Office for National Statistics

Statistical bulletin

Greenhouse gas emissions intensity, UK: 2018 provisional estimates

Greenhouse gas and other pollutant emissions intensity for the UK, including breakdown by industry and comparisons with other European countries. Part of the UK Environmental Accounts.

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1 . Main points

- Between 1990 and 2018, greenhouse gas (GHG) emissions intensity for the UK fell by two-thirds.
- GHG emissions intensity of the energy supply industry fell by 69% from 1990 to 2018.
- Between 1990 and 2018, acid rain precursor emissions intensity for the UK fell by 88%, partly because of a decline in sulphur dioxide emissions from coal and oil production.
- Only one European country (Germany) reported higher GHG emissions than the UK in 2017. However, only four European countries (Sweden, France, Luxembourg and Austria) reported lower GHG emissions intensity.

2 . Things you need to know about this release

Air emissions accounts record the levels of gaseous and particulate materials emitted into the atmosphere. The air emissions accounts can be used to measure the intensity of air emissions relative to economic output. This can be done for the economy as a whole or for specific industries. Emissions intensity [1] is measured in this article as the level of emissions per unit of gross value added (GVA).

Estimates of greenhouse gas (GHG)[2] emissions intensity are part of the UK Environmental Accounts, which are "satellite accounts" to the main UK National Accounts. The accounts are produced on a UK residency basis [3] which is in line with national accounting principles and allows environmental impacts to be compared on a consistent basis with economic indicators. In terms of air emissions, this allows the calculation of emissions intensity. Data for air emissions and air emissions intensity on a residency basis are not available below UK level.

The UK is required to report its estimated GHG emissions on a variety of different bases in order to fulfil a wide range of international agreements. An explanation of the differences can be found in the Net zero and the different official measures of the UK's greenhouse gas emissions article; the emissions bridging tables illustrate the differences numerically. Carbon footprint estimates[4] are published by the Department for Environment, Food and Rural Affairs (Defra).

Comparisons over time are mostly between 2017 and 2018, or between 1990 and 2018 – the period for which data are available. The data for 2018 are provisional[5].

Notes for: Things you need to know about this release

1. Emissions intensity in this article is calculated by dividing the level of greenhouse gas (GHG) emissions by gross value added (GVA). GVA is the difference between output and intermediate consumption, that is, the difference between the value of goods and services produced (output) and the cost of raw materials and other inputs which are used up in production (intermediate consumption). The GVA data used in the denominator are chained volume measures, in constant prices, with 2016 as the base year (see Chain-linking methods used within the UK National Accounts). Emissions intensity can be calculated using other data series in the denominator, for example, the emissions intensity dataset also provides a measure of carbon intensity, calculated using gross domestic product (GDP).

2. The GHGs included in the atmospheric emissions accounts are those covered by the Kyoto Protocol: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride and nitrogen trifluoride.

3. Emissions that UK residents and UK-registered businesses are directly responsible for, whether in the UK or overseas, are included in these estimates, while emissions from foreign visitors and businesses in the UK are not.

4. Carbon footprint figures estimate the emissions associated with the consumption spending of UK residents on goods and services (wherever in the world these emissions arise along the supply chain), and those which are directly generated by UK households.

5. To produce provisional 2018 air emissions data, the 2017 data on activities occurring that could result in emissions, are updated using information on production activities for 2018 (where available, or using appropriate proxy information if necessary). Emission factors, also from 2017, which estimate the mass of emissions associated with those activities (by type of gas or pollutant), are then applied.

3 . Greenhouse gas emissions intensity for the UK fell by two thirds between 1990 and 2018

