Air pollution statistics - emission inventories

Statistics Explained

Data from July 2019
Planned article update: September 2020

This article is about emissions of air pollutants classified by technical processes. These are recorded in so-called emission inventories for air pollutants and form the official data for international policies on transboundary air pollution.

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

This article highlights the emission levels of the following most important air pollutants in the European Union (EU) : sulphur oxides (SOx), nitrogen oxides (NOx), ammonia (NH3), non-methane volatile organic compounds (NMVOC) and fine particulate matter (PM2.5). However, greenhouse gas emissions are not analysed here, but in the article Greenhouse gas emission statistics .

General overview

Air pollution harms human health and the environment. Nitrogen dioxide and particulate matter pollution pose serious health risks while Europe's sensitive ecosystem areas are affected by acid deposition of excess sulphur and nitrogen compounds (SOx, NOx, NH3).

Air pollutants are emitted from human activities, mainly the combustion of fuels. Thanks to a wide range of environmental policy measures, emissions of air pollutants in Europe decreased significantly over the last 28 years.

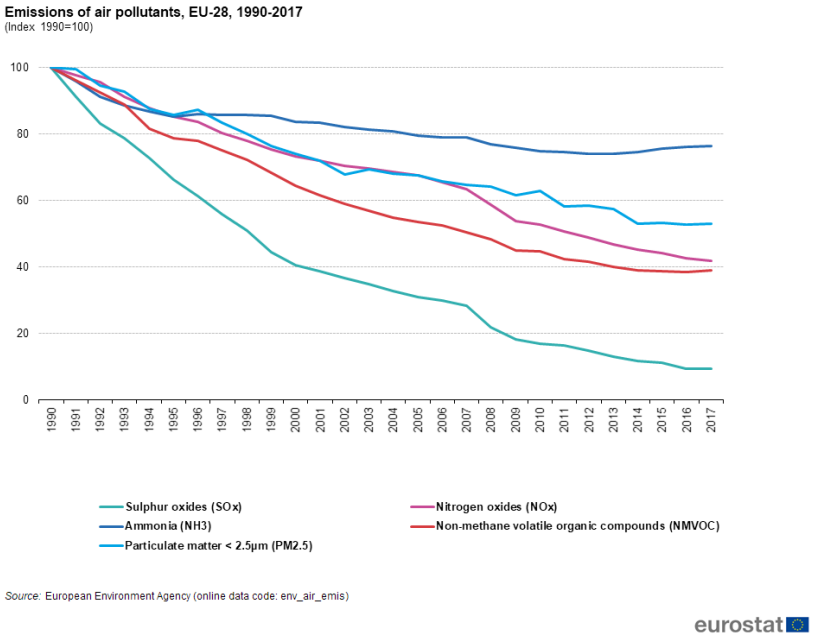

Figure 1: Emissions of air pollutants, EU-28, 1990-2017 (Index 1990=100), Source: EEA, also available at Eurostat (env_air_emis)

For the last 28 years (1990 to 2017) the EU-28 recorded reductions in emissions of all air pollutants considered in this article (see Figure 1). The biggest fall was reported for sulphur oxides (SOx) which decreased by 90%, followed by non-methane volatile organic compounds (NMVOC) and nitrous oxides (NOx), which declined roughly by 60 %. Emissions of fine particulate matter (PM2.5) decreased by almost a half since the year 1990. The smallest decrease was reported for ammonia (NH3) emissions, which fell by roughly one quarter.

The following main findings are widely based on the European Union emission inventory report 1990–2017 under the UNECE Convention on Long-range Transboundary Air Pollution (LRTAP) (published by EEA).

