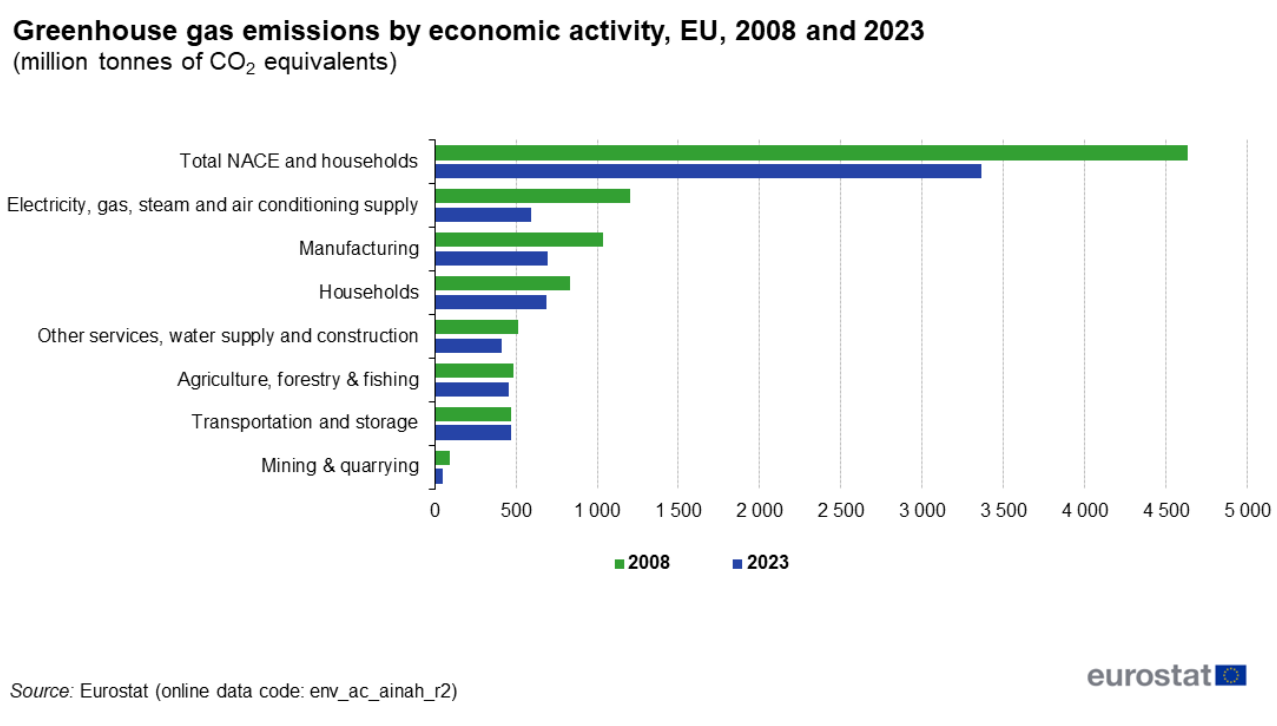
Greenhouse gas emission statistics - air emissions accounts

Statistics Explained

Data extracted in December 2024.
Planned article update: December 2025.

Highlights

" In 2023, emissions of greenhouse gases generated by economic activities of EU resident units stood at 3.4 billion tonnes of CO2equivalents, 27% lower than in 2008. "



Greenhouse gas emissions by economic activity, EU, 2008 and 2023 (million tonnes of CO2 equivalents)
Source: Eurostat (env_ac_ainah_r2)

This article is about emissions of greenhouse gases (GHG emissions) classified by emitting economic activities. Eurostat records and publishes these in annual air emissions accounts (AEA) , one of the modules in the European environmental economic accounts (for which the legal basis is Regulation (EU) No 691/2011 (including its amendments in 2014 and 2022)). AEA are suited for integrated environmental-economic analyses such as calculating emission intensities or 'footprints' .

In addition, Eurostat disseminates emissions from the EU countries' territories ('greenhouse gas inventories') . Territorial data are used to follow the development of emissions in relation to climate actions of the European Union and of the members of the United Nations according to the guidelines developed by the UN panel on climate change (IPCC) . These are the official data to measure emissions in each country. Furthermore, Eurostat estimates

and disseminates 'footprints' which are GHG emissions classified by final products that are demanded by households or government, or that are invested in or exported.

