meet or exceed their commitment targets by implementing additional measures and/or using Kyoto mechanisms and/or using carbon sinks. Three EU-15 Member States (Italy, Denmark, Spain) project that they will miss their target despite the implementation of additional measures or the use of Kyoto mechanisms or carbon sinks.

Greenhouse gas emissions have declined substantially more in almost all new Member States. In 2005, energy-related emissions were more than 26.8 % below 1990 emissions, mainly due to the introduction of market economies and the consequent restructuring or closure of heavily polluting and energy-intensive industries. Transport represents the most rapidly growing source of emissions in these countries. All new Member States were on track to meet their individual Kyoto targets of 8% (Czech Republic, Estonia, Latvia, Lithuania, Slovakia and Slovenia) and 6% (Hungary and Poland) on the basis of their emissions in 2005. Only Slovenia proposes to make use of additional policies, carbon sinks (CO_2 removals from land-use change and forestry) and Kyoto Mechanisms to achieve its Kyoto target; all other new Member States project that existing policies and measures will be sufficient. Cyprus and Malta do not have Kyoto targets.

National projections[5] show that in the EU-15, existing measures could bring greenhouse gases emissions to 4 % below base-year levels by 2010. Including the reductions that Member States forecast they will achieve through additional measures, emissions in 2010 are projected to be 7.9 % below base-year emissions in the EU-15. With the additional consideration of Kyoto Mechanisms and carbon sinks, the EU-15 emissions are projected to be 11.4 % below base-year emissions, thus (over)achieving the Kyoto target.

Nine of the ten new Member States with a Kyoto target are projected to meet and indeed overachieve their targets by the use of existing domestic policies and measures. Slovenia projects that it will meet its Kyoto target with additional policies and measures and the use of carbon sinks and Kyoto Mechanisms. However, in most new Member States, emissions fell markedly between 1990 and 2005 but are projected to increase between 2005 and 2010 (EEA, 2007b).

Those existing policies and measures that are currently projected to help most in reducing energy-related emissions in the EU-27 include:

- promotion of renewable energy (including electricity from renewable sources, see EN29 and EN30);
- the EU emissions trading scheme, which has created a market for carbon dioxide allowances and aims to ensure that emissions reductions can be made where it is most economically efficient;
- promotion of combined heat and power (CHP, see EN20);
- improvements in the energy performance of buildings;
- promotion of alternative fuels in transport (in particular biofuels);
- reduction of the average carbon dioxide emissions of new passenger cars;
- taxation of energy products and electricity.

Nevertheless, in a long-term perspective, baseline projections for the EU-27 beyond 2010 indicate that energy-related CO_2 emissions may start rising again unless further action is taken. According to PRIMES projections[6], by 2030, energy-related CO_2 emissions could reach a level almost 6% above 1990 levels, with a 41% increase in emissions from transport. Projections for the EU-15 are similar to those for the EU-25 as a whole. In the new EU-12, CO_2 emissions from transport are projected to more than double between 1990 and 2030, while significant reductions are predicted in the industry, household and energy supply sectors.

The projections for overall greenhouse gas emissions are more stable over time (Fig. 1), as the increase in CO2 emissions is projected to be partially negated by large decreases in methane and N2O emissions. However, it should be noted that

[5] The national projections are the official data provided by each Member State under the EU Monitoring Mechanism of Greenhouse Gas Emissions (Decision No 280/2004/EC). These projections can be aggregated to obtain projections for the EU-27, EU-15, etc. Data reported by Member States by 31 May 2007 are presented in an EEA report published in October 2007 (EEA, 2007b).

