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Approximated EU GHG inventory: early estimates for 2010

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Contents

The full report and annexes are available at:

http://www.eea.europa.eu/publications/approximated-eu-ghg-inventory-2010/

Executive summary

Objective of the report

The objective of this report is to provide an early estimate of greenhouse gas (GHG) emissions in the EU-15 and EU-27 for the year 2010. The official submission of 2010 data to the United Nations Framework Convention on Climate Change (UNFCCC) will occur in 2012.

In recent years, the EEA and its European Topic Centre on Air Pollution and Climate Change Mitigation have developed a methodology to estimate GHG emissions using a bottom up approach — based on data or estimates for individual countries, sectors and gases — to derive EU GHG estimates in the preceding year (t–1). For transparency, this report shows the country-level GHG estimates from which the EU estimates have been derived. The 2010 estimates are based on the latest activity data available at country level and assume no change in emission factors or methodologies as compared to the official 2011 submissions to UNFCCC (which relate to emissions in 2009).

Some Member States estimate and publish their own early estimates of GHG emissions for the preceding year. Where such estimates exist they are clearly referenced in this report in order to ensure complete transparency regarding the different GHG estimates available. Member State early estimates were also used for quality assurance and quality control of the EEA's GHG early estimates for 2010.

Finally, EEA has also used the early estimates of 2010 GHG emissions produced by EEA member countries to assess progress towards the Kyoto targets in its annual trends and projections report (due to be published alongside the present report). In that report, the EEA's early estimates for 2010 were only used for countries that lack their own early estimates to track progress towards national and EU targets.

Rationale for early GHG emissions estimates

The European Union (EU), as a Party to the UNFCCC, reports annually on GHG inventories within the area covered by its Member States (i.e. emissions occurring within its territory). National GHG inventories for EU Member States are only available with a delay of 1.5 years. Inventories submitted on 15 April of the year t therefore include data up to the year t–2.

The latest official EU data available (1990–2009) covering all countries, sectors and gases were released on 31 May 2011 (EEA, 2011a) in connection with the annual submission of the EU GHG inventory to the UNFCCC (EEA, 2011b). The inventory data include GHG emissions not covered by the Montreal Protocol — both from sectors covered by the EU Emission Trading Scheme (ETS) and from non-trading sectors. However, whereas UNFCCC emissions run on a year t–2 timeline, Kyoto registries and EU ETS information is available on a year t–1 timeline. As such, verified EU ETS emissions are already available for 2010 (EEA, 2011c).

There are clear advantages in generating early GHG estimates for all sectors. Under the Kyoto Protocol, the EU-15 took on a common commitment to reduce emissions by 8 % between 2008 and 2012 compared to emissions in the base year. Total emissions from sectors included in the EU ETS are capped for the period 2008–2012, meaning that EU compliance with the Kyoto targets will be largely determined by the performance of non-ETS sectors, i.e. those sectors for which data are only available on a t–2 timeline. An early estimate of the previous year's emissions can therefore improve tracking and analysis of progress towards Kyoto targets, as is done in the annual EEA report on greenhouse gas emission trends and projections in Europe. Member States seeking to determine whether they need to use Kyoto's flexible mechanisms to achieve their targets also benefit from access to early data.

In addition, the EU's 2009 Climate and Energy Package encourages trading and non-trading sectors to run on similar timelines. The Package represents the EU's initial response to limiting the global average temperature increase to no more than 2 °C above pre-industrial levels. To achieve this, Member States agreed to reduce total EU GHG emissions by 20 % compared to 1990 by 2020 (– 21 % and – 10 % for ETS and non-ETS sectors, respectively, compared to 2005). As with Kyoto, meeting the 2020 national targets will largely be determined by how countries reduce emissions in the non-trading sectors. Early GHG estimates can therefore help track progress towards the EU and national targets for 2020.

Finally, the Beyond GDP process (EU, 2011) likewise encourages authorities to generate environmental information in as timely a manner as socio-economic information.

Previous early GHG emission estimates for 2008 and 2009

At the end of August 2009 the EEA published its first early estimates of total greenhouse gas emissions in the preceding year (EEA, 2009). The actual reduction in greenhouse gas emissions in 2008, as officially reported to the UNFCCC in 2010, was within the confidence interval of the EEA's mean early estimates for the EU-15 and the EU-27.

