EU greenhouse gas inventory

Trends and drivers in greenhouse gas emissions in the EU in 2016

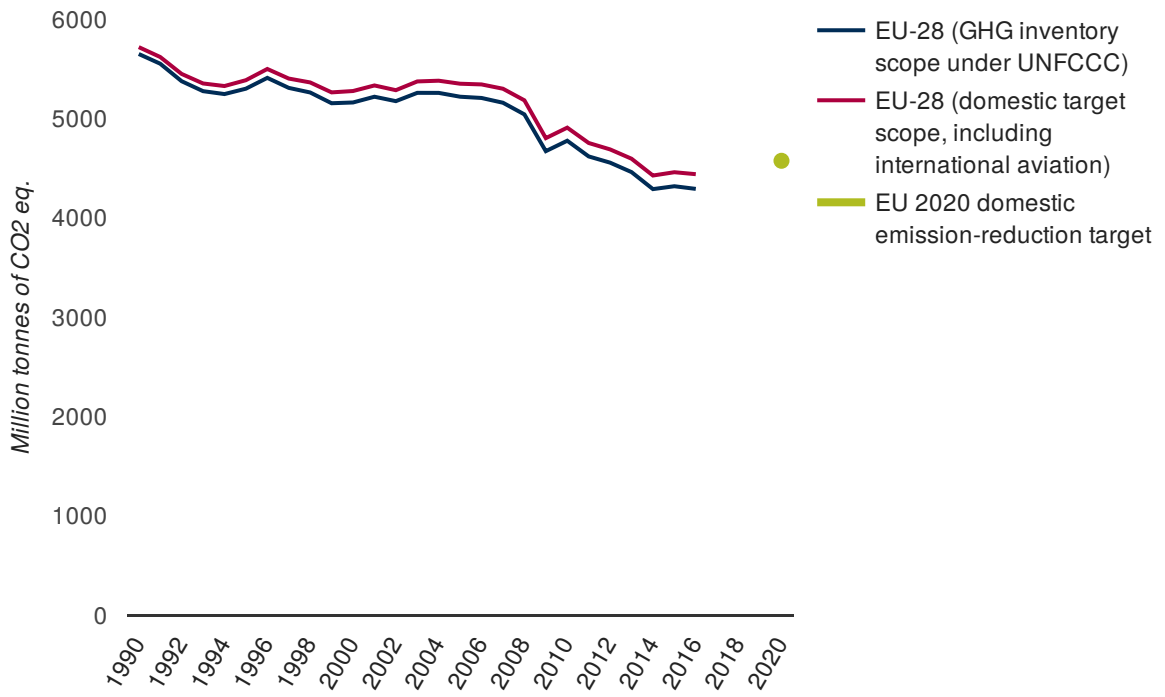
Official data for 2016 confirm the long-term reduction in greenhouse gas emissions across Europe. This briefing describes the key trends in EU greenhouse gas (GHG) emissions, based on national submissions under the United Nations Framework Convention on Climate Change (UNFCCC). It also includes an analysis of the main drivers underpinning these trends.

- EU GHG emissions decreased by 0.4 % in 2016 compared with 2015 (and by 0.6 % if emissions from international aviation are excluded). This decrease was mainly due to a reduction in coal used to produce heat and electricity. However, increases in emissions were observed in road transportation (for the third year in a row) and in the residential sector.
- Between 1990 and 2016, the EU reduced its net GHG emissions by 22.4 % (and by 24 % if emissions from international aviation are excluded). This decrease occurred as a combined result of policies (e.g. more renewables and improved energy efficiency, and less use of coal compared with other fossil fuels), economic factors (e.g. recession and a more service-oriented economy) and climatic conditions (e.g. overall milder winters).
- These drivers have made the EU's economy less intensive and more efficient in its energy production and energy use, as well as less intensive in terms of carbon dioxide emissions. These factors will continue to play a key role in the future, but further efforts will be needed to ensure the EU achieves its 40 % reduction target by 2030.

Lower GHG emissions in 2016 as the heat and power sector used less coal, although road transport emissions continue to increase

In 2016, total GHG emissions — excluding land use, land use change and forestry (LULUCF) — decreased by 19.7 million tonnes to 4 441 million tonnes of CO_2 equivalent (Mt CO_2e). This was equivalent to a 0.4 % reduction compared with 2015 (0.6 % excluding international aviation) and a 22.4 % reduction compared with 1990 (24 % excluding international aviation) (Figure 1). The small decrease in emissions in 2016 occurred while the EU's gross domestic product (GDP) increased by 2.0 %.

