

Greenhouse gas emission statistics - emission inventories

Statistics Explained

Data from June 2021

Planned article update: June 2022

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). 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 2019, greenhouse gas emissions in the [EU](#) were down by 24 % compared with 1990 levels, representing an absolute reduction of 1 182 million tonnes of CO₂-equivalents.

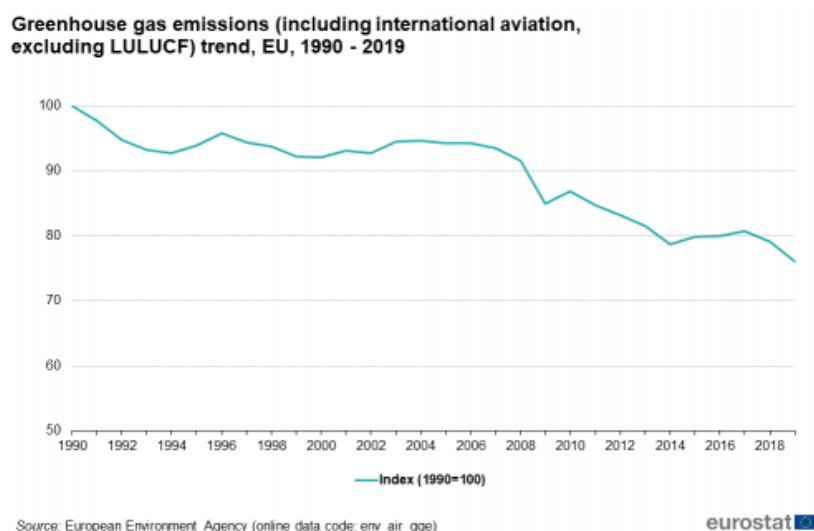


Figure 1: Total greenhouse gas emissions (including international aviation, excluding LULUCF) trend, EU, 1990–2019 (Index 1990 = 100) Source: Eurostat (env_air_gge), European Environment Agency

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 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 2019 emissions decreased by 3.8 % (149 million tonnes of CO₂-equivalents) compared to 2018 levels.

For detailed analysis of greenhouse gas emissions consult the [Annual European Union greenhouse gas inventory 1990–2019 and inventory report 2021](#) (published by EEA).

Source data for tables and graphs

- [GHG statistics: tables and figures 2021](#)

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.

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 (CRF1);
- industrial processes and product use (CRF2)

- agriculture (CRF3)
- land use, land use change and forestry (LULUCF) (CRF4)
- waste management (CRF5)

Three perspectives of greenhouse gas emission statistics

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

Emissions accounts versus emission inventories

Perspective	Statistical framework	Purpose	Related data set	Related SE article
1. GHG emissions classified by economic activities	Air Emissions Accounts (AEA) by Eurostat	tailored for integrated environmental-economic analyses	env_air_aa	link
2. GHG emissions classified by technical processes	GHG emission inventories by UN	official international reporting framework for international climate policies (UN-FCCC, EU MMR)	env_air_gge	this article
3. 'footprints' = GHG emissions classified by final use of products	Modelling results published by Eurostat	one particular analytical application of AEA	env_ac_io10	link

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 in-

Air emissions accounts – greenhouse gases (residence principle)	Greenhouse gas emission inventories (territory principle)
Emissions are assigned to the country where the economic operator causing the emission is resident.	Emissions are assigned to the country where the emission takes place
Emissions are classified by economic activity, following the NACE classification of the system of national accounts.	Emissions are assigned to processes classified according to their technical nature (e.g. combustion in power plants, solvent use).
Emissions from international navigation and aviation are assigned to the countries where the operator of the ship/aircraft is resident, regardless of where the emission takes place.	Emissions from international navigation and aviation are assigned to the countries where the associated fuel is bunkered, irrespective of the operator's place of residence.

ventories 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 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, 2020](#)

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](#)