Sulphur oxides

The pollutant with the greatest reduction in emissions across the EU-28 has been **SOx** . Emissions of SOx in 2017 stood at 2.3 million tonnes compared to 25 million tonnes in 1990 (see Figure 2). The majority of SOx emissions were reduced in the energy production and distribution sector (15.3 million tonnes less). SOx reductions have been a result of a combination of policy measures:

- fuel switching in energy-related sectors, away from solid and liquid fuels with high sulphur content to low-sulphur fuels such as natural gas;
- applying flue-gas desulphurisation (FGD) techniques in industrial facilities;
- EU directives relating to the sulphur content of certain liquid fuels.

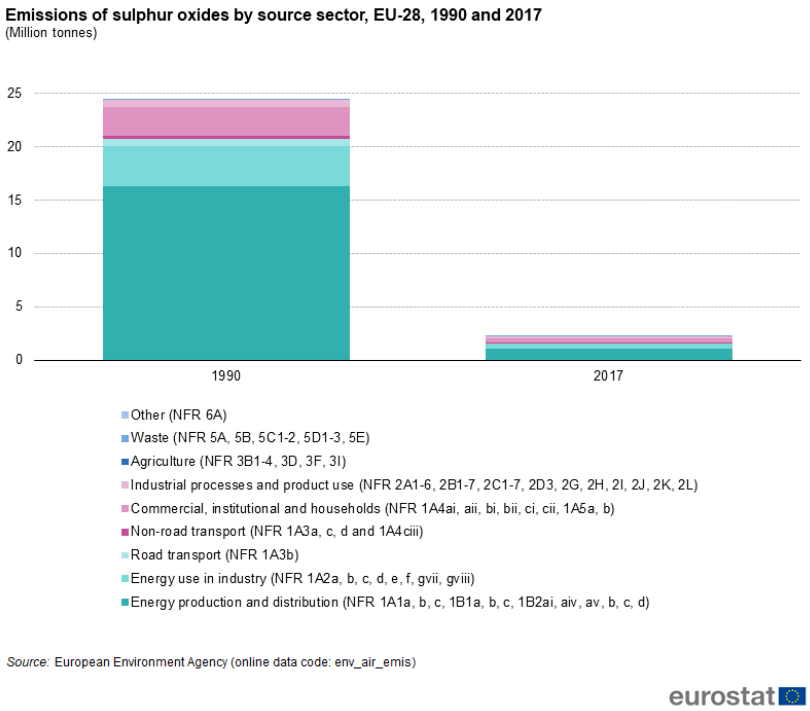

Figure 2: Emissions of sulphur oxides by source sector, in million tonnes, EU-28, 1990 and 2017, Source: EEA, also available at Eurostat (env_air_emis)

Nitrous oxides

Over the last 28 years, EU-wide emissions of **NOx** more than halved from 18 to 7.5 million tonnes (see Figure 3). The largest reduction took place in road transport (4.6 million tonnes less) which is the main contributing sector to total NOx emissions. Emission reductions from the road transport sector are primarily a result of fitting catalysts to vehicles. The legislative standards known as 'Euro' standards have driven this move. NOx emissions in the energy production and distribution sector decreased by 3 million tonnes thanks to the introduction of specific abatement technologies (e.g. low-NOx burners, flue-gas abatement techniques), and switching fuel from solid to gaseous.