Figure 1: Total GHG emissions, 1990-2016

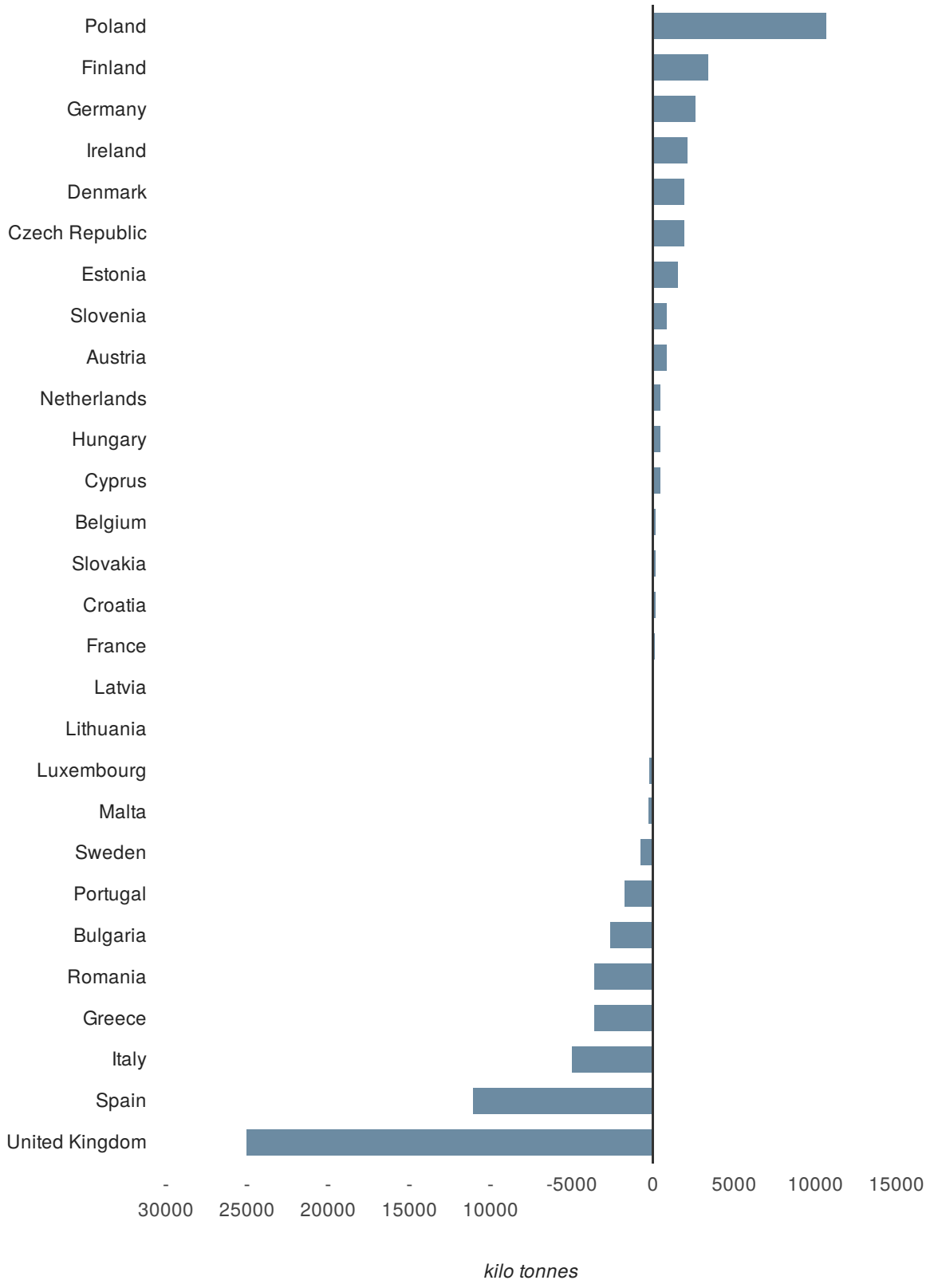


Note:
Total GHG emissions in this figure exclude emissions from land use, land-use change and forestry (LULUCF) and include emissions from indirect CO_2.

Data sources: EEA. National emissions reported to the UNFCCC and to the EU Greenhouse Gas Monitoring Mechanism

The United Kingdom and Spain accounted for the largest decreases in GHG emissions in absolute terms in the EU in 2016. Reductions in these countries were largely because of lower consumption of solid fuels in the power sector. On the other hand, there was a relatively large increase in emissions in Poland, particularly in the road transport sector (figure 2).