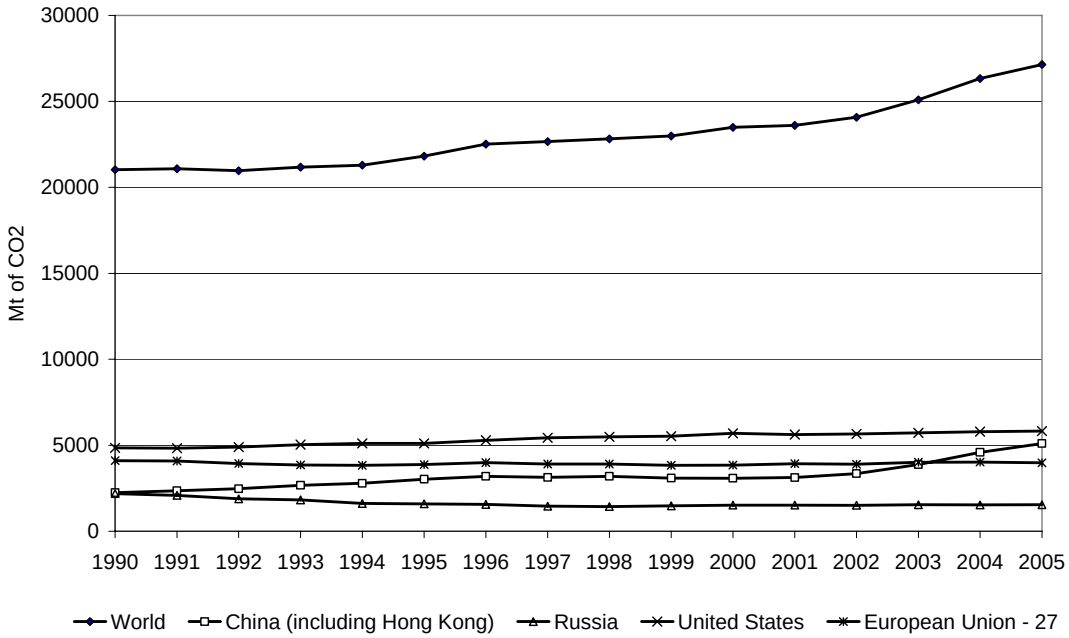
[6] All projections mentioned for 2030 derive from the PRIMES model. These projections have not been made by Member States, but are produced under contract for the European Commission.

fluorinated gas emissions are projected to triple between 1990 and 2030. Latest Member State projections of EU-27 greenhouse gas emissions in 2020 are 6% below 1990 levels (EEA, 2007b).

2. International context

Figure 4 shows the rapidly increasing trend in global CO_2 emissions, particularly since the early nineties. EU-27 emission levels have remained above those of China and Russia until 2003, since when China's emissions have overtaken those of the EU-27. EU-27 emissions have remained below those of the United States throughout the period 1990-2005.

Fig 4: Total CO_2 emission by selected regions, 1990 - 2005

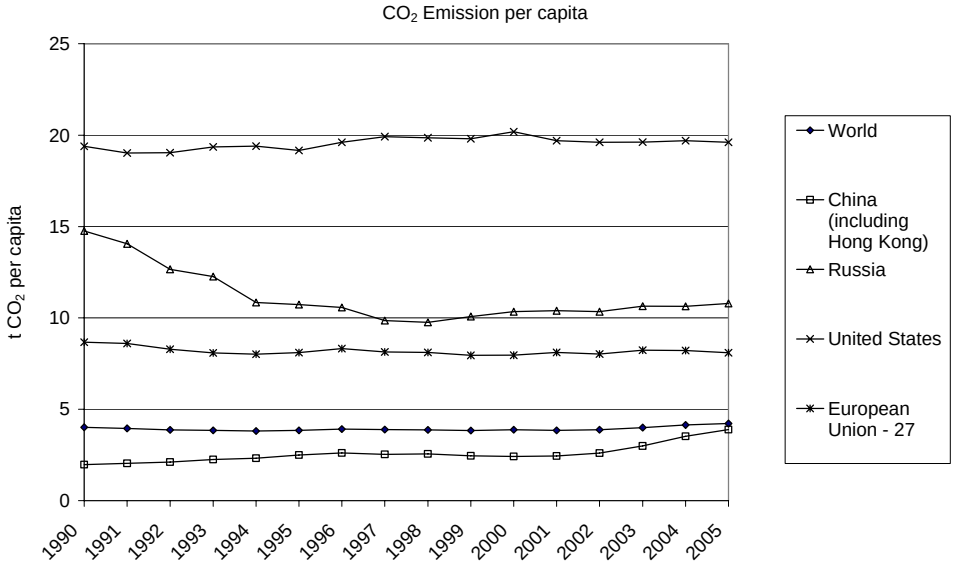


Note: Total CO_2 emissions covering all sectors

Source: Eurostat (population data) and EEA (CO_2 emission data)

Figure 5 shows that EU-27 CO2 emissions per capita have remained relatively constant over the period 1990-2005 and are significantly below those of the US, and to a lesser extent, Russia. EU-27 CO2 emissions per capita are, however, considerably greater than those of the World and China.