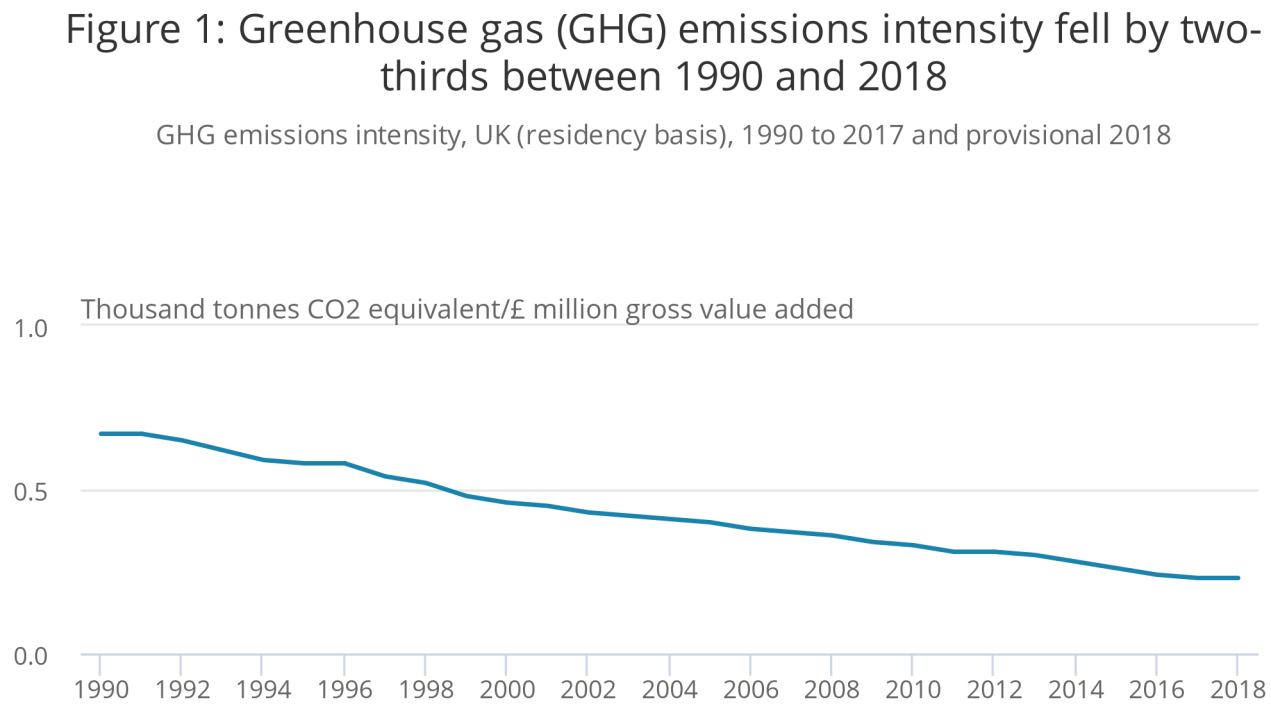
The economic activity of a country or industry will have an impact on the amount of greenhouse gas (GHG) emissions they produce. To be able to compare across countries or industries, it is therefore helpful to consider measures of GHG emissions intensity.

GHG intensity measures the level of emissions per unit of gross value added (GVA) and can be used to examine the relationship between economic growth and greenhouse gas emissions. For example, a reduction in overall UK greenhouse gas emissions intensity may indicate the UK is moving towards a greener and more sustainable economy. This could be through individual industries becoming more efficient in their processes and emitting fewer GHG emissions per unit of GVA. At the same time, it may also reflect changes to the structure of the economy, for example, a change from manufacturing to services, which produce fewer GHG emissions.

In 2018, GHG emissions intensity[1] for the UK remained around 0.23 thousand tonnes of carbon dioxide (CO2) equivalent[2] per £ million of GVA. Figure 1 shows GHG intensity for the UK has reduced steadily over time. Between 1990 and 2018, there has been a reduction of two-thirds (from 0.67 to 0.23 thousand tonnes of CO2 equivalent per £ million of GVA).

Figure 1: Greenhouse gas (GHG) emissions intensity fell by two-thirds between 1990 and 2018

GHG emissions intensity, UK (residency basis), 1990 to 2017 and provisional 2018



Source: Office for National Statistics – UK Environmental Accounts, Atmospheric emissions datasets

Notes:

1. GHG emissions intensity is calculated by dividing the level of GHG emissions by gross value added (GVA). GVA data are chained volume measures, in constant prices, with 2016 as the base year.

2. GHG emissions intensity is calculated excluding emissions from households (referred to as “consumer expenditure” emissions in the datasets accompanying this article).

Carbon dioxide (CO2) is the main greenhouse gas and tends to strongly influence overall GHG emissions. Carbon dioxide emissions intensity is one of the indictors in the Sustainable Development Goals (SDGs) [3], specifically “Indicator 9.4.1: CO2 emission per unit of value added”.

Notes for: Greenhouse gas emissions intensity for the UK fell by two thirds between 1990 and 2018

1. GHG emissions intensity is calculated excluding emissions from households (referred to as “consumer expenditure” emissions in the GHG emissions dataset).

2. The potential of each GHG to cause global warming is assessed in relation to a given weight of CO2 so all GHG emissions are measured as carbon dioxide equivalents (CO2e).

3. Sustainable Development Goals (SDGs) were introduced in 2015 and are a universal set of 17 Goals designed to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030. More information about SDGs can be found on the UN website. The UK data for SDGs are available on the online reporting platform.

4 . Greenhouse gas emissions intensity of the energy supply industry fell by 69% from 1990 to 2018

The industries[1] with the highest greenhouse gas (GHG) emissions intensity in 2018 were the agriculture, energy supply and mining and quarrying industries (Figure 2).