This article analyses the emissions of greenhouse gases (GHGs) in the European Union (EU) by emitting economic activities and households. The GHGs comprise carbon dioxide (CO2), nitrous oxide (N2O), methane (CH4) and fluorinated gases (hydrofluorocarbons (HFC), perfluorocarbons (PFC), sulphur hexafluoride (SF6) and natrium trifluoride (NF3).

Greenhouse gas emissions

In 2023, GHG emissions generated by economic activities and households in the EU stood at 3.4 billion tonnes of CO2equivalents.

Analysis by economic activity

Annual air emissions accounts offer a detailed analysis by 64 emitting economic activities (classified by NACE) as well as households as defined and classified within national accounts . For the purpose of this article these 64 economic activities have been further aggregated into 6 groupings.

Between 2008 and 2023 the level of greenhouse gas emissions from the supply of electricity, gas, steam and air conditioning fell by 609 million tonnes of CO2equivalents, a fall of 51% in relative terms. Both in absolute and relative terms, this was the largest decrease recorded among the activity groupings studied. This activity is also among the largest emitters of greenhouse gases. In 2023, it contributed 18% to the total greenhouse gases emitted by the EU economy and households, after manufacturing, which had 21% share in the total. For the same period, the second largest absolute drop in greenhouse gas emissions occurred in manufacturing (-345 million tonnes of CO2equivalents). Households in the EU reduced their emissions by 146 million tonnes of CO2equivalents (a reduction of 17 %) between 2008 and 2023 (Figure 1).

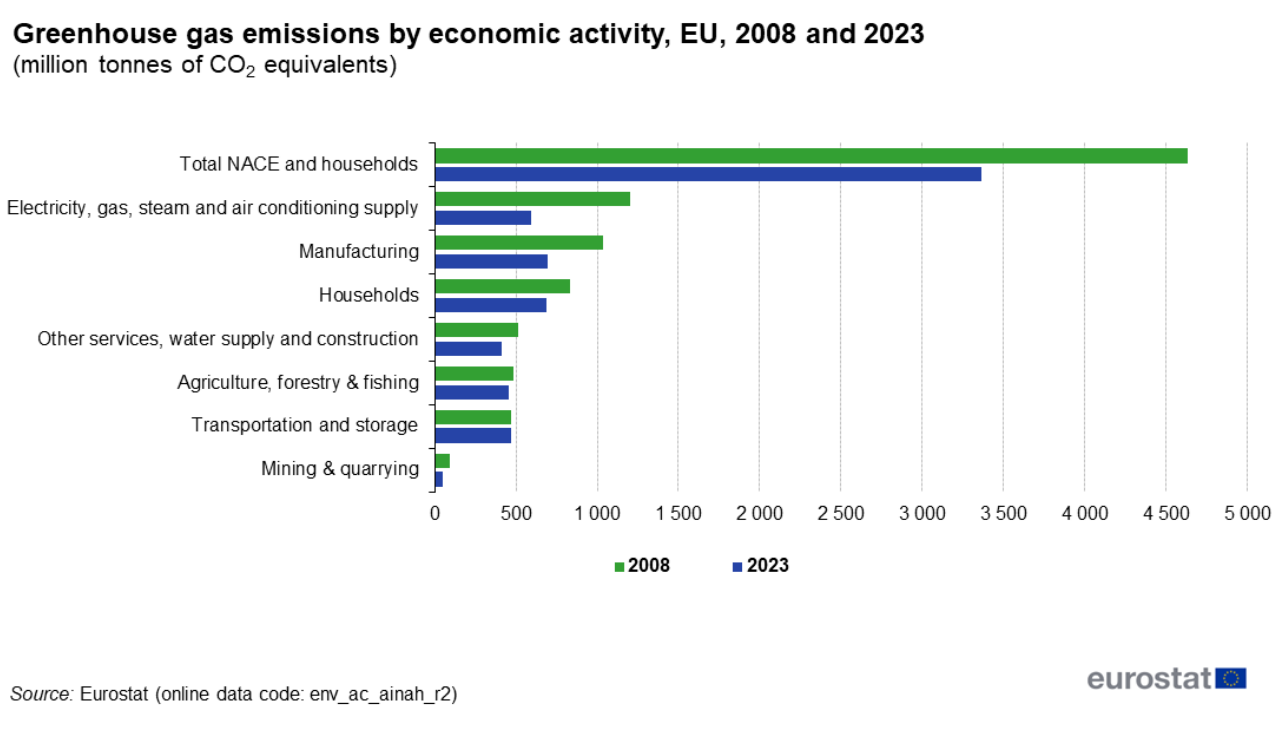


Figure 1: Greenhouse gas emissions by economic activity, EU, 2008 and 2023 (million tonnes of CO2 equivalents) Source: Eurostat (env_ac_ainah_r2)