In 2010, the EEA published its early emission estimates for 2009 — a year that witnessed the deepest economic recession since governments began reporting official GHG emission inventories to the UNFCCC (EEA, 2010). Again, the EEA's early estimates for EU-15 and EU-27 were accurate, with subsequent official UNFCCC emissions falling within the expected range of uncertainty. The main factors explaining the strong reduction in emissions in 2009 were further analysed in the 2011 EU GHG inventory submitted to the UNFCCC (EEA, 2011d).

Methodology for early GHG emission estimates

The present report sets out the estimated GHG emissions for 2010 for the EU Member States, the EU-15 and the EU-27 based on data sources that were published by mid-July of 2011. The estimates cover total GHG emissions as reported under the Kyoto Protocol and the UNFCCC excluding the land use, land-use change and forestry (LULUCF) sector.

Estimations are made for all major source categories in all sectors. For the most important source categories, data sources with updated activity or emission data for the year t–1 were identified and used to calculate emissions. For source categories for which no international datasets with updated activity data exist or which are too complex for such an approach, emissions were extrapolated from past trends (linear extrapolation) or emissions from the previous year were kept constant if historic data did not show a clear trend. On this basis, a detailed bottom-up approach was developed covering the full scope of emissions included in a GHG inventory submission.

The EEA estimates are based on publicly available datasets at the national, European and international levels, disaggregated by major source categories in all sectors reported under the UNFCCC and the Kyoto Protocol. Some countries publish their own early greenhouse gas estimates (Austria, Denmark, Germany, Italy, Luxembourg, the Netherlands, Poland, Spain, the United Kingdom, Norway and Switzerland). Where relevant, the EEA used these estimates to assess current progress in relation to greenhouse gas emission targets better and to verify its own calculations.

Early GHG emission estimates for 2010

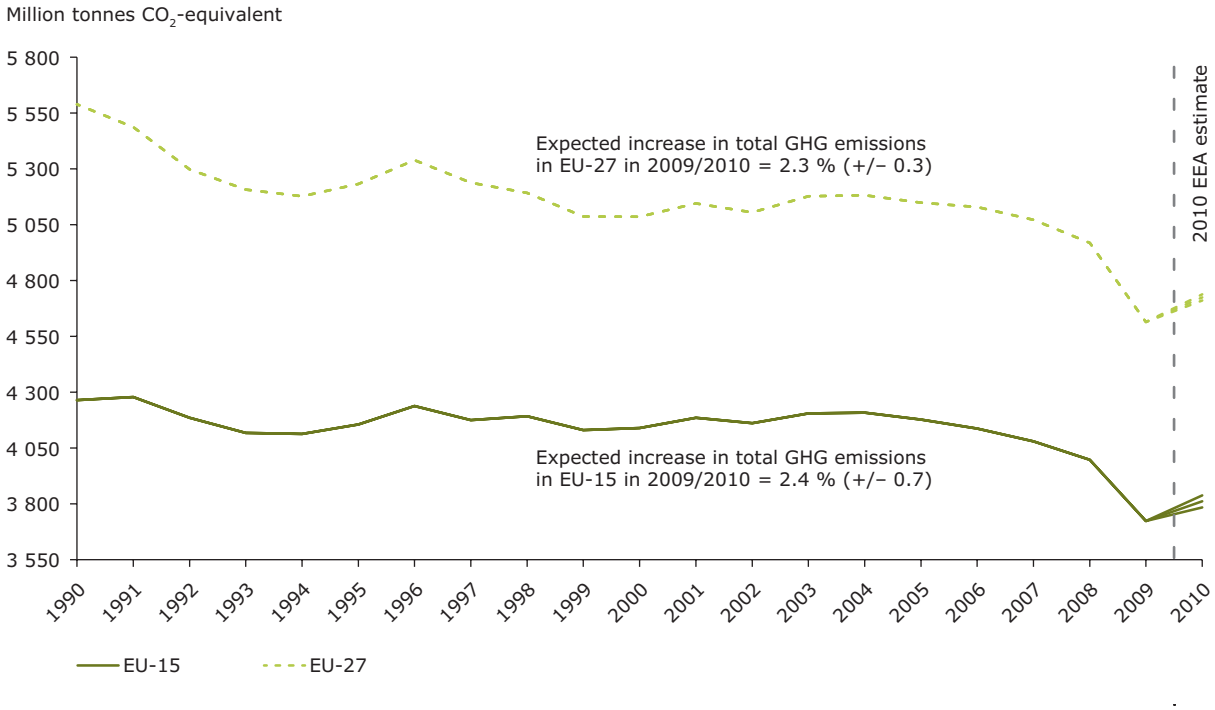
Compared to 2009, estimated 2010 GHG emissions increased by 2.3 % (+/– 0.7) in the EU-15 and by 2.4 % (+/– 0.3) in the EU-27. This implies that EU-15 greenhouse gas emissions were approximately 10.6 % below the 1990 level in 2010 ([1]) or 10.7 % below the base year level (EEA, 2011d). EU-27 emissions were 15.5 % below the 1990 level ([2]) .