Fig 5: CO_2 emissions per capita

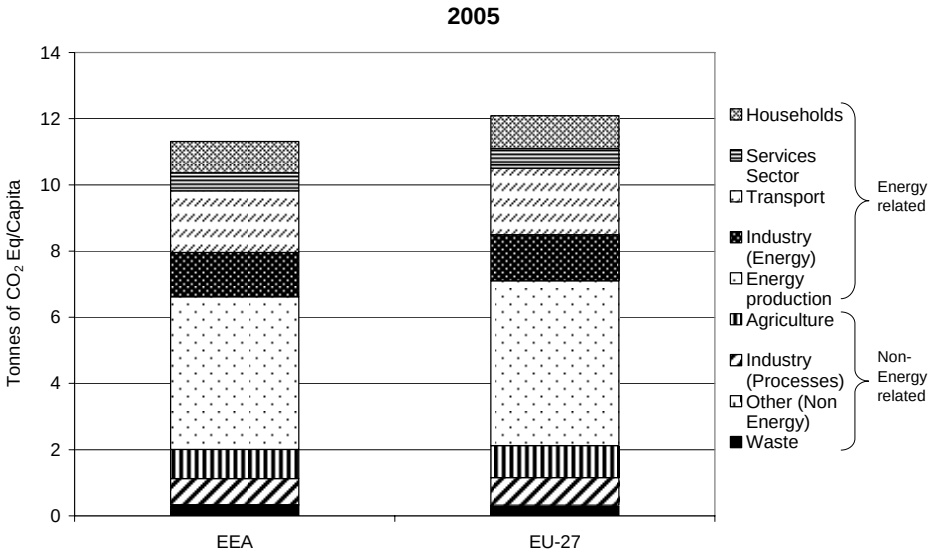


Note: Total CO_2 emissions covering all sectors

Source: IEA

Figure 6 illustrates the difference in CO2 emissions per capita between the EEA-32 and EU-27 and the overwhelming contribution of energy related sectors to emissions.

Fig 6: CO_2 emissions per capita by sectors, 2005



Note: Total CO_2 emissions covering all sectors

Source: Eurostat (population data) and EEA (CO_2 emission data)

3. Indicator rationale

3.1 Environmental context

This indicator shows past and projected trends in energy and non-energy-related greenhouse gas emissions.

There is growing evidence that global emissions of greenhouse gases are causing global and European surface air temperatures to increase, resulting in climate change (IPCC, 2007). The potential consequences at the global level include rising sea levels, increased frequency and intensity of floods and droughts, changes in biota and food productivity and increases in diseases. Efforts to reduce or limit the effects of climate change are focused on limiting the emissions of all greenhouse gases covered by the Kyoto Protocol. This indicator uses a breakdown in non-energy emissions and energy-related emissions by economic sector.

3.2 Policy context

Under the Kyoto Protocol, the pre-2004 Member States (EU-15) are committed to reducing their combined emissions of the greenhouse gases controlled by the Protocol to 8 % below the base year level over the period 2008–2012. This overall target has been translated into a specific legally binding target for each EU-15 Member State, based on its capacity to curb emissions (Council Decision 2002/358/EC). Each of the new Member States, excepting Cyprus and Malta, has an individual target under the Kyoto Protocol. Bulgaria, the Czech Republic, Estonia, Latvia, Lithuania, Romania, Slovakia and Slovenia have reduction targets of 8 % from the base-year, while Hungary and Poland have reduction targets of 6 %. There is no joint Kyoto target for the EU-27. At a UN conference in August 2007 it was agreed that an emission reduction in the range of 25-40 % below 1990 levels is necessary to avoid the most catastrophic forecasts.

In preparation for a post-Kyoto international agreement, the European Commission has forth a range of proposals to further reduce greenhouse gas emissions by 2020. The proposals include a target for the EU-27 to reduce greenhouse gas emissions by 20 % compared to 1990, rising to 30 % when new global climate agreement reached. The 20% target will be disaggregated into trading and non-trading sectors. Emissions covered by the EU ETS scheme are to be reduced by 21% from 2005 levels by 2020 and emissions not covered by the ETS (agriculture, buildings, transport and waste) are to be reduced by 10% from 2005 levels by 2020. Individual targets for each Member State have also been proposed.