In most activities, carbon dioxide was the most emitted greenhouse gas. Agriculture, forestry and fishing and mining and quarrying were the only activities where emissions of methane and nitrous oxide (expressed in CO2equivalents) were greater than those of carbon dioxide (Figure 2).

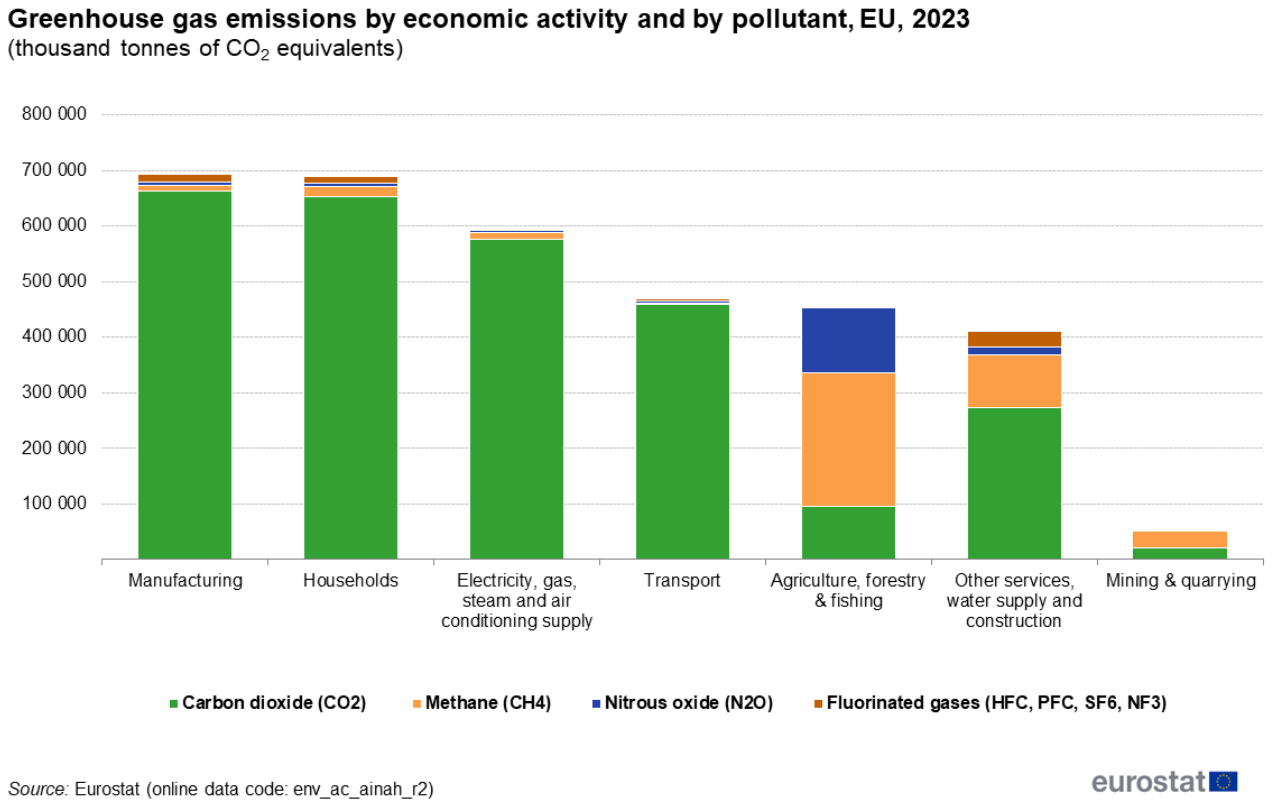


Figure 2: Greenhouse gas emissions by economic activity and by pollutant, EU, 2023 (thousand tonnes of CO2 equivalents) Source: Eurostat (env_ac_ainah_r2)

Analysis across EU countries

Among the EU countries, the greenhouse gases emitted by economic activities and households in 2023 varied considerably (see Table 1). These differences are, in part, due to different economic structures and different mixes of renewable and non-renewable energy sources. Manufacturing and electricity, gas, steam and air conditioning supply were the main emitters of greenhouse gases in 7 countries. Households were the main source of GHGs in 5, and transportation and storage activities in 4 countries.

