Office for National Statistics

Statistical bulletin

Greenhouse gas intensity, provisional estimates, UK: 2017

Greenhouse gas emissions intensity for the UK, by industrial sector, long-term trends and European comparisons. Part of the UK Environmental Accounts.

Contact:
Louise Clarke and Laura Tolland
environment.accounts@ons.gov.uk
+44 (0)1 633 456097

Release date:
5 February 2019

Next release:
To be announced

Table of contents

1 . Main points

- Greenhouse gas emissions intensity, the level of emissions per unit of economic output (constant price level), for the UK fell 4% between 2016 and 2017, the continuation of a long-term trend.
- Between 2016 and 2017, nearly every sector reduced their greenhouse gas emissions intensity; the greatest reduction was in the energy supply sector.
- In 2017, greenhouse gas intensity was greatest in the agriculture, forestry and fishing sector.
- In 2016, the UK had the seventh-lowest greenhouse gas intensity when compared with other European countries.
- The Sustainable Development Goals (SDGs) Indicator 9.4.1 measures carbon dioxide emissions per unit of value added (or carbon dioxide emissions intensity); for the UK this has reduced by 48% since 1997 and 4% since 2016.

2 . Things you need to know about this release

Air emissions accounts (AEA) record flows of gaseous and particulate materials emitted by the economy into the atmosphere. The air emissions accounts can be used to measure the intensity of emissions across the economy as a whole or within particular industries. Emissions intensity is measured as the level of emissions per unit of economic output (constant price level).

Estimates of figures on greenhouse gas emissions intensity are part of the UK Environmental Accounts, which are “satellite accounts” to the main UK National Accounts. The environmental accounts show how the environment contributes to the economy (for example, through the extraction of raw materials), the impact that the economy has on the environment (for example, energy consumption and air emissions) and how society responds to environmental issues (for example, through taxation and expenditure on environmental protection).

The UK Environmental Accounts are based on a UK residency basis (as opposed to a territory basis) so 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 excluded. This is in line with national accounting principles, allowing environmental impacts to be compared on a consistent basis with economic indicators such as gross domestic product (GDP). In terms of air emissions, it allows the calculation of emissions intensity.

UK figures for air emissions on a territory basis are published by the Department for Business, Energy and Industrial Strategy (BEIS) and the Department for Environment, Food and Rural Affairs (Defra). The emissions bridging tables illustrate the difference between these estimates for 1990 to 2016; bridging data are not yet available for 2017. Further explanation of the differences can be found in the article Alternative approaches to reporting UK greenhouse gas emissions (PDF, 253KB).

The data for 2017 are provisional; details of the methodology used can be found in the Quality and methodology section.

This section includes analysis by Standard Industry Classification 2007: SIC 2007. To simplify, within the text:

- the electricity, gas, steam and air conditioning supply sector is referred to as the energy supply sector
- the transport and storage sector is referred to as the transport sector
- the water supply; sewerage, waste management and remediation activities sector is referred to as the water supply sector

Greenhouse gas intensity cannot be calculated for consumer expenditure so this is not covered in this bulletin. However, it should be noted that in 2017 greenhouse gas emissions related to consumer expenditure were higher than for any industry. Figures of greenhouse gas emissions for consumer expenditure can be found in the Atmospheric emissions: greenhouse gasses dataset released alongside this bulletin.

3 . Greenhouse gas intensity for the UK has continued to fall

When comparing greenhouse gas (GHG) emissions across sectors and countries, the size of the country or sector will have an impact. To understand how efficient an industry or country is in regard to its GHG emissions it is helpful to consider GHG intensity.