Figure ES.1 shows the emission trend for total GHG emissions without LULUCF in the period

([1]) Under the Kyoto Protocol, the EU-15 has a common commitment to reduce emissions on average by 8 % between 2008 and 2012 compared to emissions in the 'base year'. The base-year emissions for the EU-15 have been fixed to 4 265.5 million tonnes CO_2-equivalents (UNFCCC, 2011).

([2]) Unlike the EU-15, the EU-27 does not have a common target under the Kyoto Protocol and therefore the EU-27 does not have an applicable base-year against which to compare emission changes. Emission changes compared to 1990 are applicable to the EU-27 as it has made a unilateral commitment to achieve at least a 20 % reduction of greenhouse gas emissions by 2020 compared to 1990.

Figure ES.1 Trends in total greenhouse gas emissions excluding LULUCF in the EU-15 and the EU-27



Source: EEA European Topic Centre for Air Pollution and Climate Change Mitigation (ETC/ACM), based on the 2011 EU greenhouse gas inventory submitted to the UNFCCC for the years 1990–2009 and early estimates for 2010.

1990–2010 ([3]). The emission increase in 2010 was partly due to recovery from economic recession in many European countries, which had caused substantial emission reductions in 2008 and 2009 in all Member States. In 2010 the winter was also colder than in the previous year, in particular in northern, central and eastern European countries, leading to increased demand for heating and higher emissions from the residential and commercial sectors.