Greenhouse gas emissions by economic activity, 2023
(thousand tonnes of CO_2 equivalents)

	Agriculture, forestry and fishing	Mining and quarrying	Manufacturing	Electricity, gas, steam and air conditioning supply	Transportation and storage	Other services, water supply and construction	Total economic activities	Households	Economic activities plus households
EU	454 921	51 842	693 907	594 551	468 493	411 087	2 674 801	690 075	3 364 876
Belgium	11 968	392	29 464	11 969	6 923	14 630	75 347	25 796	101 143
Bulgaria	6 430	1 799	8 526	13 832	7 449	4 735	42 773	3 486	46 259
Czechia	9 246	4 388	17 135	34 135	10 101	12 054	87 058	13 552	100 610
Denmark	13 054	1 130	4 676	4 562	44 329	6 475	74 227	6 233	80 460
Germany	63 837	5 293	170 514	175 978	75 763	59 942	551 327	169 035	720 362
Estonia	1 747	21	1 030	5 121	1 378	1 212	10 509	1 844	12 353
Ireland	20 954	31	6 631	7 503	18 825	5 374	59 318	11 406	70 724
Greece	9 514	359	17 942	11 758	16 451	10 873	66 897	13 526	80 423
Spain	47 641	1 159	64 074	30 985	38 515	39 571	221 944	65 785	287 729
France	75 123	282	73 347	18 757	60 579	74 029	302 117	101 249	403 366
Croatia	3 379	655	4 140	3 540	1 360	4 339	17 412	5 997	23 409
Italy	39 808	3 138	89 083	65 010	42 364	55 000	294 402	104 958	399 360
Cyprus	660	48	1 562	3 137	350	1 396	7 153	1 791	8 943
Latvia	2 855	41	1 300	1 136	2 605	1 893	9 831	1 875	11 706
Lithuania	4 237	20	4 493	1 479	8 473	1 776	20 479	4 645	25 124
Luxembourg	795	6	970	252	4 641	887	7 552	1 522	9 074
Hungary	8 066	571	9 144	8 976	8 127	11 225	46 109	14 893	61 002
Malta	117	5	83	779	2 031	547	3 562	319	3 881
Netherlands	26 702	1 686	39 673	23 616	24 347	20 407	136 431	26 644	163 075
Austria	8 226	747	24 168	5 605	10 110	6 829	55 685	13 568	69 253
Poland	52 053	21 723	56 284	120 793	49 005	27 507	327 365	49 818	377 183
Portugal	9 050	311	11 600	4 354	9 582	12 780	47 676	9 348	57 024
Romania	20 275	6 244	20 096	18 724	6 449	17 040	88 828	20 860	109 688
Slovenia	2 008	271	2 444	3 479	780	2 227	11 208	3 186	14 393
Slovakia	1 894	282	13 129	5 395	2 761	6 838	30 298	6 778	37 077
Finland	7 252	416	9 067	8 398	8 410	5 358	38 901	4 573	43 475
Sweden	8 029	824	13 332	5 277	6 787	6 143	40 393	7 388	47 781