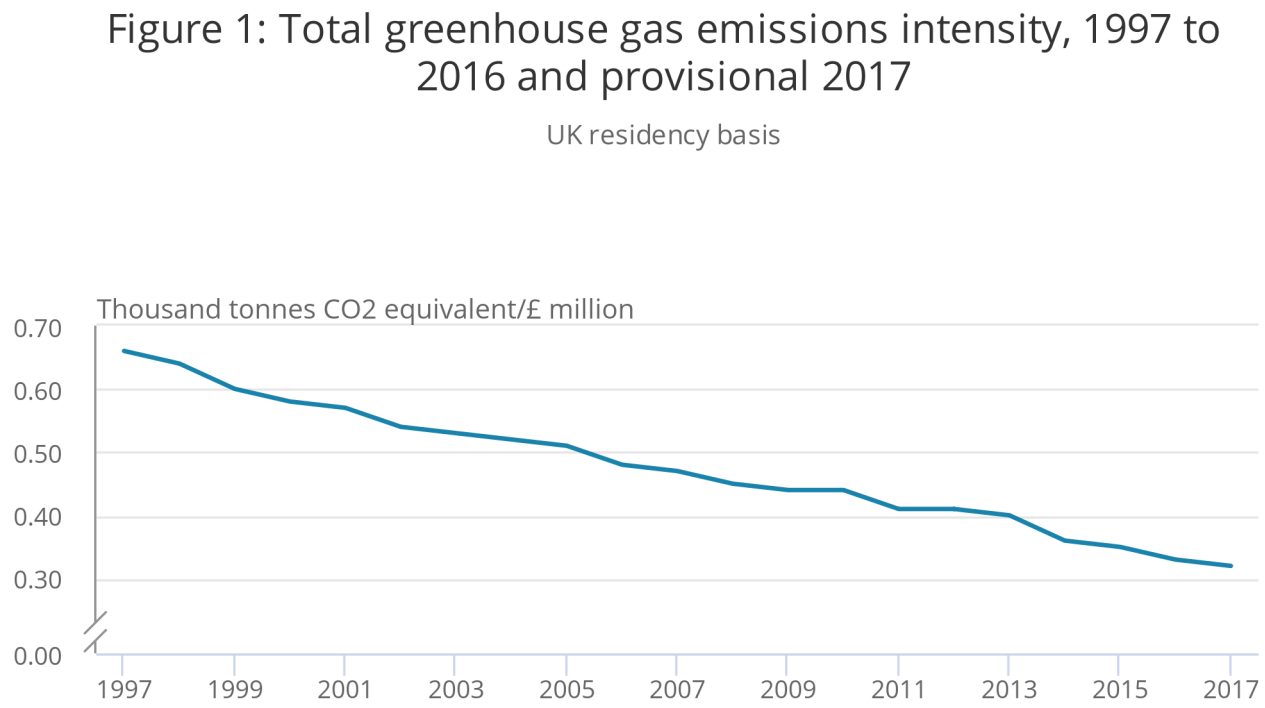
GHG intensity measures the level of emissions per unit of economic output (constant price level) [1] and can be used to examine the relationship between economic growth and greenhouse gas emissions. For example, a reduction in overall UK greenhouse gas emissions intensity may indicate the UK is moving 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 economic output. At the same time, it may also reflect changes to the structure of the economy, for example, a change from manufacturing industries to services, which produce fewer GHG emissions.

Between 2016 and 2017, GHG emissions intensity for the UK fell 4%, from 0.33 to 0.32 thousand tonnes of carbon dioxide (CO2) equivalent per £million of value added [2] . This was a continuation of a long-term trend.

Figure 1 shows GHG intensity for the UK has reduced steadily over time. Since 1997, there has been a reduction of 52% (from 0.66 to 0.32 thousand tonnes of CO2 equivalent per £million of value added). This reduction is partly because some industries have become more efficient and reduced their greenhouse gas emissions in relation to their economic output. In addition, the UK has switched to a more service-based economy, with the importance of heavily-polluting industries decreasing since 1997.

Figure 1: Total greenhouse gas emissions intensity, 1997 to 2016 and provisional 2017

UK residency basis



Source: Ricardo Energy and Environment, Office for National Statistics - Environment Accounts

Notes:

1. Greenhouse gas emissions intensity is calculated by dividing the level of greenhouse gas emissions by Gross Value Added (GVA) in constant prices. This is the difference between output and intermediate consumption for any given industry/sector. 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). Data are in constant prices with 2016 defined as the base year.