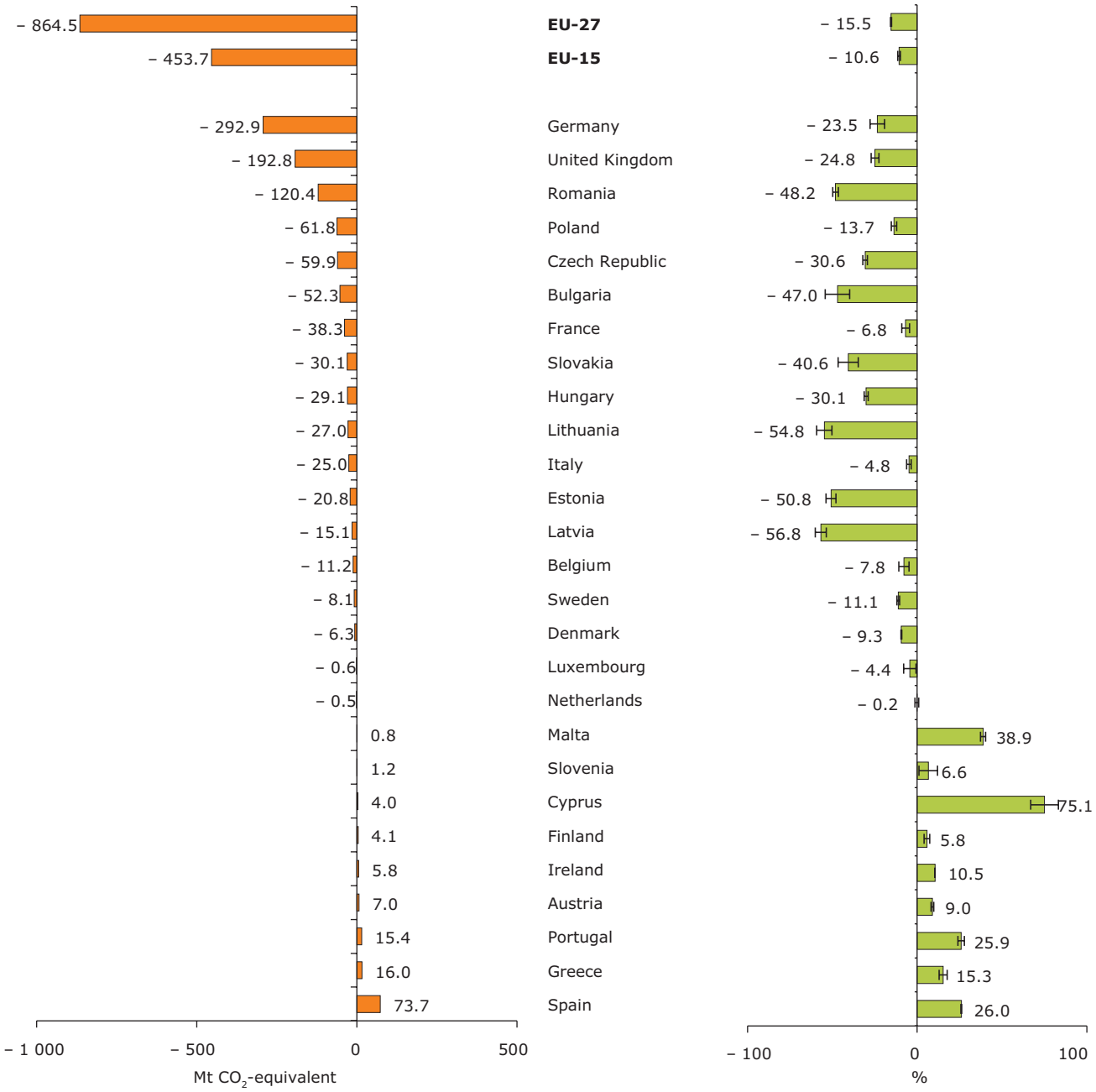
Change in GHG emissions in the period 1990–2010

Figure ES.2 presents the estimated change in GHG emissions for each Member State between 1990 and 2010 ([4]). Leaving aside the 2009 economic recession, a wide range of factors and policies (climatic and non-climatic) have contributed to the long-term decline in GHG emissions in the EU, particularly for CO_2. These include improvements in energy efficiency, the shift to less carbon-intensive fossil fuels and the strong increase in renewable energy use. Implementation of the EU's Climate and Energy Package should lead to further reductions in emissions. The direct effects of the Montreal Protocol in reducing emissions of ozone-depleting substances have also indirectly contributed to significant reductions in emissions of some potent greenhouse gases such as CFCs. Other EU policies such as the Nitrates Directive, the Common Agriculture Policy (CAP) and the Landfill Waste Directive have also been successful in indirectly reducing greenhouse gas emissions from non-CO_2 gases such as methane and nitrous oxides.

([3]) This is not equivalent to the difference to base year emissions because of accounting rules such as the selection of the base year for F-gases and the continuing recalculations of GHG inventories.

([4]) The percentage change cannot be directly compared to the emission reduction obligations under the Kyoto Protocol and the Effort Sharing Decision because Member State net balances under the EU Emission Trading Scheme (ETS) need to be taken into account and the fixed base-year emissions are not identical to the latest recalculation of 1990 emissions. Furthermore, Member State use of flexible mechanisms and LULUCF activities also contribute to compliance with the Kyoto targets.

Figure ES.2 Change in total GHG emissions (without LULUCF) in the EU and its Member States, 1990–2010



