Greenhouse gas emission statistics - air emissions accounts

Statistics Explained

Data extracted in February 2021.
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This article is about emissions of greenhouse gases (GHG emissions) classified by emitting economic activities. Eurostat records and publishes these in 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). AEA are suited for integrated environmental-economic analyses such as calculating emission intensities or 'footprints'.

In addition, Eurostat disseminates GHG emissions classified by technical processes. These are recorded in GHG emission inventories and form the official data for international climate policies. Thirdly, Eurostat estimates and disseminates so-called '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 (industries 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 2019, GHG emissions generated by industries and households in the EU-27 stood at 3.8 billion tonnes of CO2equivalents.

Analysis by economic activity

Air emissions accounts offer a detailed analysis by 64 emitting industries (classified by NACE) as well as households as defined and classified within national accounts . For the purpose of this article these 64 industries have been further aggregated to six groupings.

Between 2008 and 2019 the level of greenhouse gas emissions from the supply of electricity, gas, steam and air conditioning fell by 381 million tonnes of CO2equivalents, a fall of 31 % in relative terms. Both in absolute and relative terms, this was the largest decrease recorded among the activity groupings studied. This activity grouping is also among the biggest emitters of greenhouse gases. In 2019, it contributed 20 % to the total greenhouse gases emitted by EU industries and households. For the same period, the second biggest absolute drop in greenhouse gas emissions occurred in manufacturing (-220 million tonnes of CO2equivalents). The second biggest relative drop was observed in mining and quarrying with 30 %. Households in the EU-27 reduced their emissions by 93 million tonnes of CO2equivalents (a reduction of 11 %) between 2008 and 2019. (Figure 1)

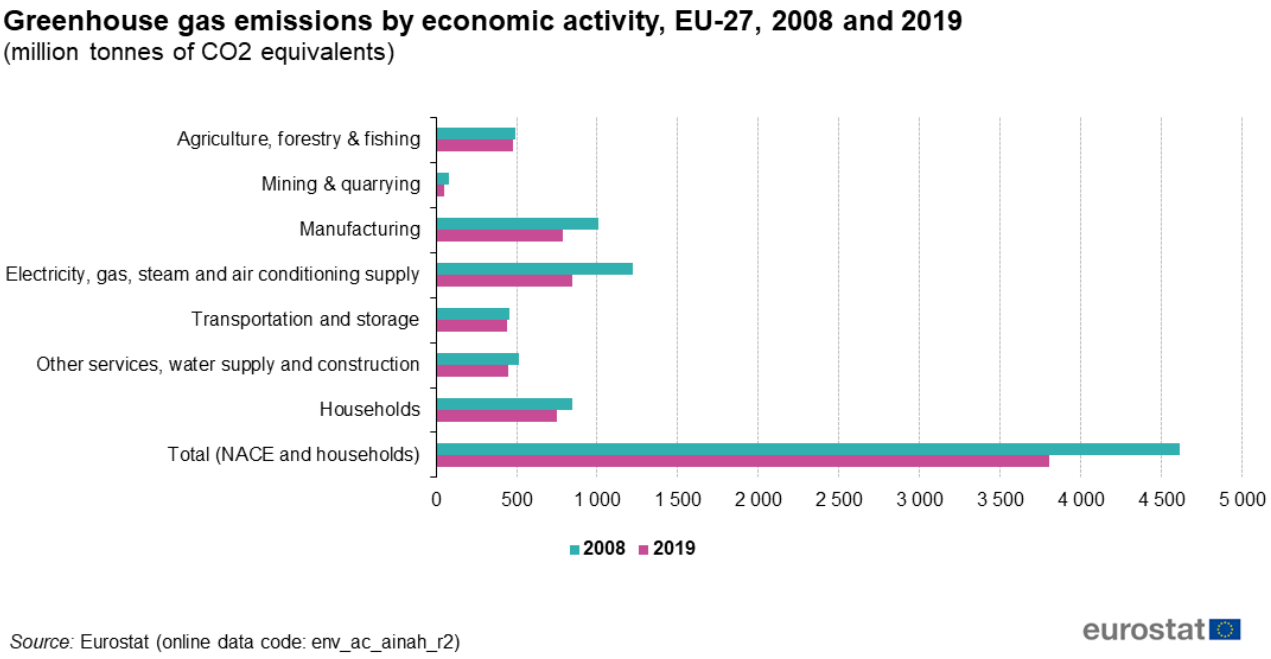

Figure 1: Greenhouse gas emissions by economic activity, EU-27, 2008 and 2019 (% of total emissions in CO2 equivalents) Source: Eurostat (env_ac_ainah_r2)

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).