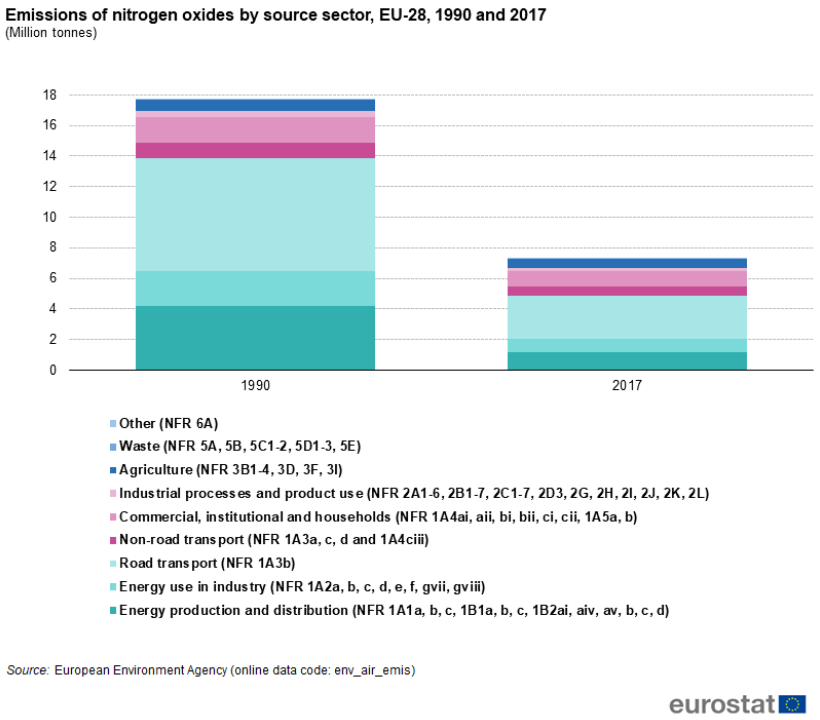

Figure 3: Emissions of nitrogen oxides by source sector, in million tonnes, EU-28, 1990 and 2017, Source: EEA, also available at Eurostat (env_air_emis)

Ammonia

Emissions of **NH3** almost entirely derive from agriculture (see Figure 4). Compared to other pollutants, reductions in NH3 emissions were moderate. In the EU-28 over the past 27 years the emissions of NH3 decreased only by roughly one quarter from 5.2 to 3.9 million tonnes. Main reductions were achieved through better manure management. Nowadays, ammonia is likely to be the most significant acidifying gas emitted in Europe.

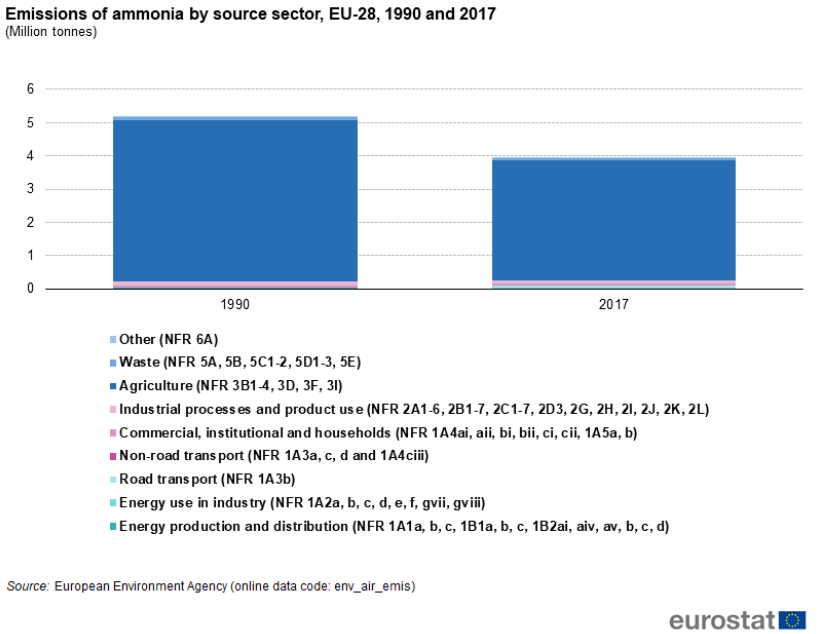

Figure 4: Emissions of ammonia by source sector, in million tonnes, EU-28, 1990 and 2017, Source: EEA, also available at Eurostat (env_air_emis)

Non-methane volatile organic compounds

Between 1990 and 2017, EU-wide emissions of **NMVOC** have been reduced by roughly 60 % from 17.8 to 7 million tonnes (see Figure 5). Major reduction took place in the road transport sector (5 million tonnes less) and in industrial processes and product use (2.9 million tonnes less).