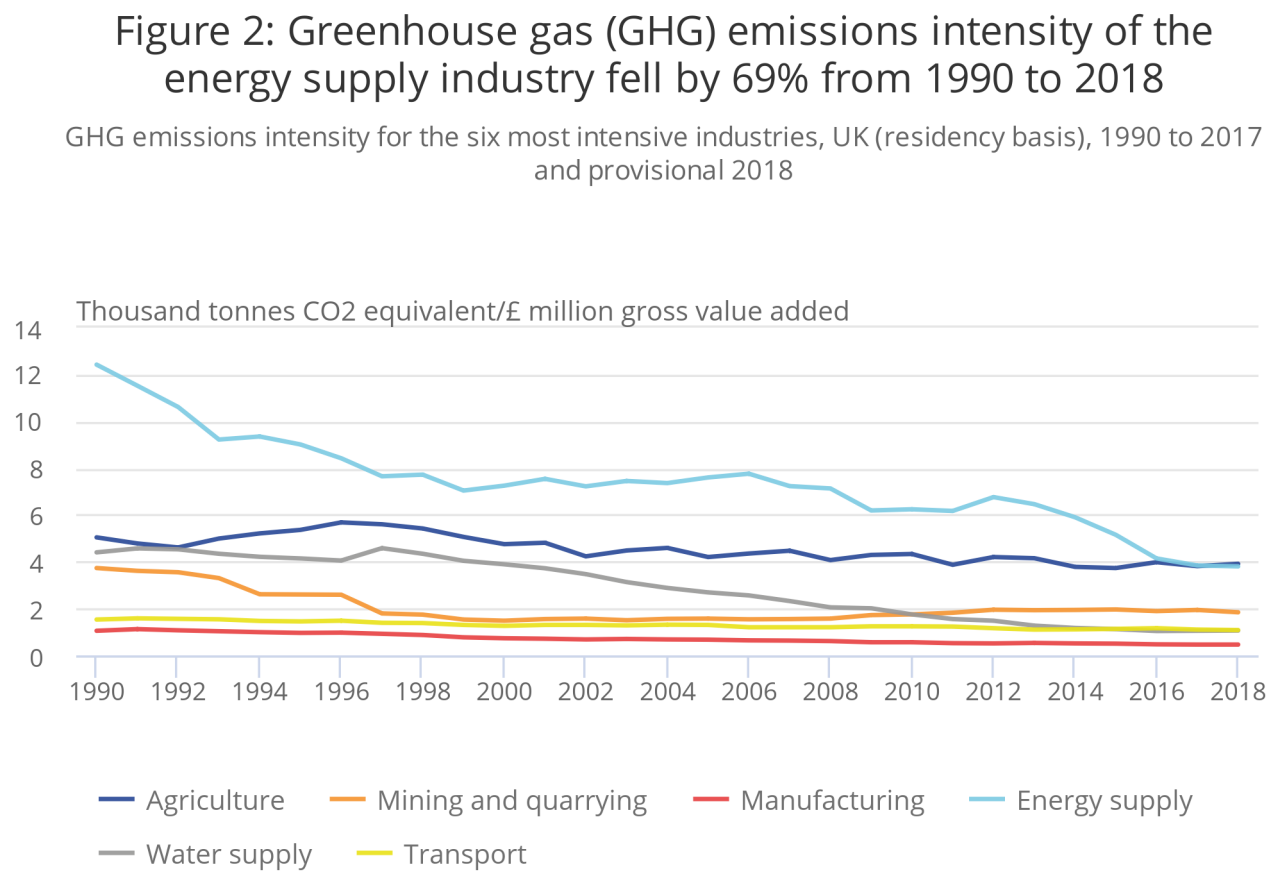
The GHG intensity of the energy supply industry fell by 69% from 1990 to 2018. This was mainly as a result of a 56% fall in emissions from the industry over this period as the move from coal and gas towards renewable forms of energy continued. Despite this, the energy supply industry remained the highest GHG emitting industry in 2018, just ahead of the manufacturing and transport industries (Figure 3).

By contrast, the GHG emissions intensity of the agriculture industry remained relatively stable from 1990 to 2018. Although the level of GHG emissions from this industry are not the highest compared to other industries (see Figure 3), the industry's relatively low level of GVA meant the agriculture industry had the highest GHG emissions intensity in 2018.

GHG emissions from the agriculture industry are mainly of methane (53% in 2018) and nitrous oxide (29% in 2018). Methane is produced by the digestive processes of cattle and nitrous oxide emissions relate to the use of synthetic nitrogenous fertilisers. Emissions of each of these GHGs from the agriculture industry have fallen by almost a fifth from 1990 to 2018 as livestock numbers and the use of such fertilisers have decreased.

Figure 2: Greenhouse gas (GHG) emissions intensity of the energy supply industry fell by 69% from 1990 to 2018

GHG emissions intensity for the six most intensive industries, UK (residency basis), 1990 to 2017 and provisional 2018



Source: Office for National Statistics – UK Environmental Accounts, Atmospheric emissions datasets