2. Details on the nowcasting methodology used can be found in this article.

3. All figures are reported to 2 decimal places.

4. Total figures are based on raw data and therefore may not sum due to rounding.

5. All emissions intensity figures exclude consumer expenditure.

6. Estimates for 2017 are provisional.

Notes for: Greenhouse gas intensity for the UK has continued to fall

1. Greenhouse gas emissions intensity is calculated by dividing the level of greenhouse gas emissions by gross value added (GVA) in constant prices. This is the difference between output and intermediate consumption for any given industry or sector. 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). Data are in constant prices with 2016 defined as the base year. All emissions intensity figures exclude consumer expenditure.

2. Percentage changes are calculated from the unrounded data, so may differ slightly to those calculated on data quoted in the text or reference tables.

4 . The agriculture, forestry and fishing sector had the highest greenhouse gas emissions intensity in 2017

Greenhouse gas (GHG) emissions intensity reduced for all sectors between 1997 and 2017. The water supply sector saw the greatest reduction in GHG intensity between 1997 and 2017, with a fall of 79%. However, this sector was responsible for less than 10% of overall GHG emissions in both 1997 (9%) and 2017 (4%).

Between 1997 and 2017, there were five industries with a greenhouse gas emissions intensity above 1,000 tonnes of CO2 equivalent per £million value added. These were the most intensive industries and are shown in Figure 2. Individually, these five industries have higher greenhouse gas emissions intensity than the economy as a whole. This demonstrates that the industries that contribute the most to the economy have lower levels of greenhouse gas emissions intensity.

Since 1997, the energy supply sector has generally been the largest emitter of GHG emissions and had the highest level of GHG intensity. However, emissions intensity for this sector reduced by 47% between 1997 and 2017 and the agriculture, forestry and fishing sector overtook the energy supply sector as the sector with the largest GHG emissions intensity in 2016. This continued to be the case in 2017, with the gap between these two sectors widening further. It is important to note that while this industry is the most intensive, it is not the most emitting.

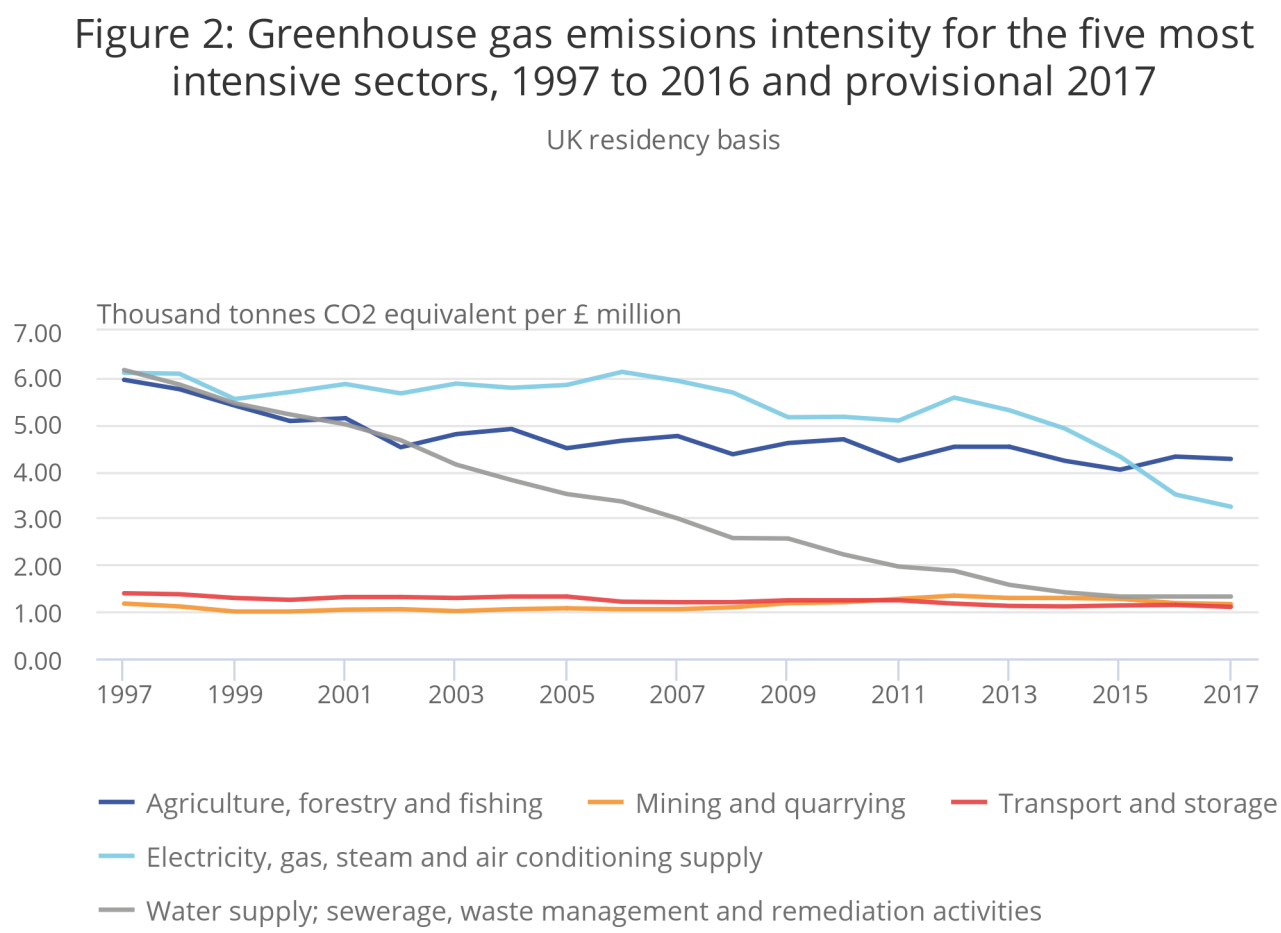
Both agriculture, forestry and fishing, and the energy supply sector have increased in size (shown by an increase in gross value added) between 1997 and 2017. Agriculture, forestry and fishing had a 24% increase, and the energy supply sector had a 12% increase.