Figure 2: Change in total GHG emissions by EU Member State, 2015-2016



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Data sources: EEA. National emissions reported to the UNFCCC and to the EU Greenhouse Gas Monitoring Mechanism

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Note: Total GHG emissions shown in this figure exclude emissions from LULUCF and international aviation, and include emissions from indirect CO_2. For the EU, the equivalent reduction in GHG emissions was 26.7 million tonnes in 2016.
Source: EEA

Emissions covered by the EU emissions trading system (ETS) decreased in 2016, in particular for the energy supply sector (mostly electricity and heat production) and the industry sector (mostly iron and steel). The decrease in the power sector was the result of a sharp decline in coal consumption. Based on Eurostat data, there was a decline in nuclear electricity generation. This was more than offset by the increase in the use of renewable energy sources for the same purpose.

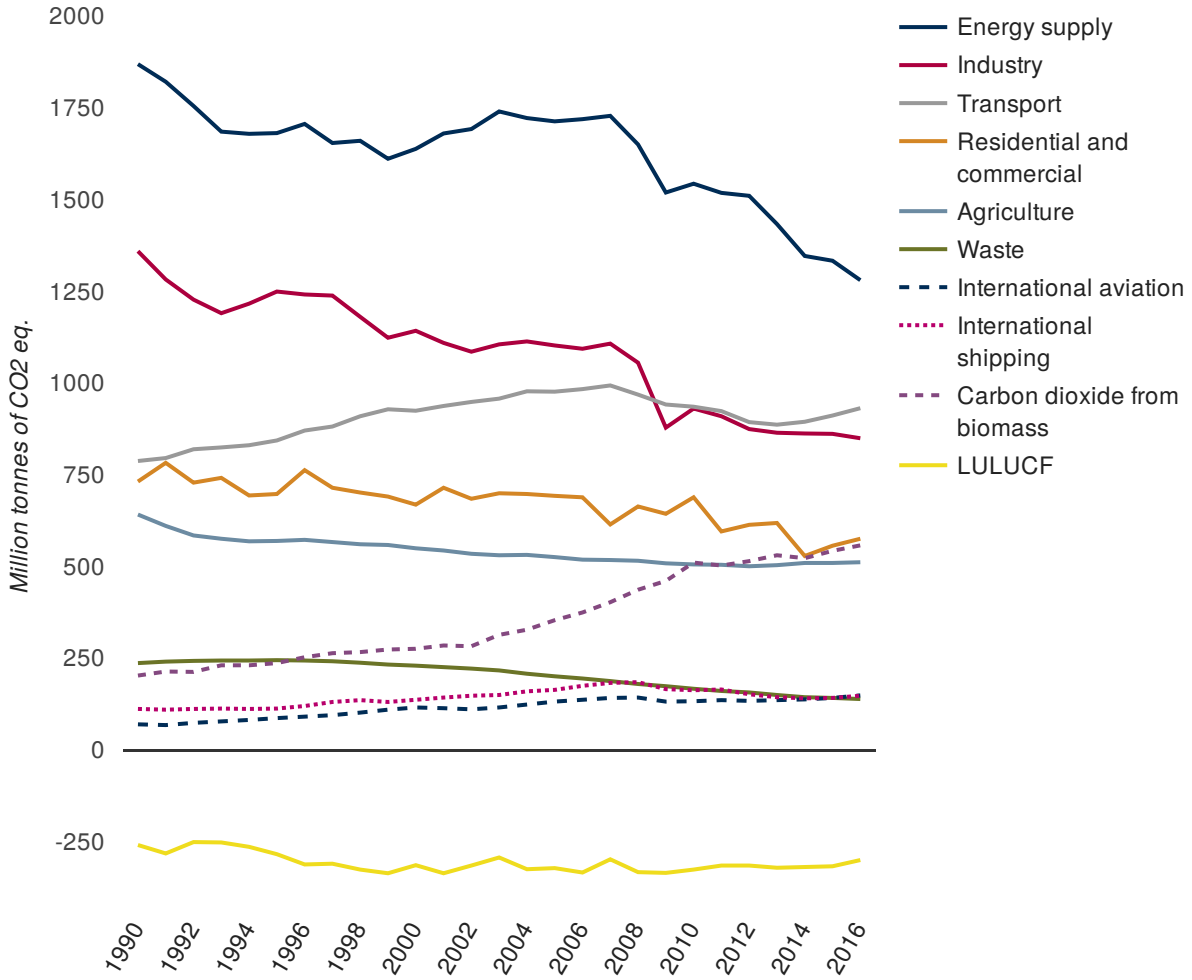
These emission cuts in the EU ETS sectors were partly offset by emission increases in sectors not covered by the ETS:

- road transport GHG emissions increased for the third year in a row, confirming the upward trend in emissions that started in 2014. This increase in road transport emissions can be attributed mainly to the use of more diesel in passenger cars, and heavy- and light-duty vehicles;
- emissions in the residential and commercial sectors increased because of a greater heat consumption during the colder winter conditions in 2016 compared to 2015. There was in particular a large increase in the use of natural gas in the residential sector.