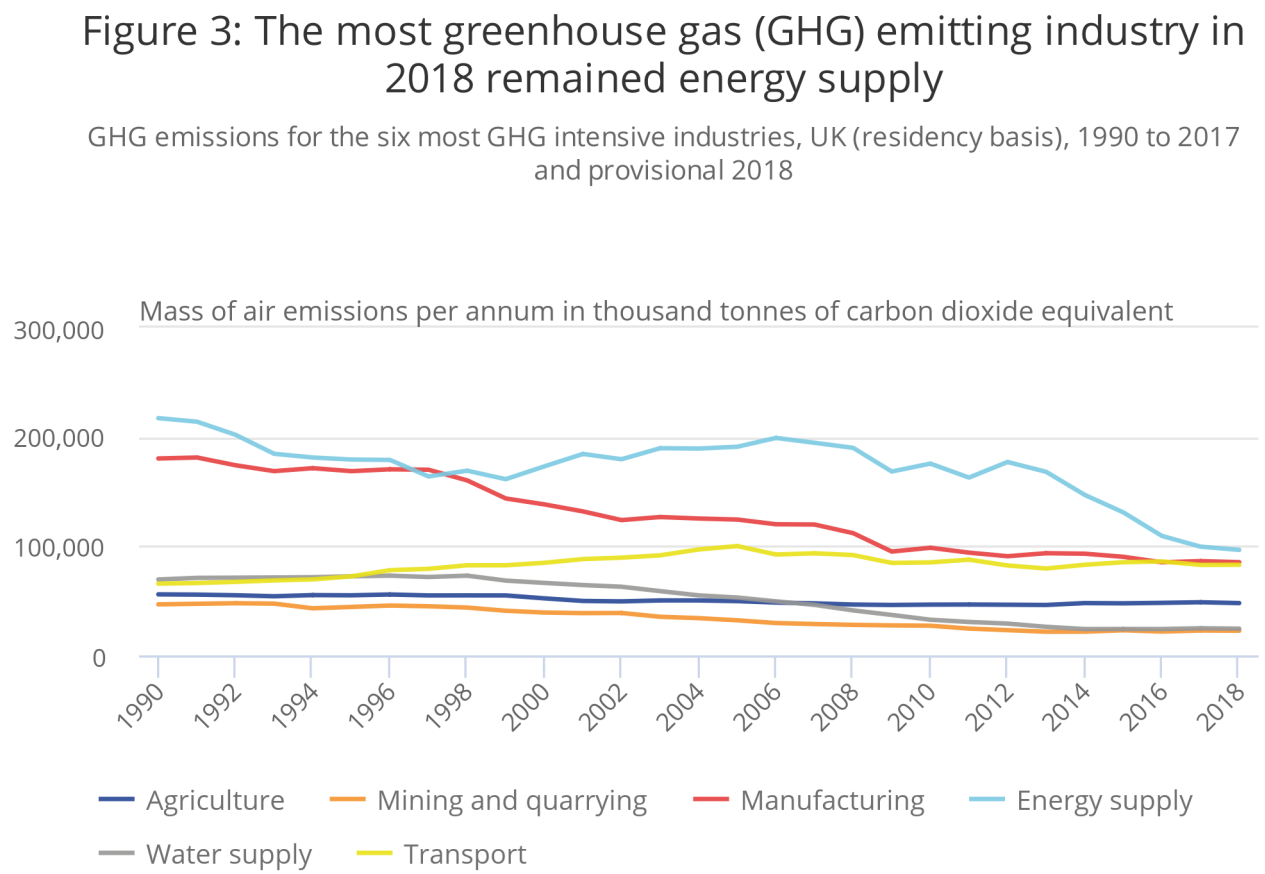
Notes:

1. GHG emissions intensity is calculated by dividing the level of GHG emissions by gross value added (GVA). This is the difference between output and intermediate consumption for any given industry. This means the difference between the value of goods and services produced (output) and the cost of raw materials and other inputs which are used up in production (intermediate consumption). GVA data are chained volume measures, in constant prices, with 2016 defined as the base year.

2. Industry aggregations are based on the UK Standard Industrial Classification (SIC) 2007. Only those industries with the highest level of GHG emissions intensity are shown. Names are shortened in this chart as follows: energy = electricity, gas, steam and air conditioning supply industry section; agriculture = agriculture, forestry and fishing section; water supply = water supply; sewerage, waste management and remediation activities industry section; transport = transport and storage industry section.

Figure 3: The most greenhouse gas (GHG) emitting industry in 2018 remained energy supply

GHG emissions for the six most GHG intensive industries, UK (residency basis), 1990 to 2017 and provisional 2018



Source: Office for National Statistics – UK Environmental Accounts, Atmospheric emissions datasets

Notes:

1. Industry aggregations are based on the UK Standard Industrial Classification (SIC) 2007. Only those industries with the highest level of GHG emissions are shown. Names are shortened in this chart as follows: energy = electricity, gas, steam and air conditioning supply industry section; agriculture = agriculture, forestry and fishing section; water supply = water supply; sewerage, waste management and remediation activities industry section; transport = transport and storage industry section.

2. Environmental accounts estimates of total GHG emissions are produced on a residency basis in line with the United Nations System of Environmental-Economic Accounting and may differ from other estimates in the public domain. Differences are explained in the Air Emissions Quality and Methodology Information report.