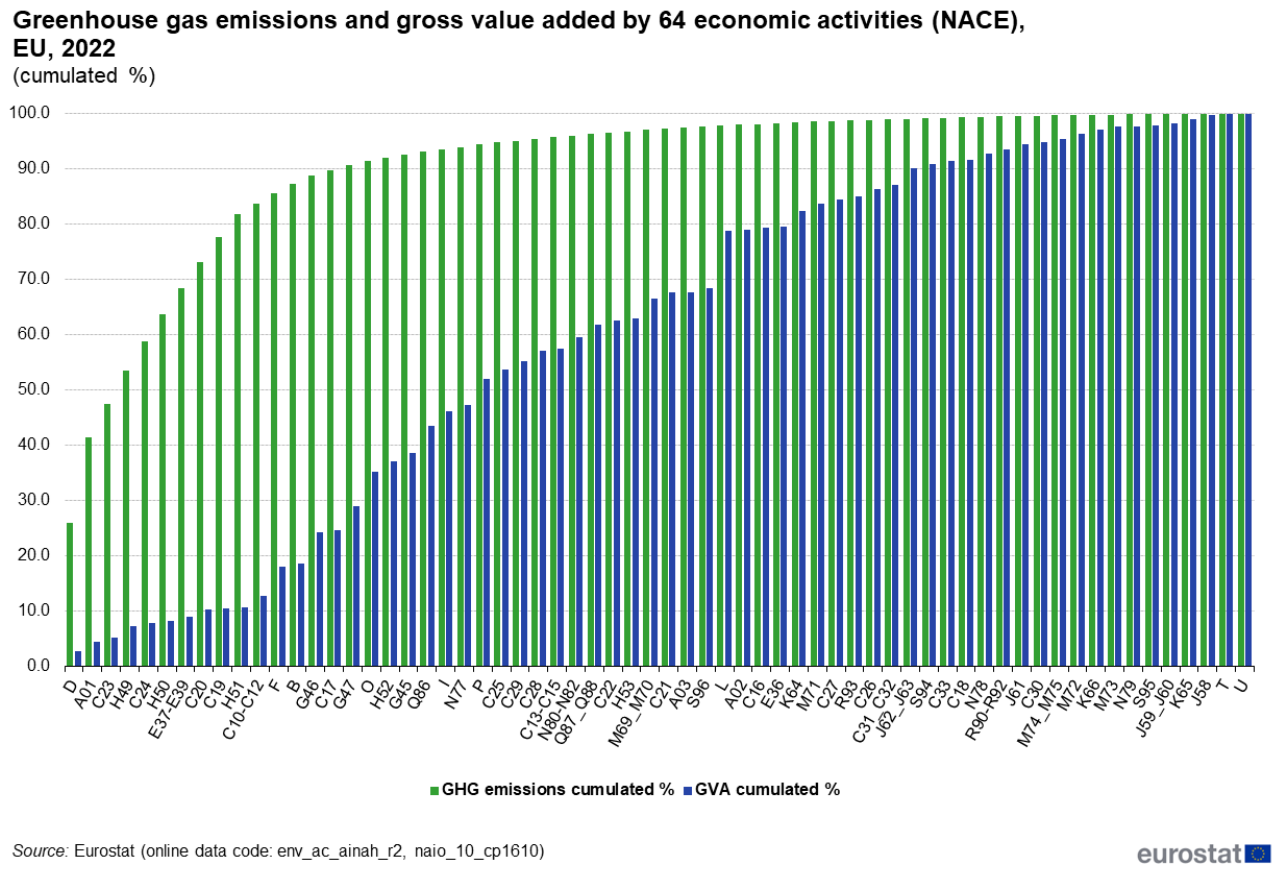
Source: Eurostat (online data code: env_ac_ainah_r2)

eurostat

Table 1: Greenhouse gas emissions by economic activity, 2023 (thousand tonnes of CO2 equivalents) Source: Eurostat (env_ac_ainah_r2)

Comparing greenhouse gas emissions with gross value added

In air emissions account, the breakdown of economic activities into 64 classes is the same as for economic statistics (national accounts), enabling integrated analyses. Figure 3 compares greenhouse gas emissions with the gross value added (GVA) for the 64 economic activities (NACE classification).



Source: Eurostat (online data code: env_ac_ainah_r2, naio_10_cp1610)

Figure 3: Greenhouse gas emissions and gross value added by 64 production activities (NACE), EU, 2022 (cumulated %) Source: Eurostat (env_ac_ainah_r2) and (naio_10_cp1610)

Figure 3 shows that the top 5 emitters account for about 60% of greenhouse gas emissions of the 64 production activities, while these top 5 production activities only contribute to 8% of the gross domestic product (GDP). These 5 production activities are: electricity, gas, steam and air conditioning supply (NACE D), crop and animal production, hunting and related service activities (NACE A01), manufacture of other non-metallic mineral products (NACE C23), land transport and transport via pipelines (NACE H49) and manufacture of basic metals (NACE C24). The GDP is the sum of gross value added of the 64 production activities plus net taxes on products.

Source data for tables and graphs

- Greenhouse gas emissions by economic activities and households: tables and figures

Data sources

Eurostat's air emissions accounts (AEA) are legally based on Regulation (EU) No 691/2011 on European environmental economic accounts.