Overall, these developments mean that in 2016, the EU continued to decouple its GHG from gross domestic product (GDP), improved the energy intensity of its economy and reduced the carbon intensity of its energy system compared with 2015.

Although the 2016 developments are positive, there are indications that GHG emissions increased in 2017 (e.g. higher verified emissions under the ETS and the CO_2 early estimates by Eurostat). The consolidated results for GHG emissions in 2017 will be published by the EEA during the autumn, as part of the Approximated EU greenhouse gas inventory.

Figure 3: GHG emissions by sector in the EU-28



Data sources: EEA. National emissions reported to the UNFCCC and to the EU Greenhouse Gas Monitoring Mechanism

Note: The sectoral aggregations are:

- Energy supply: CRF 1A1 (energy industries) + 1B (fugitives);
- Industry: CRF 1A2 (manufacturing industries and construction) + CRF 2 (industrial processes);
- Transport: CRF 1.A.3;
- Residential and commercial: CRF 1A4a (commercial) + CRF 1A4b (residential);
- Agriculture: CRF 1A4c (agriculture, forestry and fishing) + CRF 3 (agriculture);
- Waste: CRF 5 (waste);
- LULUCF: CRF 4 (LULUCF);

International aviation, international shipping and CO_2 biomass are Memorandum items not included in national GHG totals.

Source: EEA

EU reduces GHG emissions by 22.4 % in 26 years due to a combination of policies, and other economic and climatic factors

Total GHG emissions in the EU (excluding LULUCF) decreased by 1 279 Mt CO_2e in 2016, representing a reduction of 22.4 % compared with 1990. The reduction amounts to 24 % (1 358 Mt CO2e) if emissions from international aviation are excluded.

The reduction in greenhouse gas emissions over these 26 years can be explained by a variety of factors, including:

- the effects of a number of policies (both EU and country-specific), including key agricultural and environmental policies in the 1990s, and climate and energy policies in the 2000s. These include, among others:
  - the growing use of energy from renewable sources, in particular the sharp increase in the use of biomass for energy purposes;
  - the use of less carbon-intensive fossil fuels (e.g. switch from coal to gas);
  - improvements in energy efficiency;
- structural changes in the economy, with a higher share of services and a lower share of more energy-intensive industry in total GDP;
- the effects of economic recession;
- the milder winters experienced in Europe on average since 1990, which has reduced the demand for energy to heat households.

GHG emissions decreased in the majority of sectors between 1990 and 2016, with the notable exception of domestic and international transport (Figure 3). Emissions of hydrofluorocarbons (HFCs) used for refrigeration also increased over the 26-year period. The largest emission reductions were related to energy use in sectors such as manufacturing industries and construction, electricity and heat production, and residential combustion. The largest decrease in emissions in relative terms occurred in waste management, through reduced and better controlled landfilling.

Almost all EU Member States reduced their emissions and thus contributed to the overall positive EU performance, with the United Kingdom and Germany accounting for almost half of the total net reduction in the EU over the past 26 years.

Further improvements needed in both energy efficiency and carbon intensity to reach the 2030 targets