Notes for: Greenhouse gas emissions intensity of the energy supply industry fell by 69% from 1990 to 2018

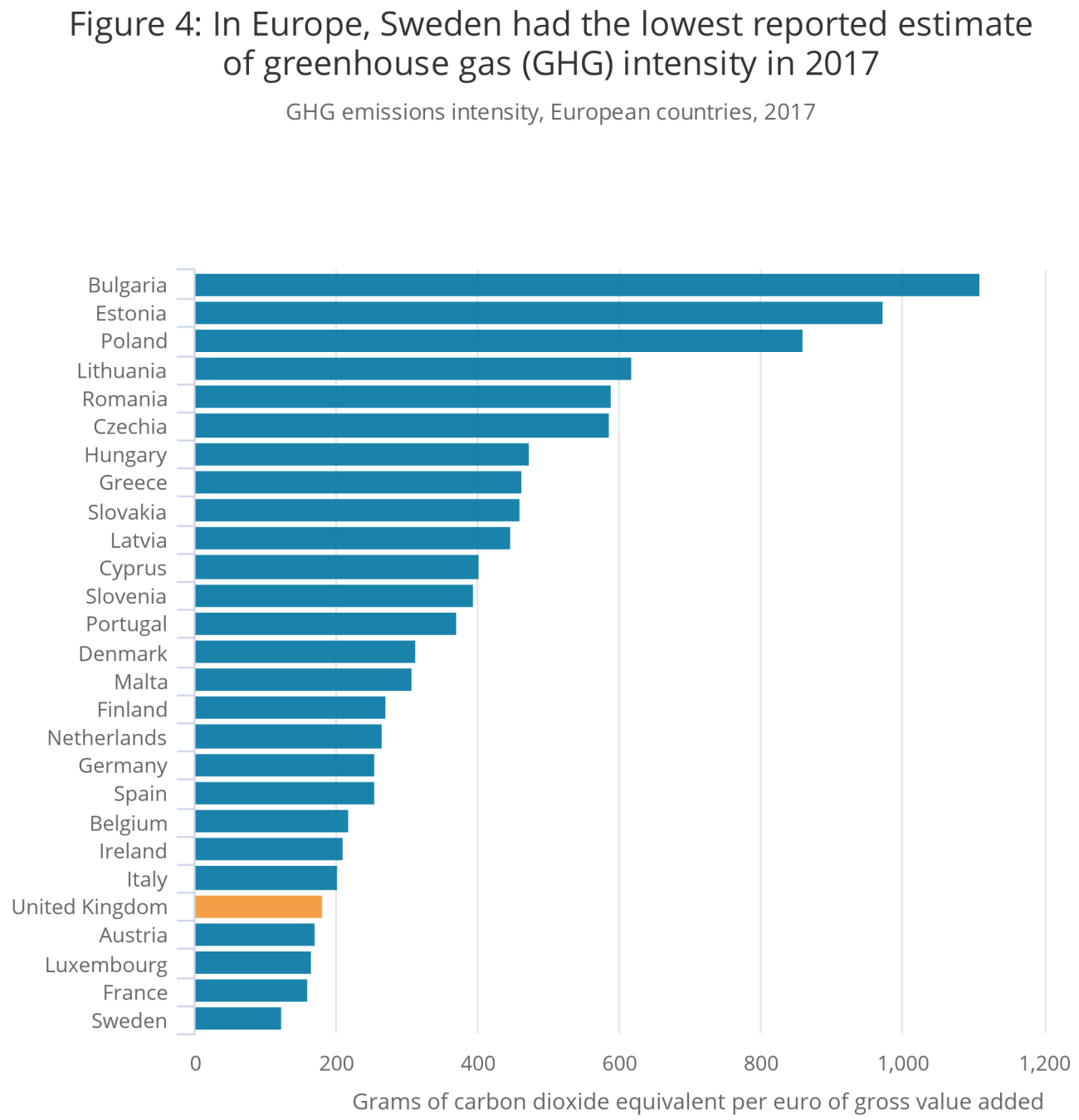
1. Industry aggregations are based on the UK Standard Industrial Classification (SIC) 2007. Only those industries with the highest level of GHG emissions are shown. Names are shortened as follows: energy = electricity, gas, steam and air conditioning supply industry section; agriculture = agriculture, forestry and fishing section; water supply = water supply; sewerage, waste management and remediation activities industry section; transport = transport and storage industry section.

5 . In Europe, only Sweden, France, Luxembourg and Austria had lower greenhouse gas (GHG) intensity estimates than the UK in 2017

Greenhouse gas (GHG) emissions intensity[1] can be compared across European countries. In 2017, for countries that had reported data on emissions[2], only Germany had higher emissions than the UK. In terms of GHG intensity, the UK figure was relatively low – only Sweden, France, Luxembourg and Austria had lower GHG intensity estimates.