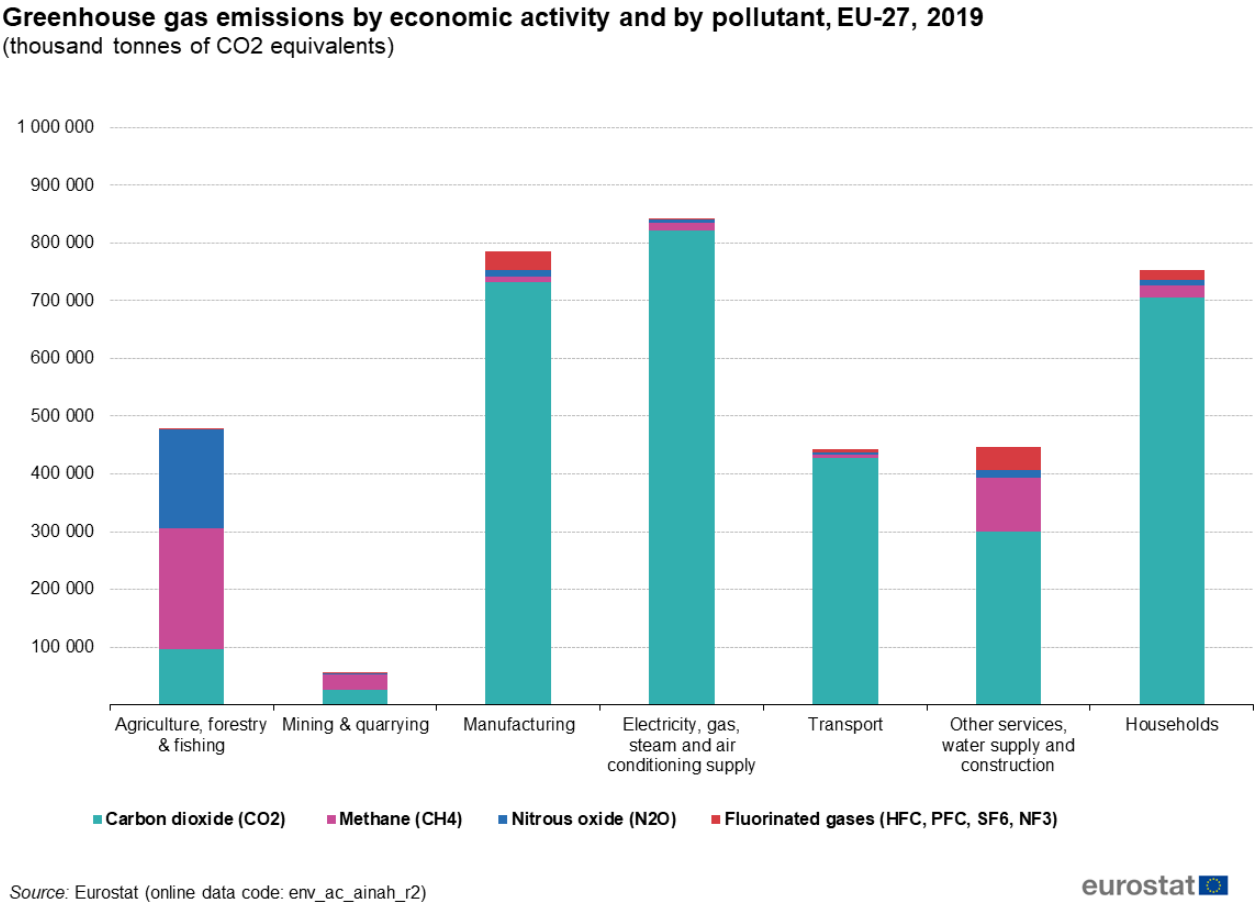

Figure 2: Greenhouse gas emissions by economic activity and by pollutant, EU-27, 2019 (thousand tonnes of CO2 equivalents) Source: Eurostat (env_ac_ainah_r2)

Analysis across EU Member States

Among the EU Member States, the GHGs emitted by the various producers and households 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. In nine EU Member States businesses supplying electricity, gas, steam and air conditioning were the main emitters of GHGs in 2019, while in eight more Member States manufacturing was the main emitter. In further six countries transportation and storage activities were the main source of greenhouse gas emissions. Households were the main source of GHGs in four Member States.