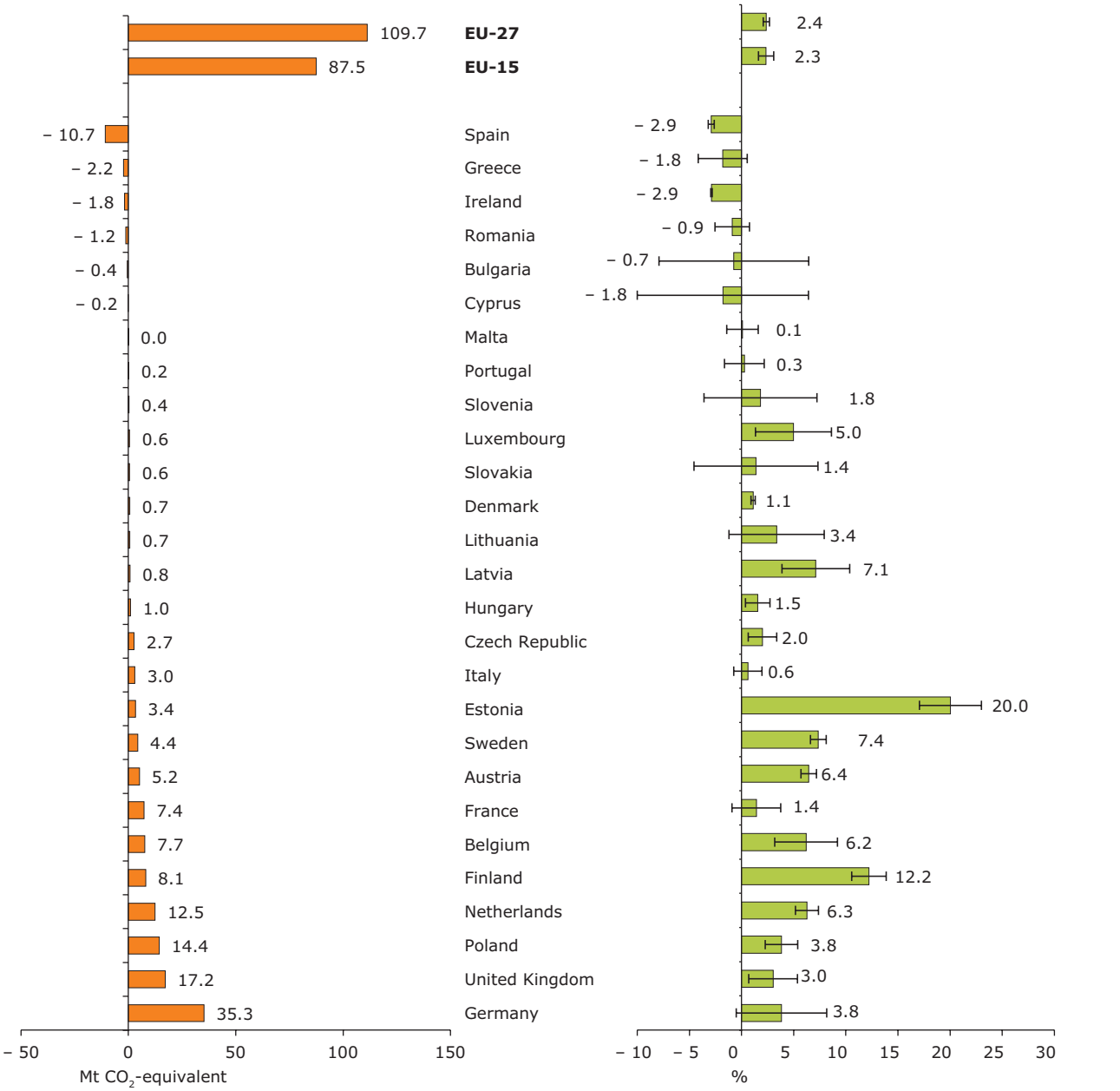
Note: Error bars are derived by doubling the deviations between the EEA's GHG inventory estimates for 2009 and the official 2009 inventory submissions for Member States and the EU on either side of the mean estimate.

Source: EEA ETC/ACM, based on the 2011 EU greenhouse gas inventory submitted to the UNFCCC for the years 1990–2009 and early estimates for 2010.

Change in GHG emissions in the period 2009–2010

The 2010 data partly reflect differences between the Member States in terms of their recovery from the economic recession. As Figure ES.3 illustrates, GHG emissions decreased in Spain, Greece and Ireland, partly due to the economic recession. The largest absolute growth in emissions occurred in Germany and in the United Kingdom. Estonia experienced the largest relative emission increase.