In addition, the package of proposals includes:

- an extended target of 20% of all energy consumed to be generated through renewable sources by 2020, with individual targets for each Member State.
- a minimum target of 10% use of biofuels in transport by 2020
- a legal framework on carbon capture and storage and a Communication on the demonstration of carbon capture and storage

It is likely that by 2030, many options for abatement of non energy-related greenhouse gas emissions will have been already exploited, putting a greater burden on the energy sector to achieve reductions. Current policies will therefore need to be extended and enhanced and new measures will be required if long-term emission reductions and the required changes in energy production and consumption patterns (power plants, buildings, transport etc) are to be realised. Given the long lead-times in the energy sector, such changes will be determined by actions taken in the immediate future. Therefore, reducing future energy-related emissions requires additional policy action now.

References

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Meta data

Technical information

1. Data source (incl. data of most recent update)
   Greenhouse-gas emissions is one of the European Environment Agency's core-set indicators. More information can be found at http://themes.eea.eu.int/IMS/CSI.
   Historical data:
   Official data (national total and sectoral emissions) reported to the United Nations Framework Convention on Climate Change (UNFCCC) and under the EU Monitoring Mechanism and EIONET. For the EU-27, the data are compiled by EEA in the European greenhouse gas inventory report (and related database) (EEA, 2007a). Data reported for the EU-27 Member States were included up to 30 May 2007. Data for other EEA countries are compiled for the EEA report Greenhouse gas emission trends and projections in Europe 2007 (EEA, 2007b). Data for these countries were included up to June 2007. EEA published 2005 GHG emission data and revised past trend emission data in June 2007.
   Projection data:
   Energy-related CO_2 emissions: European Commission PRIMES energy model (2006). All other emissions projections were estimated by AEAT for EEA (EEA, 2005).

2. Description of data/Indicator definition
   Historical data:
   Annual emissions of CO_2, CH_4, N_2O, HFC, PFC and SF_6 in UNFCCC reporting format (In Mt = million tonnes) converted to their global warming potential (100 year time horizon) for addition and comparison with the Kyoto Protocol targets (1 t CH_4 = 21 t CO_2-equivalent, 1 t N_2O = 310 t CO_2-equivalent, 1 t SF_6 = 23 900 t CO_2-equivalent. HFCs and PFCs have a wide range of GWPs depending on the gas and emissions are already reported in t CO_2-equivalent).
   For CO_2 only, the (national) totals do not include emissions from biomass burning or emissions or removals from land-use change and forestry (LUCF).
   The energy sector (CRF 1) is responsible for energy-related emissions, such as those arising from fuel combustion activities (CRF 1A) and fugitive emissions from fuels (CRF 1B). Fuel combustion activities include: energy industries (CRF 1A1), manufacturing industries and construction (CRF 1A2), transport (CRF 1A3), other sectors (CRF 1A4) and other stationary or mobile emissions from fuel combustion (CRF 1A5). Fugitive emissions from fuels include: solid fuels (1B1) and oil and natural gas (1B2).
   'Energy production' includes 'Energy industries (CRF 1A1)' (i.e. public electricity and heat production, petroleum refining and the manufacture of solid fuels) and 'Fugitive emissions' (CRF 1B) (i.e. emissions from production, processing, transmission, storage and use of fuels, in particular coal-mining and gas production).
   'Transport' (CRF 1A3) includes road transportation, national civil aviation, railways and navigation, and other non-road transportation. In accordance with UNFCCC and UNECE guidelines, emissions from international aviation and navigation are not included.
   'Industry' (CRF 1A2) includes fossil fuel combustion (for heat and electricity) in manufacturing industries and construction (such as iron and steel, and non-ferrous metals).
   'Households' (CRF 1A4b) includes fossil fuel combustion in households.
   'Services sector' (CRF 1A4a + 1A4c + 1A5) includes fossil fuel combustion (for heat and electricity) from small commercial businesses, public institutions, agricultural businesses and military.
   Non-energy related emissions include 'Industry' (CRF 2) (i.e. processes in manufacturing industries and construction without fossil fuel combustion including production and consumption of fluorinated gases), 'Agriculture' (CRF 4) (i.e. domestic livestock (dairy and non-dairy cattle) keeping, in particular manure management and enteric fermentation and emissions from soils) 'Waste' (CRF 6) (i.e. waste management facilities, in particular landfill sites and incineration plants and 'Other non-energy' (CRF 3 + 7) (i.e. solvent and other product use).