Both sectors have reduced their greenhouse gas emissions since 1997. While the energy sector still emitted more greenhouse gases than agriculture, forestry and fishing in 2017, the difference between the sectors lessened. In 1997, the energy sector emitted 106,519 thousand tonnes of CO2 equivalent more than agriculture, forestry and fishing. In 2017, the energy sector emitted 47,286 thousand tonnes of CO2 equivalent more than agriculture, forestry and fishing. Between 1997 and 2017, the energy sector had a greater reduction in greenhouse gas emissions than agriculture, forestry and fishing (40% and 11% reductions respectively) (Figure 3).

Between 2016 and 2017, around 85% of industries reduced their greenhouse gas emissions intensity. The greatest reduction was in the energy supply sector, which fell by 7% (from 3.5 to 3.2 thousand tonnes of CO2 equivalent per £million of value added). It also had the biggest reduction in absolute terms, with a fall of 0.26 thousand tonnes of CO2 equivalent per £million of value added between 2016 and 2017.

Figure 2: Greenhouse gas emissions intensity for the five most intensive sectors, 1997 to 2016 and provisional 2017

UK residency basis



Source: Ricardo Energy and Environment, Office for National Statistics - Environment Accounts

Notes:

1. Greenhouse gas emissions intensity is calculated by dividing the level of greenhouse gas emissions by Gross Value Added (GVA) in constant prices. This is the difference between output and intermediate consumption for any given industry/sector. 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). Data are in constant prices with 2016 defined as the base year.