Figure ES.3 Changes in total GHG emissions without LULUCF for the EU and its Member States, 2009–2010



Note: Two Member States — Denmark and the United Kingdom —submitted inventories to the UNFCCC that differ from those submitted pursuant to the EU's Monitoring Mechanism Decision (EC, 2004). This is because Kyoto inventories include non-EU territories. The comparison in this table refers to the EU GHG inventory submitted pursuant to the Monitoring Mechanism Decision.

Error bars are derived by doubling the deviations between the EEA's early GHG inventory estimates for 2009 and the official 2009 inventory submissions for Member States and the EU on either side of the mean estimate.

Source: EEA ETC/ACM, based on the 2011 EU greenhouse gas inventory submitted to the UNFCCC for the years 1990–2009 and early estimates for 2010.

Nine Member States have estimated and published their own early GHG emissions for 2010, which differ from the EEA data presented in Figure ES.3. Austria, Germany, Italy, Luxembourg, the Netherlands and Poland have estimated complete emissions in the form of CRF summary Table 2, similar to the approach in this report. Denmark, Spain and the United Kingdom have provided national-total emission estimates for 2010 but not for all the disaggregated subcategories of CRF summary Table 2. According to the country estimates, the expected change in GHG emissions in 2010 compared to 2009 is as follows: Austria (+ 5.4 %), Denmark (+ 0.7 %), Germany (+ 4.4 %), Italy (+ 0.5 %), Luxembourg (+ 4.6 %), the Netherlands (+ 5.9 %), Poland (+4.4 %), Spain (– 3.7 %) and the United Kingdom (+ 3.2 %).

The list below provides links to the early GHG estimates for 2010 that individual EEA member countries have published.

Germany

http://www.umweltbundesamt.de/uba-info-presse/2011/pd11-020_treibhausgase_deutlich_unter_dem_limit.htm
http://www.umweltbundesamt.de/uba-info-presse/2011/pdf/pd11-020_anhangthg_ab_1990.pdf
http://www.umweltbundesamt.de/uba-info-presse/2011/pdf/pd11-020_anhang_emissionsquellen.pdf

Finland (only CO_2 from energy)

http://www.stat.fi/til/ehkh/2010/04/ehkh_2010_04_2011-03-29_tie_001_en.html

France (only mainland France without overseas departments)

http://www.citepa.org/emissions/nationale/Ges/Emissions_FRmt_GES.pdf

The Netherlands

http://www.cbs.nl/nl-NL/menu/themas/natuur-milieu/publicaties/artikelen/archief/2011/2011-3453-wm.htm

Norway

http://www.ssb.no/english/subjects/01/04/10/klimagassn_en/

Switzerland

http://www.bafu.admin.ch/dokumentation/medieninformation/00962/index.html?lang=de&msg-id=40367

Spain

http://www.marm.es/es/calidad-y-evaluacion-ambiental/temas/sistema-espanol-de-inventario-sei-/Avance_Inventario_Emisiones_GEI_2010__tcm7-162704.pdf

The United Kingdom

http://www.decc.gov.uk/en/content/cms/statistics/climate_stats/gg_emissions/uk_emissions/2010_prov/2010_prov.aspx.

In terms of sectors, the largest absolute emission increase in the period 2009–2010 occurred in the energy sector, which recorded a growth of 77.3 Mt CO_2-equivalent for the EU-15 and 95.5 Mt CO_2-equivalent for the EU-27 — equivalent to a 2.6 % increase in emissions in each. This growth in energy sector emissions reflects the increase in gross inland energy consumption of fossil fuels in the EU-27 in 2010. EU-27 natural gas use increased by about 7.4 % in 2010 compared to 2009, rising in almost all Member States. Oil consumption showed a small decrease relative to 2009 in the EU-27 (– 1.2 %) and a more pronounced decline in the EU-15. The trend in solid fuel consumption between 2009 and 2010 varied considerably among Member States, with solid fuel use increasing by 3.8 % for EU-27 as a whole (BP, 2011).

In addition to the fossil fuel trend, EU-27 use of nuclear power and renewables increased in 2010. The use of renewable energy increased by 8.8 % (IEA/OECD, 2011a) whereas the use of nuclear power increased by 3.4 % (Eurostat, 2011) in the EU27. Energy prices rose in 2010 by 4.5 % compared to 2009, almost reaching the same level as in 2008. However, gas prices in Europe decreased by 6.1 % (notwithstanding varying trends in individual Member States), while the oil price increased by 11.5 % and the coal price rose by 9.5 %, which also explains the higher growth of gas consumption compared to other fuels (IEA/OECD, 2011b).