Projection data:
The PRIMES energy model was used as the source of energy-related CO_2 projections data (2010, 2020, 2030).
Projections of non-energy related CO_2 emissions and non-CO_2 emissions (CH_4, N_2O and fluorinated gases) were estimated by AEAT for EEA (EEA, 2005).

3. Geographical coverage
EU-27 includes EU-15 (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, the United Kingdom) and the twelve new EU Member States (Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Lithuania, Latvia, Malta, Poland, Romania, Slovenia, Slovakia).

4. Temporal coverage
1990-2005 and projections for 2010, 2020 and 2030 (PRIMES model projections / AEAT projections for EEA). Historical data gaps exist for a few countries and were filled according the implementing provisions under the EU Monitoring Mechanism. For more details see EEA (2007a).

5. Methodology and frequency of data collection (past emission data)
Annual official data submission by EU Member States to UNFCCC and EU Monitoring mechanism (EEA, 2007a). Compilation of emission estimates by Member States is based on combining sectoral activity data, calorific values and carbon emission factors. Recommended methodologies for emission data estimation are compiled in the Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories (IPCC, 2006), supplemented by the 'Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories' (IPCC, 2000) and UNFCCC Guidelines (UNFCCC, 2000).

6. Methodology of data manipulation:
The data has been weighted according to the following global warming potentials (GWP) for each greenhouse gas: CO_2 = 1, CH_4=21, N_2O =310 and SF6=23900, to give total GWP emissions in Mt CO_2 equivalent. HFCs and PFCs have a wide range of GWPs depending on the gas and emissions have been reported by the Member States as Mt CO_2 equivalent. Where data is not available for EU Member States, the data gap filling procedure has been used as agreed under the Monitoring Mechanism (EEA. 2007a).
Greenhouse gas intensity of energy use: energy related greenhouse gas emissions from / gross inland energy consumption
Average annual rate of growth calculated using: $[(\text{last year/base year})^{(1 / \text{number of years})} - 1] \times 100$

Qualitative information

7. Strengths and weaknesses (at data level)
Strength: Officially reported data following agreed procedures. e.g. regarding source sector split. The GWP weighting is the agreed UNFCCC and EU Monitoring Mechanism procedure (IPCC, 2006).
Weakness: HFC, PFC and SF6 are not reported by all Member States; for Cyprus and Malta, 2005 data were estimated by gap filling.

8. Reliability, accuracy, robustness, uncertainty (at data level):

Indicator uncertainty (historical data)
The IPCC (IPCC, 2000) suggests that the uncertainty in the total GWP-weighted emission estimates, for most European countries, is likely to be less than +/– 20 %. In 2007 uncertainty estimates were calculated for the EU-15 (EEA 2007a). The results suggest that the overall trend uncertainty of all EU-15 greenhouse gas emissions is estimated to be between 1 and 2 percentage points. Uncertainties at EU-15 level are between +/- 4 % and 8% for total EU-15 greenhouse gas emissions. For energy related greenhouse gas emissions the results suggest uncertainties of +/- 1 % (stationary combustion), +/- 1 % (transport) and +/- 8 % (fugitive emissions). Uncertainties for specific gases and for specific sectors are also available at the EU-15 level. For the new Member States and some other EEA countries, uncertainties are assumed to be higher than for the EU-15 Member States because of data gaps. Uncertainties in trends are much lower than in absolute values. For more information see EEA 2007a.

Indicator uncertainty (scenarios)
Scenario analysis always includes many uncertainties and the results should thus be interpreted with care.
- uncertainties related to future socioeconomic and other developments (e.g. GDP);
- uncertainties in the underlying statistical and empirical data (e.g. on future technology costs and performance);
- uncertainties in the representativeness of the indicator;
- uncertainties in the dynamic behaviour of the energy system and its translation into models;
- uncertainties in future fuel costs and the share of low carbon technologies in the future.

9. Overall scoring – historical data (1 = no major problems, 3 = major reservations):
Relevance: 1
Accuracy: 2
Comparability over time: 2
Comparability over space: 1