Greenhouse gas emissions by economic activity, 2019

(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 production activities	Households	Production activities plus households
EU-27	478 257	54 049	785 360	842 907	441 933	447 266	3 049 773	753 099	3 802 872
Belgium	13 164	485	38 282	16 381	10 760	16 627	95 698	25 084	120 782
Bulgaria	4 282	383	7 542	25 630	6 458	1 691	45 986	10 296	56 283
Czechia	8 868	6 914	20 851	48 406	10 403	13 173	108 614	13 842	122 456
Denmark	12 411	1 576	5 596	6 001	46 014	7 217	78 816	8 228	87 044
Germany	68 496	4 100	168 666	264 356	86 557	78 449	670 624	183 063	853 687
Estonia	1 762	96	1 449	8 053	1 558	1 038	13 955	1 580	15 535
Ireland	20 325	173	7 478	8 506	20 393	6 420	63 295	12 582	75 877
Greece	8 241	309	18 000	30 044	7 793	8 954	73 341	11 844	85 185
Spain	50 971	1 666	80 785	44 881	45 261	31 224	254 788	68 434	323 222
France	87 367	1 097	92 075	26 008	44 055	80 334	330 937	119 443	450 379
Croatia	3 624	574	4 327	3 289	1 553	5 169	18 536	6 033	24 570
Italy	39 161	5 052	90 935	83 311	40 896	60 991	320 347	110 765	431 112
Cyprus	584	30	1 463	3 354	593	1 169	7 193	1 868	9 062
Latvia	3 322	49	1 383	1 966	3 883	1 566	12 169	1 901	14 069
Lithuania	4 622	13	5 554	1 354	7 200	1 676	20 419	6 086	26 505
Luxembourg	735	8	1 495	310	4 918	1 118	8 585	1 740	10 324
Hungary	9 393	851	12 009	11 460	4 667	11 309	49 690	15 989	65 679
Malta	91	3	66	368	3 436	332	4 296	312	4 608
Netherlands	28 233	2 299	48 551	42 343	25 543	22 274	169 244	33 728	202 971
Austria	8 742	990	27 216	10 639	6 812	7 300	61 698	15 003	76 701
Poland	53 617	18 890	67 252	139 939	25 429	39 903	345 030	51 676	396 706
Portugal	8 496	303	14 549	11 040	6 097	11 998	52 483	10 421	62 903
Romania	20 622	5 832	23 972	23 879	6 249	15 152	95 706	18 832	114 538
Slovenia	2 040	310	3 242	4 718	1 549	3 535	15 394	3 422	18 816
Slovakia	2 233	492	17 038	5 895	3 846	5 790	35 293	6 388	41 681
Finland	8 126	436	10 769	15 091	10 616	5 733	50 771	5 956	56 727
Sweden	8 729	1 119	14 814	5 686	9 395	7 123	46 867	8 584	55 451

Source: Eurostat (online data code: env_ac_ainah_r2)

eurostat

Table 1: Greenhouse gas emissions by economic activity, 2019 (thousand tonnes of CO2 equivalents) Source: Eurostat (env_ac_ainah_r2)

Comparing greenhouse gas emissions with gross value added

The breakdown of production activities into 64 classes is the same as for economic statistics (national accounts), therefore enabling integrated analyses. Figure 3 compares emissions of ozone precursors with the gross value added (GVA) for the 64 production activities (NACE classification).