Annual data are transmitted by the EU Member States, as well as the European Free Trade Association (EFTA) countries and some candidate countries .

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: CO2equivalents). The weighting factors currently used are the following: carbon dioxide = 1, methane = 28, nitrous oxide = 265 and sulphur hexafluoride = 23 500. Hydrofluorocarbons and

perfluorocarbons comprise a large number of different gases that have different GWPs.

Eurostat calculates early estimates for greenhouse gases in air emissions accounts (timeliness: T+12 months). The developed methodology is based on the Approximated estimates for greenhouse gas emissions published by the European Environment Agency . In Figures 1, 2, 3 and Table 1 of this article, year 2023 data are the early estimates calculated by Eurostat.

In AEA, the emissions data are organised by economic activity, using the NACE classification. This arrangement makes it possible to have an integrated environmental-economic analysis to supplement national accounts. The scope encompasses production by all businesses resident in the country, including those operating ships, aircraft and other transportation equipment in other countries.

Air emissions accounts also include households as consumers. Their emissions are accounted for whenever household consumption is directly responsible for environmental pressures. For example, emissions from a privately owned car are accounted under households, whereas cars owned by transport businesses (such as taxis) are accounted under transportation and storage.

The following activity groupings are used in this article:

- agriculture, forestry and fishing — NACE Rev. 2 Section A;
- mining and quarrying — NACE Rev. 2 Section B;
- manufacturing — NACE Rev. 2 Section C;
- electricity, gas, steam and air conditioning supply — NACE Rev. 2 Section D;
- transportation and storage — NACE Rev. 2 Section H;
- other services, water supply and construction — NACE Rev. 2 Sections E to G and I to U, in other words all remaining economic activities as defined in NACE;
- households — households as consumers.

Three perspectives of greenhouse gas emission statistics

Eurostat presents 3 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	this article
2. GHG emissions classified by technical processes	GHG emission inventories by UN	official international reporting framework for international climate policies (UNFCCC, EU MMR)	env_air_gge	link
3. 'footprints' = GHG emissions classified by final use of products	Modelling results published by Eurostat	1 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 2 approaches, as different boundaries apply. GHG inventories include international aviation and maritime transport (international bunker fuels) as memorandum items, which mean 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

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.

with emission inventories through 'bridging items'.

Context

The need to supplement information on the economy with environmental indicators was recognised in a European Commission Communication titled ' GDP and beyond ' (COM(2009) 433). Furthermore, similar recommendations were made within the Report by the Commission on the Measurement of Economic Performance and Social Progress , released by the Commission on the Measurement of Economic Performance and Social Progress. Such recommendations support the analysis of statistics on human well-being to supplement economic indicators such as gross domestic product , for example by including physical indicators related to the environment.

Air emissions accounts measure the interplay between the economy and the environment with respect to air emissions, in order to assess whether current production and consumption activities are on a sustainable path of development. Measuring sustainable development is a complex undertaking as it has to incorporate economic, social and environmental indicators. The data obtained from air emissions accounts may subsequently feed into political decision-making, underpinning policies that target both continued economic growth and sustainable development, for example, the European Commission's latest initiative, the European Green Deal .

Explore further

Other articles

- Greenhouse gas emission accounts
- Quarterly greenhouse gas emissions in the EU
- Air pollution statistics - air emissions accounts
- Greenhouse gas emission statistics - emission inventories
- Greenhouse gas emission statistics - carbon footprints
- Environmental accounts - establishing the links between the environment and the economy
- National accounts and GDP

Database

- Climate change (cli)
- Environment (env)
- Emissions of greenhouse gases and air pollutants , see:

Air emissions accounts (env_air_aa)

env_ac_ainah_r2

env_ac_aibrid_r2

env_ac_aeint_r2

env_ac_aigg_q

- Air emissions accounts - Data Browser

Dedicated section

- Climate change
- Environment
- Emissions of greenhouse gases and air pollutants

Publications

- Manual for air emissions accounts, 2015 edition

Methodology

- NACE background
- System of Environmental-Economic Accounting - Central Framework

External links

- Kyoto Protocol
- Paris Agreement
- United Nations Framework Convention on Climate Change (UNFCCC) — UN Climate Change — Newsroom
- The European environment — state and outlook 2020: knowledge for transition to a sustainable Europe
- Complementary emission estimates produced by EU organisations