Figure 4: In Europe, Sweden had the lowest reported estimate of greenhouse gas (GHG) intensity in 2017

GHG emissions intensity, European countries, 2017



Source: Eurostat

Notes:

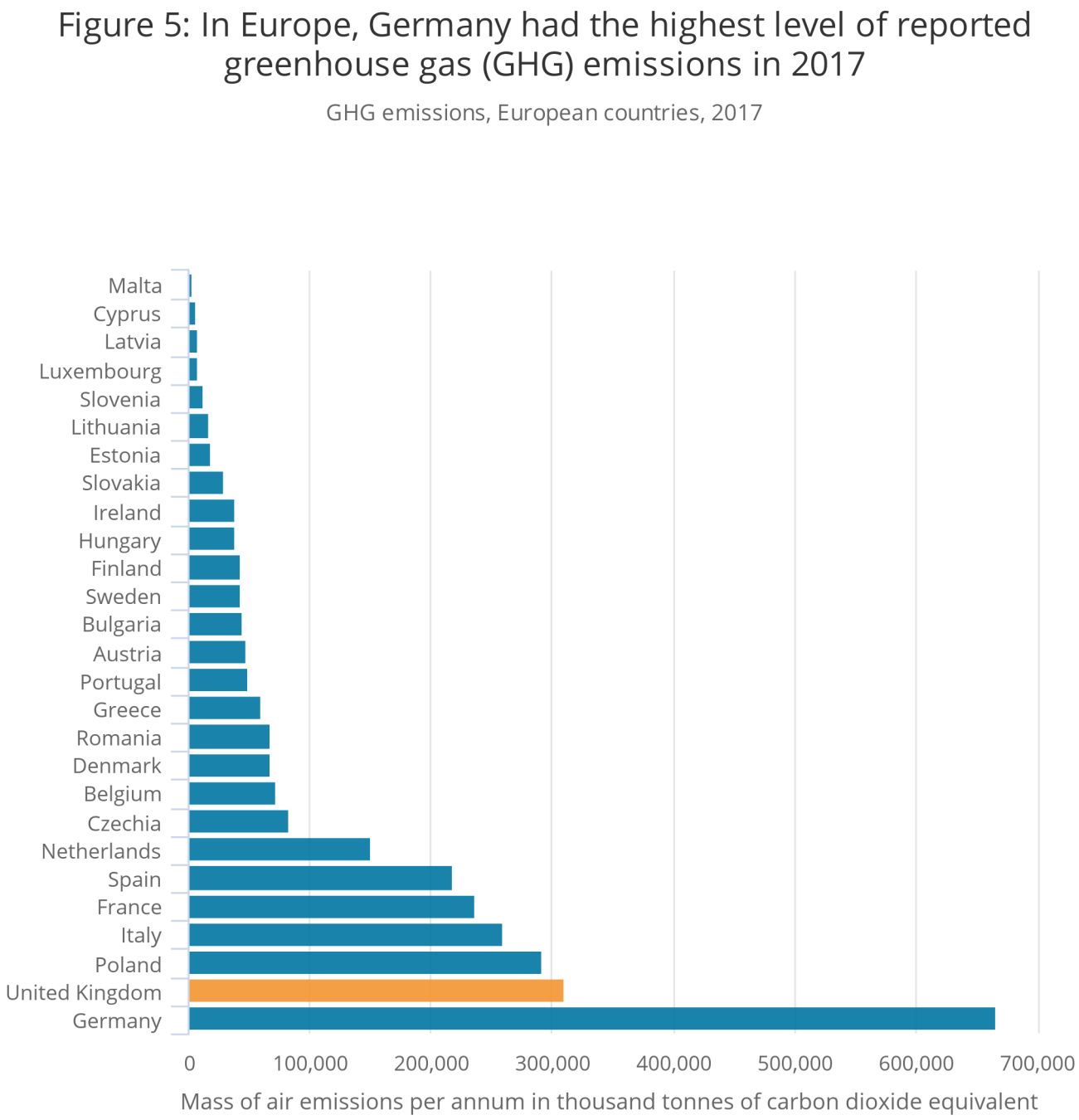
1. Because of the unavailability of data on emissions of gases for some countries, GHG emissions for European comparison include only carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O).

2. GHG intensity is calculated based on data supplied to Eurostat in 2018. At the time of compiling this chart, 2017 estimates were not available for Croatia, Iceland, Norway, Switzerland, Serbia and Turkey.

3. GHG intensity is calculated excluding emissions from households.

Figure 5: In Europe, Germany had the highest level of reported greenhouse gas (GHG) emissions in 2017

GHG emissions, European countries, 2017



Source: Eurostat

Notes:

1. Because of the unavailability of data on emissions of gases for some countries, GHG emissions for European comparison include only carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O).

2. GHG emissions are calculated based on data supplied to Eurostat in 2018. At the time of compiling this chart, 2017 data were not available for Croatia, Iceland, Norway, Switzerland, Serbia and Turkey.

3. GHG emissions are calculated excluding emissions from households.

Notes for: In Europe, only Sweden, France, Luxembourg and Austria had lower greenhouse gas (GHG) intensity estimates than the UK in 2017

1. Because of the unavailability of data on emissions of gases for some countries, GHG emissions for European comparison include only carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O).