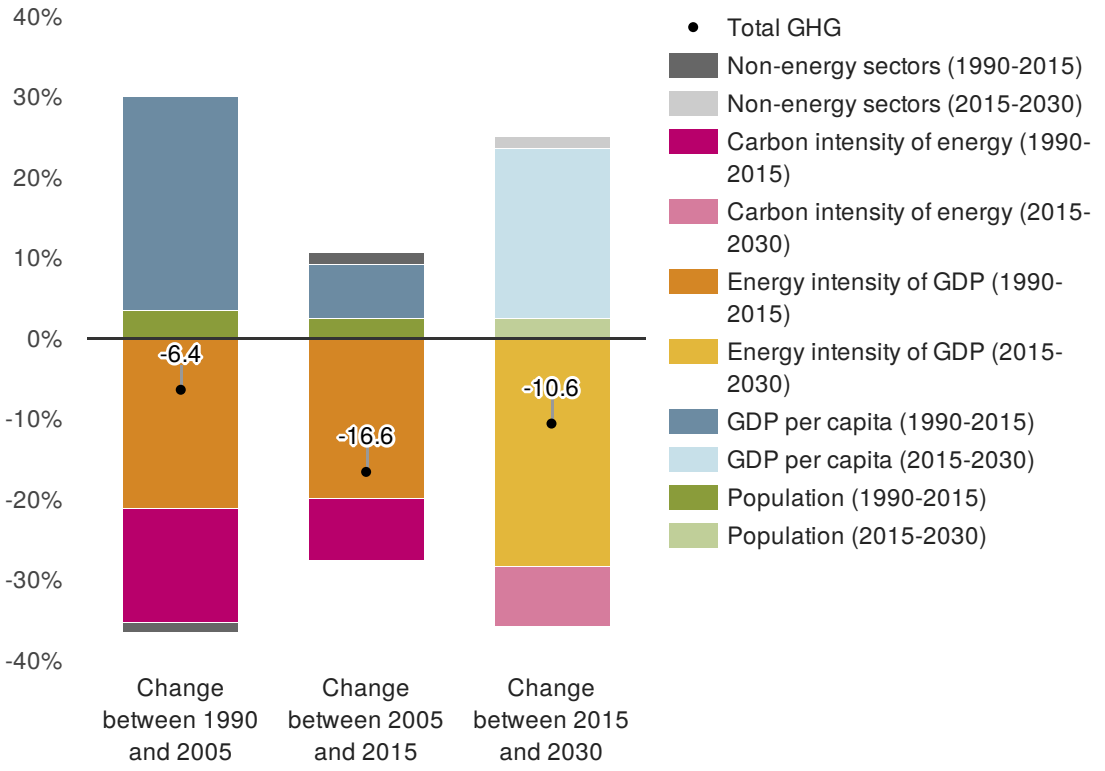
Figure 4 shows a comparison of key drivers underpinning GHG emissions in three different periods (1990-2005, 2005-2015 and 2015-2030), based on information reported by EU Member States.

Overall, the four main findings are:

- Emissions decreased and are expected to decrease further as GDP increases. This confirms that GHG emissions can decrease alongside an increase in GDP and that attempts to mitigate climate change do not necessarily conflict with a growing economy. GDP over the 2015-2030 period is projected to grow significantly faster than during the 2005-2015 period. Projections by Member States suggest a continued decoupling of GHG emissions alongside higher economic growth.
- The lower carbon intensity of energy (i.e. fewer emissions to produce and use energy) was, and is expected to remain an important factor underpinning lower emissions in the future. Both an increase in renewable energy sources and a less carbon intensive fossil fuel mix, with more gas, less coal and a lower consumption of oil, are expected to drive emission reductions in the future.
- The decrease in primary energy intensity was the largest contributing factor to lower CO_2 emissions from fossil fuel combustion in the past. It is expected to remain a key factor in the transition to a low carbon economy. This means continued improvements in energy efficiency, both in transformation and end-use.
- The largest emission reductions will continue to occur in the energy sector, although all sectors are expected to contribute, including industrial processes, waste management and agriculture.

Thus, the same factors driving emission reductions in the past are also expected to play a key role in the future, although to a different degree. For the EU as whole, the provisional overall estimates for GHG emission reductions by 2030 (with existing policies and measures), as reported by Member States, are consistent with a 30 % reduction compared with 1990 (excluding LULUCF, including international aviation). Whereas the EU is on track to achieve its 20 % GHG reduction target by 2020, more efforts to reduce GHG emissions will be needed to achieve its reduction target of at least 40 % by 2030. These results suggest that efforts should, together with lower energy intensity and higher efficiency, concentrate on further improving the carbon intensity of energy production and consumption. There is also room to increase emission reduction efforts in non-energy sectors.

Figure 4: Decomposition analysis of key historic and projected emission drivers in the EU, 1990-2030



Data sources: EEA. National emissions reported to the UNFCCC and to the EU Greenhouse Gas Monitoring Mechanism

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Note: The decomposition analysis is based on the logarithmic mean Divisia index (LMDI). The bar segments show the changes associated with each factor alone, holding the other respective factors constant. Projections at EU level have been aggregated based on Member States' submissions under EU reporting requirements. GHG emission projections in this figure refer to those in the 'with existing measures' scenario. The EU Reference Scenario 2016 from the European Commission (based on the PRIMES and GAINS models) was used to gap-fill incomplete reporting for specific Member States' variables.

Source: EEA

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