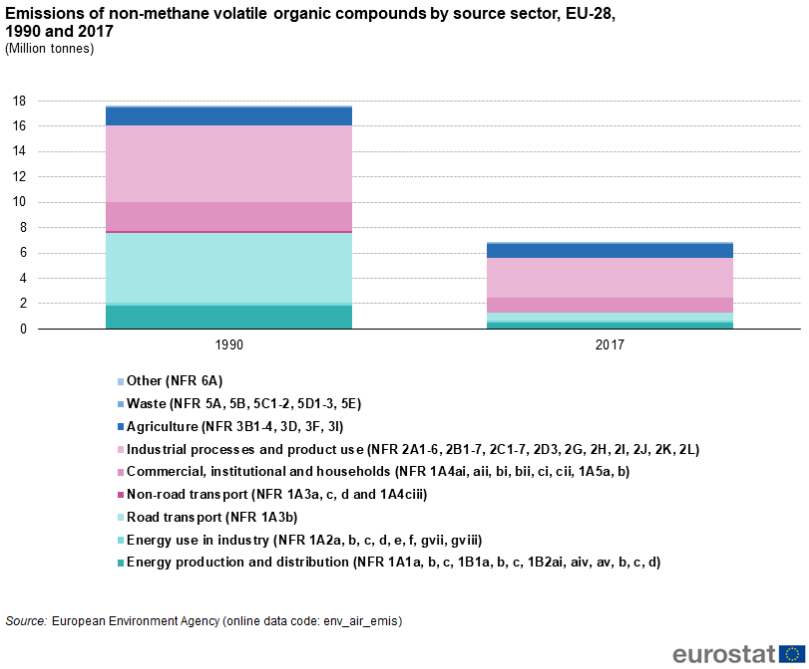

Figure 5: Emissions of non-methane volatile organic compounds by source sector, in million tonnes, EU-28, 1990 and 2017, Source: EEA, also available at Eurostat (env_air_emis)

Fine particulate matter

EU-wide emissions of **PM2.5** dropped by almost 50 % between 1990 and 2017 (see Figure 6). Most significant reductions took place in the energy production and distribution sector, in the commercial, institutional and households sector, as well as in road transport.

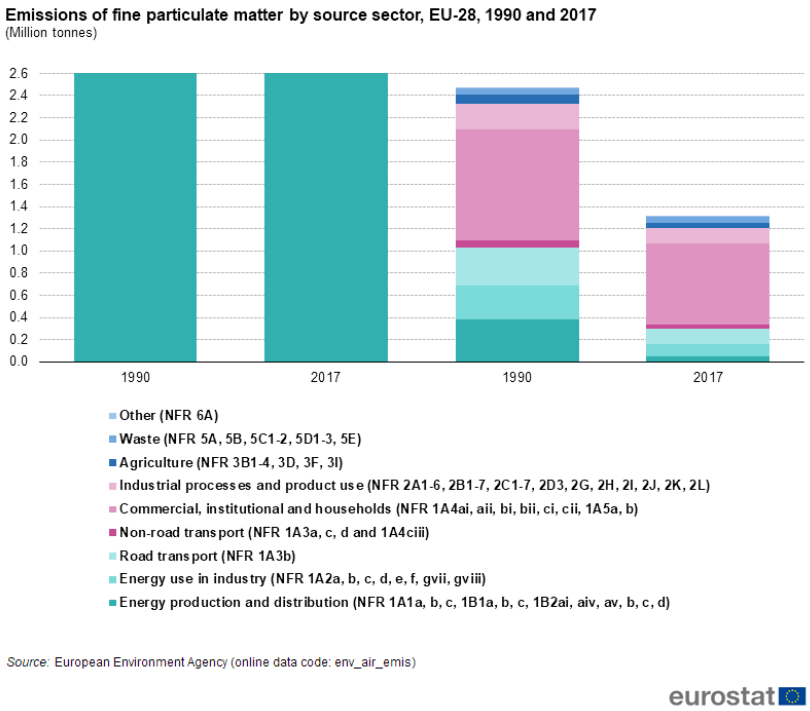

Figure 6: Emissions of fine particulate matter by source sector, million tonnes, EU-28, 1990 and 2017, Source: EEA, also available at Eurostat (env_air_emis)