2. Data for 2018 are not available for all countries so comparisons are made on 2017 estimates. At the time of compiling these estimates, 2017 data were not available for Croatia, Iceland, Norway, Switzerland, Serbia and Turkey. In 2016, Switzerland and Norway had low GHG intensity estimates and Turkey had high emissions relative to the other countries.

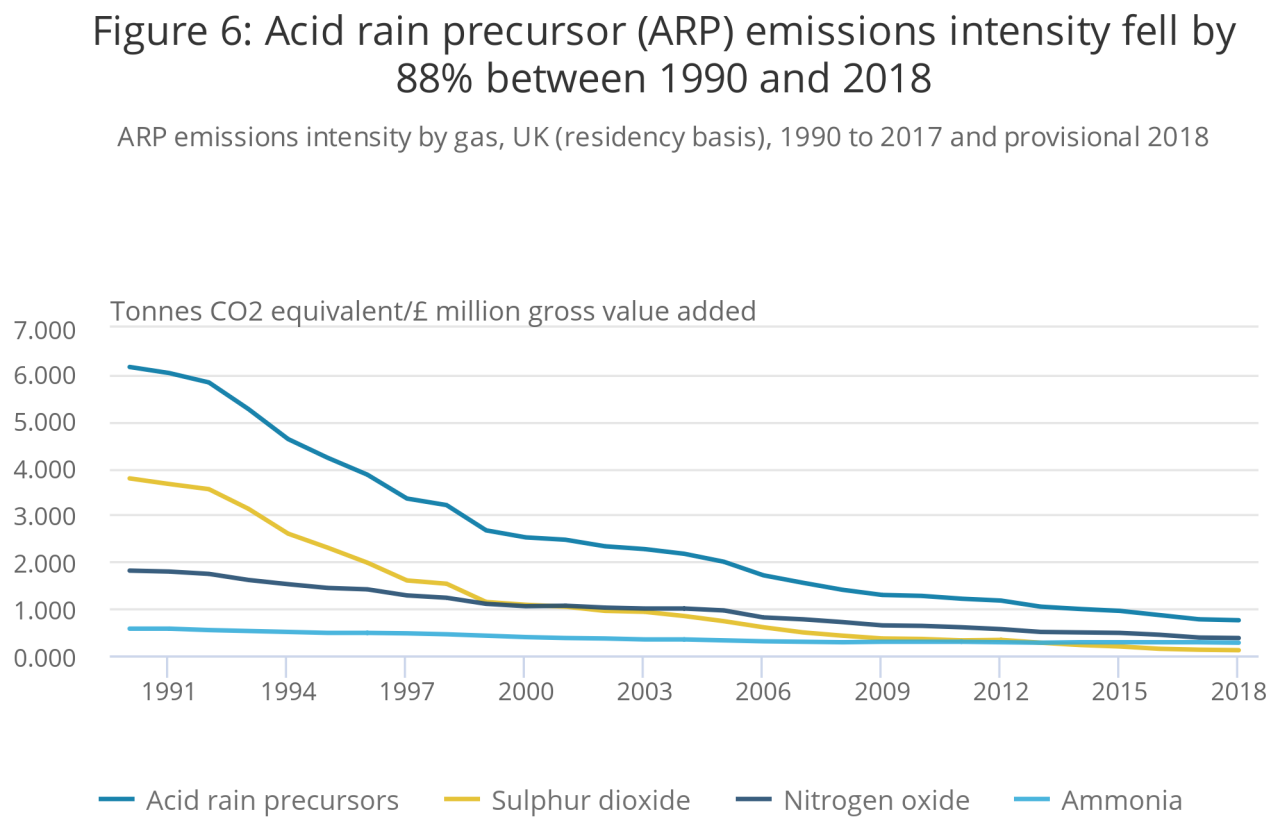
6 . The emissions intensity of acid rain precursors for the UK fell by 88% between 1990 and 2018

Datasets published alongside this article include Atmospheric emissions: acid rain precursors by industry and gas and Atmospheric emissions: other pollutants by industry and gas.

Figure 6 shows the emissions intensity of acid rain precursors (ARP) in the UK. ARPs include sulphur dioxide (SO2), nitrogen oxide (N2O) and ammonia (NH3). The UK's ARP emissions intensity fell 88% between 1990 and 2018. Over this period, SO2 emissions intensity fell by 97%, driven by falls in the energy supply industry (SO2 emissions are given in the acid rain precursors by industry dataset). The fall in SO2 emissions is mainly because of decreases in such emissions from the production of coal and, to a lesser extent, oil industries.