In Europe as a whole, the winter in 2010 was colder than the preceding year, while summer 2010 was warmer (EEA, 2011e), leading to a higher demand for heating and cooling. Cooling degree days ([5])

([5]) Cooling degree days are defined as follows: the higher the outdoor temperature, the higher the number of cooling degrees days. On those days, when the daily average outdoor temperature is higher than 21°C, cooling degrees days values are in the range of positive numbers, otherwise they equal zero.

in several Member States in the third quarter of 2010 were higher than in the same period in 2009, especially in France, Greece, Hungary, Italy, Portugal, Romania and Spain (EC, 2011).

The second largest absolute increase in emissions occurred in the industrial processes sector with growth of 17.6 Mt CO_2-equivalent for the EU-15 (7.0 %) and 24.1 Mt CO_2-equivalent for the EU-27 (7.5 %). This rise in industrial emissions reflects increased emissions in cement production and the iron and steel industry, whereas the chemical industry recorded a slight decrease. Verified emissions from industrial installations (excluding combustion) covered under the ETS (activity codes 2–8) increased by 6 % for the EU-15 and by 5 % for the EU-27 during 2009 and 2010. The increase was particularly strong in the pig iron or steel sector, which recorded 22.1 % growth in the EU-15 and a 19 % increase in the EU-27 (EEA, 2011c). Economic recovery in many European countries led to significant increases in industrial output and emissions.

In the agricultural sector GHG emissions decreased by 4.9 Mt CO_2-equivalent or 1.3 % in the EU-15 and by 7.3 Mt CO_2-equivalent or 1.5 % in the EU-27. The enteric fermentation and agricultural soils sub-sectors recorded particularly large reductions. Based on data derived from Eurostat, Italy and France showed a slight decrease in the number of cattle, while in Romania cattle, swine and sheep numbers declined significantly. A lower number of cattle results in less manure applied to soils and thus lower emissions of N_2O from soils. In addition, as the annual consumption of synthetic fertiliser — and thus N_2O emissions from the N input to soils — is estimated based on crop areas and the fertiliser application rate, a decrease in total utilised agricultural area leads to a reduction in emissions.

Greenhouse gas emissions from the waste sector are estimated to have fallen by 2.3 % in the EU-15 in 2010 and by 1.8 % in the EU-27. Emissions mainly occur in the solid waste disposal on land sub-sector, where CH_4 emissions are largely determined by the amount of biodegradable waste going to landfills. Emission reductions in recent years are partly due to the (early) implementation of the Landfill Directive (EC, 1999) and similar legislation in the Member States. The Landfill Directive requires the Member States to reduce the amount of biodegradable waste that goes untreated to landfills and to install landfill gas recovery at all new sites. Linear extrapolation of the trend of previous years therefore implied a continued fall in GHG emissions from waste.

Uncertainty in early GHG emissions estimates

There is always a degree of uncertainty in estimating greenhouse gas emissions. Uncertainty increases if there is a lack of up-to-date activity data for some source categories, or there are changes in implied emission factors or in the methodologies used by Member States.

The early 2010 estimates are based on the national methodologies and emission factors used by Member States in their 2011 official submissions to the UNFCCC. Current quality improvements in Member State inventories due to take effect in next year's official submissions to the UNFCCC are therefore a source of uncertainty for the proxy inventory.

The uncertainty ranges presented for the early 2010 estimates are derived from comparing the official national data submitted to the UNFCCC for 2009 to the EEA early estimates for that year. However, by assessing the early greenhouse gas estimates that several Member States have produced for 2010 (Austria, Denmark, Germany, Italy, Luxembourg, the Netherlands, Poland, Spain and the United Kingdom), the EEA was able to verify the most suitable methodology for calculating emissions (see also Section 4.1.1), resulting in a reduced uncertainty range.

Official 2010 greenhouse gas emissions for the EU will be available in end-May or early-June 2012, when the EEA publishes the EU greenhouse gas inventory 1990–2010 and inventory report 2012 for submission to the UNFCCC.

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