This article is about emissions of greenhouse gases (GHG emissions) classified by technical processes. These are recorded in GHG emission inventories submitted to the United Nations Framework Convention on Climate Change (UNFCCC) and form the official data for international climate policies.

In addition, Eurostat disseminates GHG emissions classified by emitting economic activities. Those are recorded in air emissions accounts (AEA). Furthermore, Eurostat estimates and disseminates so-called 'footprints' which are GHG emissions classified by products that are finally demanded by households or government, or that are invested in or exported.

Trends in greenhouse gas emissions

This article presents trends in emissions of all greenhouse gases, namely: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF6) and sodium trifluoride (NF3). In line with the EU international headline target of 20% reduction of GHG emissions by 2020, data presented in this article include emissions from international aviation and exclude emissions or removals from land use, land use change and forestry (LULUCF).

The driving forces behind GHG (e.g. increased energy use, etc.) are not discussed here, nor are the impacts of climate change on human activities. For an analysis of the driving forces behind emissions, based on Eurostat statistics, see the article Climate change - driving forces.

In 2018, greenhouse gas emissions in the EU-27 were down by 21% compared with 1990 levels, representing an absolute reduction of 1 018 million tonnes of CO2-equivalents, putting the EU on track to surpass its 2020 target, which is to reduce GHG emissions by 20% by 2020 and by 40% by 2030 compared with 1990.
Figure 1: Total greenhouse gas emissions (including international aviation, excluding LULUCF) trend, EU-27, 1990–2018 (Index 1990 = 100) Source: Eurostat (env_air_gge), European Environment Agency

Figure 1 shows that there was a general downward trend to emissions during the 1990–1999 period (aside from a relative peak in 1996, when a cold winter led to an increase in heating requirements). From 1999 to 2008 the evolution of greenhouse gas emissions within the EU-27 remained relatively unchanged. The year 2009 saw a sharp drop in emissions as a consequence of the global financial and economic crisis and the resulting reduced industrial activity. Emissions increased in 2010 and decreased again from 2011 onward. Between 2015 and 2017, GHG emissions had slightly been increasing. In 2018 emissions decreased by 2.1% (83.6 million tonnes of CO2-equivalents) compared to 2017 levels.

Across EU Member States in 2018, greenhouse gas emissions were the highest in Germany (23% of the EU-27 total or 889 million tonnes of CO2-equivalents), followed by France and Italy. The biggest decreases compared with 1990 were reported for Lithuania (−57%), Latvia (−54%) and Romania (−53%). On the other side of the spectrum, the biggest increases compared with 1990 were reported for Cyprus (+54%), Spain (+20%) and Portugal (+19%). (See Table 1 and Figure 2).
Table 1: Total greenhouse gas emissions (including international aviation, excluding LULUCF), by country, 1990–2018 (million tonnes of CO2-equivalents) Source: Eurostat (env_air_gge), European Environment Agency

Figure 2: Total greenhouse gas emissions (including international aviation, excluding LULUCF), by country, 2018 (Index 1990 = 100) Source: Eurostat (env_air_gge), European Environment Agency

Figure 3 shows the EU-27 greenhouse gas emissions broken down by main source sectors. 'Fuel combustion and fugitive emissions from fuels (without transport)' was responsible for 53 % of EU-27 greenhouse gas emissions in 2018. In 1990 this source sector was even more dominant at 62 %. Fuel combustion for transport (including international aviation) was the second largest source sector with 25 % in 2018; it has increased its contribution significantly since 1990 (15 %). Greenhouse gas emissions from agriculture contributed with 10 % to EU-27 total greenhouse gas emissions. Industrial processes and product use contributed another 9 %. Management of waste contributed with 3 %.
Each greenhouse gas has a different capacity to cause global warming, depending on its radiative properties, molecular weight and the length of time it remains in the atmosphere. The global warming potential (GWP) of each gas is defined in relation to a given weight of carbon dioxide for a set time period (for the purpose of the Kyoto Protocol a period of 100 years). GWPs are used to convert emissions of greenhouse gases to a relative measure (known as carbon dioxide equivalents: CO2-equivalents). The weighting factors currently used are the following: carbon dioxide = 1, methane = 25, nitrous oxide = 298, and sulphur hexafluoride = 22 800; hydrofluorocarbons and perfluorocarbons comprise a large number of different gases that have different GWPs.