Source data for tables and graphs

- Download Excel file

Data sources

Data in this article are based on the data reported in national emission inventories for air pollutants under the United Nations Economic Commission for Europe (UNECE) Convention on Long-range Transboundary Air Pollution (CLRTAP) and the EU National Emission Ceilings Directive (NEC) . The principles and methodology to estimate air pollutant inventories are laid down in the EMEP/EEA air pollutant emission inventory guidebook .

Within the EU inventory system, the European Environment Agency and its European Topic Centre on Air Pollution and Climate Change Mitigation are responsible for the annual compilation of the EU inventory. Air pollutant emission inventories record the emissions of a wide range of substances from sources classified according to the Nomenclature for Reporting (NFR).

Three perspectives of emission statistics for air pollutants

Eurostat presents three perspectives of emission statistics for air pollutants:

Emissions accounts versus emission inventories

The main differences between air emissions accounts (AEA) and emission inventories for air pollutants 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 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'.

Perspective	Statistical framework	Purpose	Related data set	Related SE article
1. Emissions of air pollutants classified by economic activities	Air Emissions Accounts (AEA) by Eurostat	tailored for integrated environmental-economic analyses	env_air_aa	link
2. Emissions of air pollutants classified by technical processes	Emission inventories for air pollutants by UNECE	official international reporting framework for CLRTAP	env_air_emis	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	not available

Air emissions accounts – air pollutants (residence principle)	Emission inventories for air pollutants (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.

Context

Air pollution has been one of Europe's main environmental policy concerns since the late 1970s. The control of emissions from mobile sources, improving fuel quality and promoting and integrating environmental protection requirements into the transport and energy sector are part of these aims.

The Commission adopted a Clean Air Policy Package in December 2013, consisting of*A new Clean Air Programme* for Europe with new air quality objectives for the period up to 2030, a revised National Emission Ceilings Directive with stricter national emission ceilings for the six main pollutants, and a proposal for a new Directive to reduce pollution from medium-sized combustion installations. Internationally, the emissions of acidifying substances that result in acid rain are to a large extent regulated by the Gothenburg Protocol under the UNECE Convention on long-range transboundary air pollution (CLRTAP), signed in 1979.

Other articles

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

Tables

- Emissions of greenhouse gases and air pollutants (Source: EEA)

Database

- Air emission inventories (Source: EEA)

Dedicated section

- Air emissions inventories (source: EEA)

Publications

- Energy, transport and environment indicators Statistical book, 2017 edition

Legislation

- Framework Directive 96/62/EC of 27 September 1996 on ambient air quality assessment and management
- Directive 1999/30/EC of 22 April 1999 relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air of 27 September 1996 on ambient air quality assessment and management
- Directive 2001/81/EC of 23 October 2001 on national emission ceilings for certain atmospheric pollutants (NEC Directive)
- Directive 2002/3/EC of 12 February 2002 relating to ozone in ambient air
- Decision 2004/224/EC of 20 February 2004 laying down arrangements for the submission of information on plans or programmes required under Council Directive 96/62/EC
- Directive 2004/42/EC of 21 April 2004 on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain paints and varnishes and vehicle refinishing products and amending Directive 1999/13/EC
- Directive 2008/50/EC of 21 May 2008 on ambient air quality and cleaner air for Europe

External links

- EU legislation on air quality and emissions
- European Commission - Environment - Air
- European Environment Agency - Air pollution
- National emission ceilings under Directive 2001/81/EC of the European Parliament and the Council on National Emission Ceilings for certain pollutants (NEC Directive)
- World Health Organization - Air pollution