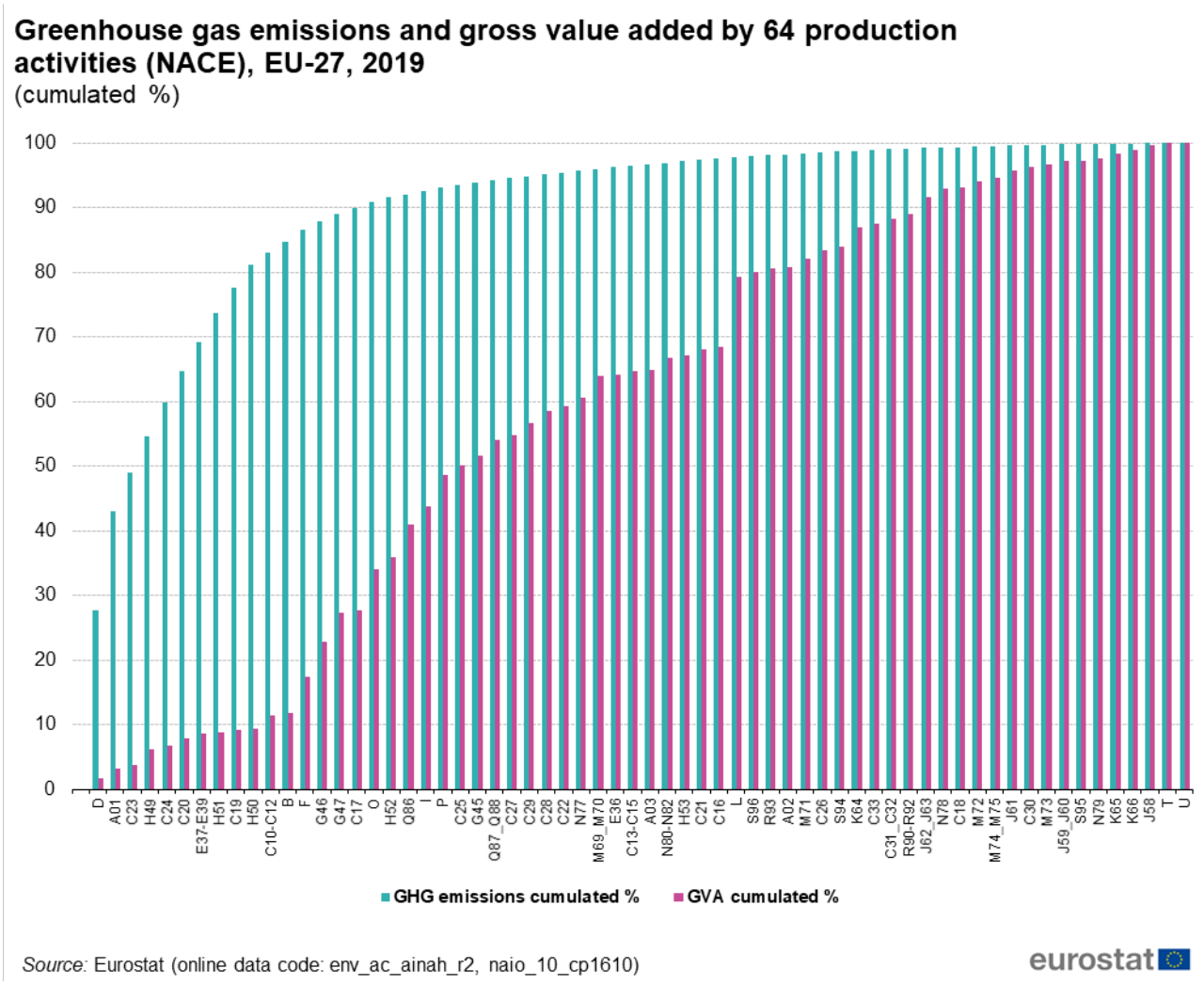

Figure 3:Greenhouse gas emissions and gross value added by 64 production activities (NACE), EU-27, 2019_(cumulated %) Source: Eurostat (env_ac_ainah_r2) and (naio_10_cp1610)

Figure 3 shows that the top five emitters account for 60 % of greenhouse gas emissions of the 64 production activities, while these top five production activities only contribute to 6.7 % of the gross domestic product (GDP). These five 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 industries 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: 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.

Eurostat calculates early estimates for greenhouse gases in air emissions accounts (timeliness: T+12 months). The developed methodology is based on the Proxy GHG inventories published by the European Environment Agency . In Figures 1, 2, 3 and Table 1 of this article, year 2019 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 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	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	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 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 with emission inventories through so-called '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 so-called 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 .

Other articles

- 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

- Air emissions accounts , see:

env_ac_ainah_r2

env_ac_aibrid_r2

env_ac_aeint_r2

Dedicated section

- Air emissions accounts

Publications

- Manual for air emissions accounts, 2015 edition

Methodology

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

External links

- Kyoto Protocol
- 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