The European Environment Agency (EEA) compiles an annual greenhouse gas inventory report on behalf of the EU. Estimates of greenhouse gas emissions are produced for a number of sources which are delineated in sectors primarily according to the technological source of emissions, as devised by the Intergovernmental Panel on Climate Change (IPCC). The five main emission source sectors include:

- energy (fuel combustion and fugitive emissions from fuels) — which also includes transport;
- industrial processes and product use;
- agriculture;
- land use, land use change and forestry (LULUCF); and
- waste management.

Three perspectives of greenhouse gas emission statistics

Eurostat presents three perspectives of greenhouse gas (GHG) emissions statistics:

**Emissions accounts versus emission inventories**

The main differences between air emissions accounts (AEA) and GHG emission inventories are:

Note: National and EU totals differ between the two approaches, as different boundaries apply. GHG inventories include international aviation and maritime transport (international bunker fuels) as memorandum items, which means that they are excluded from national totals reported. However, they are included in air

Figure 3: Greenhouse gas emissions, by source sector, EU-27, 1990 and 2018 (percentage of total)
Source: Eurostat (env_air_gge), European Environment Agency

Source data for tables and graphs

- GHG statistics: tables and figures 2020

Data sources

Data in this article is based on the data reported in annual greenhouse gas inventories from the European Union (EU) to the United Nations under the United Nations Framework Convention on Climate Change (UNFCCC). Under the inventories, international aviation is reported as a memo item, while LULUCF is one of the six inventory sectors (see below). For a further understanding of the EU targets and commitments, see Context.
1. GHG emissions classified by economic activities
   - **Purpose**: Tailored for integrated environmental-economic analyses
   - **Related data set**: env_air_aa
   - **Related SE article**: link

2. GHG emissions classified by technical processes
   - **Purpose**: Official international reporting framework for international climate policies (UNFCCC, EU MMR)
   - **Related data set**: env_air_gge
   - **Related SE article**: this article

3. 'Footprints' = GHG emissions classified by final use of products
   - **Purpose**: One particular analytical application of AEA
   - **Related data set**: env_ac_iotu
   - **Related SE article**: link

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Emissions accounts totals. Therefore, total emissions reported in GHG inventory databases can differ significantly from the total reported in air emissions accounts for countries with a large international aircraft and/or shipping fleet. AEA reconciles totals with emission inventories through so-called 'bridging items'.

**Context**

The EU is fighting climate change through ambitious policies at home and close cooperation with international partners. The EU has set itself targets for reducing its greenhouse gas emissions progressively. The EU is on track to meet the 20% emissions reduction target for 2020. By 2050, Europe aims to become the world’s first climate-neutral continent.

**Other articles**

- Greenhouse gas emission statistics - air emissions accounts
- Climate change - driving forces
- Air pollution statistics - emission inventories

**Publications**

- Energy, transport and environment indicators — Statistical book, 2019

**Main tables**

- Air emission inventories (source: EEA)
Database

- Air emission inventories (source: EEA)

Dedicated section

- Air emission inventories (source: EEA)

Legislation

Climate strategies and targets

External links

European Commission

- The Directorate-General for Climate Action of the European Commission (DG CLIMA)
- Environment and climate change research by the Joint Research Centre
- Research & Innovation - Climate action

European Environment Agency

- European Environment Agency - Climate change
- EEA greenhouse gas - data viewer

United Nations Framework Convention on Climate Change (UNFCCC)

- UNFCCC home page

Intergovernmental Panel on Climate Change (IPCC)

- IPCC home page
- 2006 IPCC Guidelines for National Greenhouse Gas Inventories