Figure 6: Acid rain precursor (ARP) emissions intensity fell by 88% between 1990 and 2018

ARP emissions intensity by gas, UK (residency basis), 1990 to 2017 and provisional 2018



Source: Office for National Statistics – UK Environmental Accounts, Atmospheric emissions datasets and GDP low level aggregates

Notes:

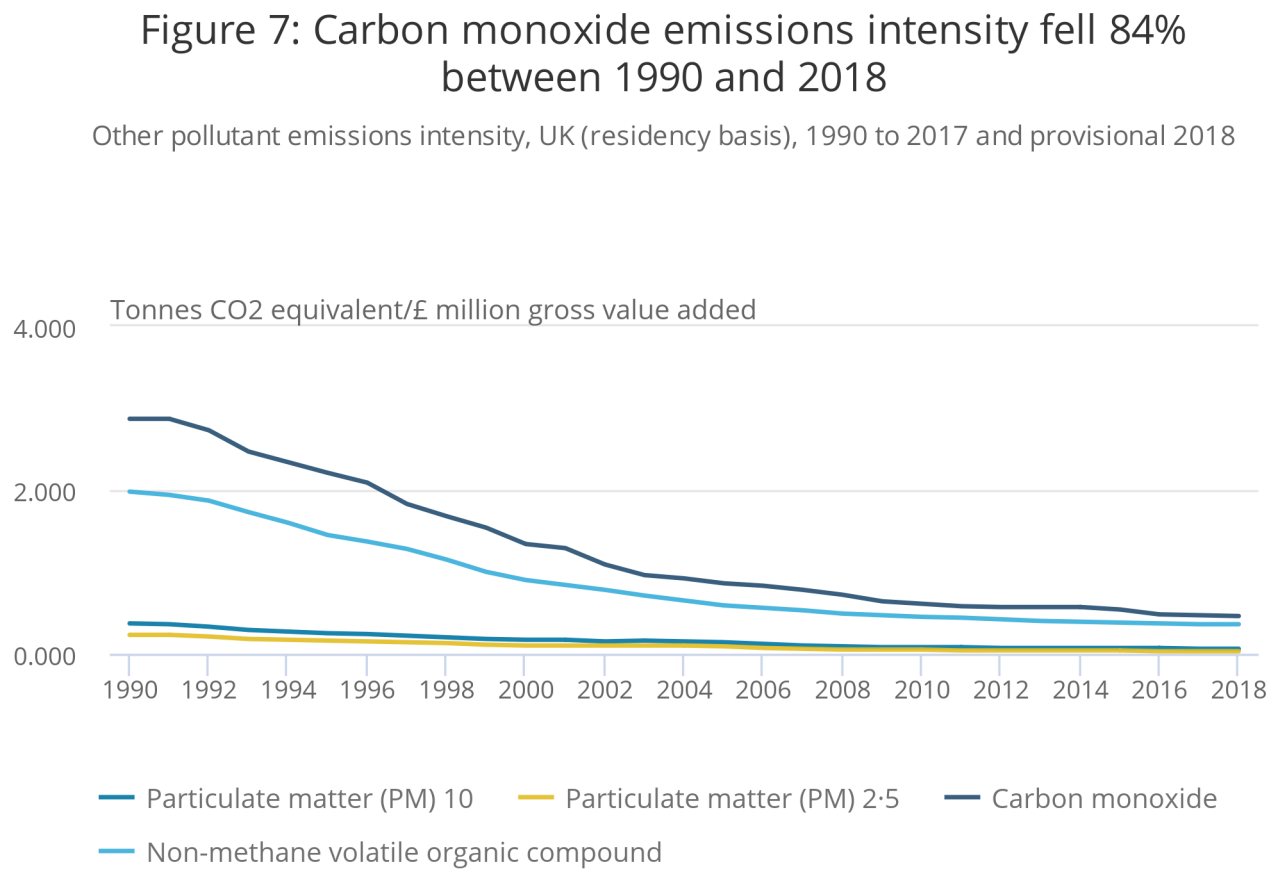
1. ARP emissions intensity is calculated by dividing the level of ARP emissions by gross value added (GVA). GVA data are chained volume measures, in constant prices, with 2016 as the base year.

2. ARP emissions intensity is calculated excluding emissions from households (referred to as “consumer expenditure” emissions in the datasets accompanying this article).

Figure 7 shows the “other” pollutants included in the datasets provided with this article: particulate matter (PM) 10 and PM2.5, carbon monoxide (CO) and non-methane volatile organic compound (NMVOC). CO emissions intensity fell 84% between 1990 and 2018, a decline caused by reductions in emissions from the agriculture and transport industries.

Figure 7: Carbon monoxide emissions intensity fell 84% between 1990 and 2018

Other pollutant emissions intensity, UK (residency basis), 1990 to 2017 and provisional 2018



Source: Office for National Statistics – UK Environmental Accounts, Atmospheric emissions datasets and GDP low level aggregates

Notes:

1. Other pollutants emissions intensity is calculated by dividing the level of emissions by gross value added (GVA). GVA data are chained volume measures, in constant prices, with 2016 as the base year.

2. Other pollutant emissions intensity is calculated excluding emissions from households (referred to as “consumer expenditure” emissions in the datasets accompanying this article).

Nearly half of CO emissions in 2018 were emitted by households (for which intensity cannot be measured). Between 1990 and 2017, there was a 93% drop in household travel related emissions of CO (see “consumer expenditure” emissions, other pollutants by industry). A fall in household emissions, again from travel, has also prompted a downward trend in NMVOC emissions.