2. Details on the nowcasting methodology used can be found in this article.

3. All figures are reported to two decimal places.

4. Total figures are based on raw data and therefore may not sum due to rounding.

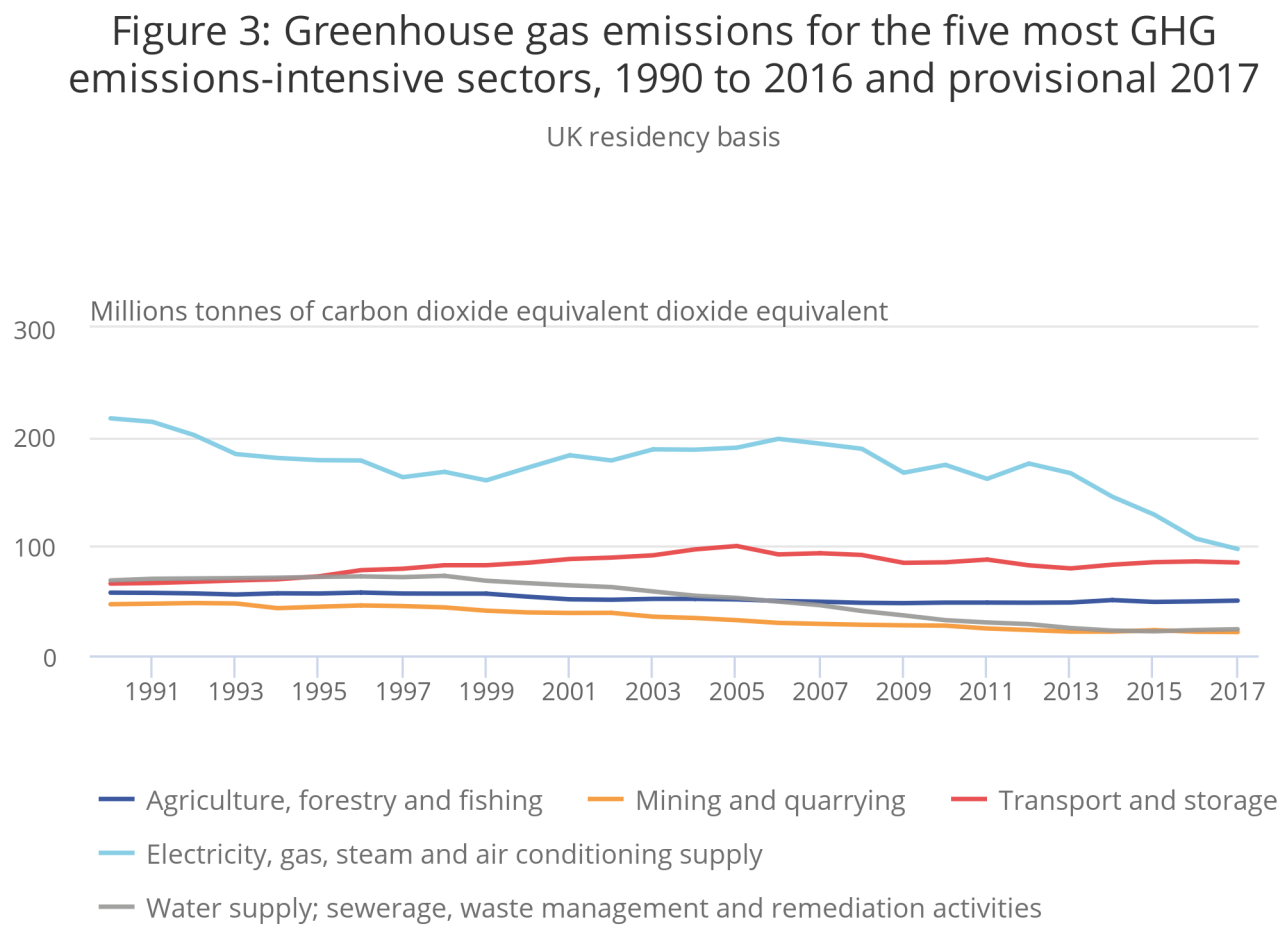
5. All emissions intensity figures exclude consumer expenditure.

6. Estimates for 2017 are provisional.

7. Industry aggregations are based on the UK Standard Industrial Classification (SIC) 2007. Not all industries (SICs) have been included. Note: before 2017 data are provisional: All emissions intensity figures exclude consumer expenditure. Industry level greenhouse gas emissions intensity calculations cannot be summed to reach total greenhouse gas intensity because it is calculated as a ratio.

Figure 3: Greenhouse gas emissions for the five most GHG emissions-intensive sectors, 1990 to 2016 and provisional 2017

UK residency basis



Source: Ricardo Energy and Environment, Office for National Statistics - Environment Accounts

Notes:

1. Industry aggregations are based on the UK Standard Industrial Classification (SIC) 2007. Not all sectors are shown here, only those with the highest level of GHG emissions intensity. This may not be the same as the sectors with the largest GHG emissions.

2. Estimates for 2017 are provisional. Details on the nowcasting methodology used can be found in the methodology section of this article.

5 . UK has improved in European rankings of greenhouse gas emissions intensity

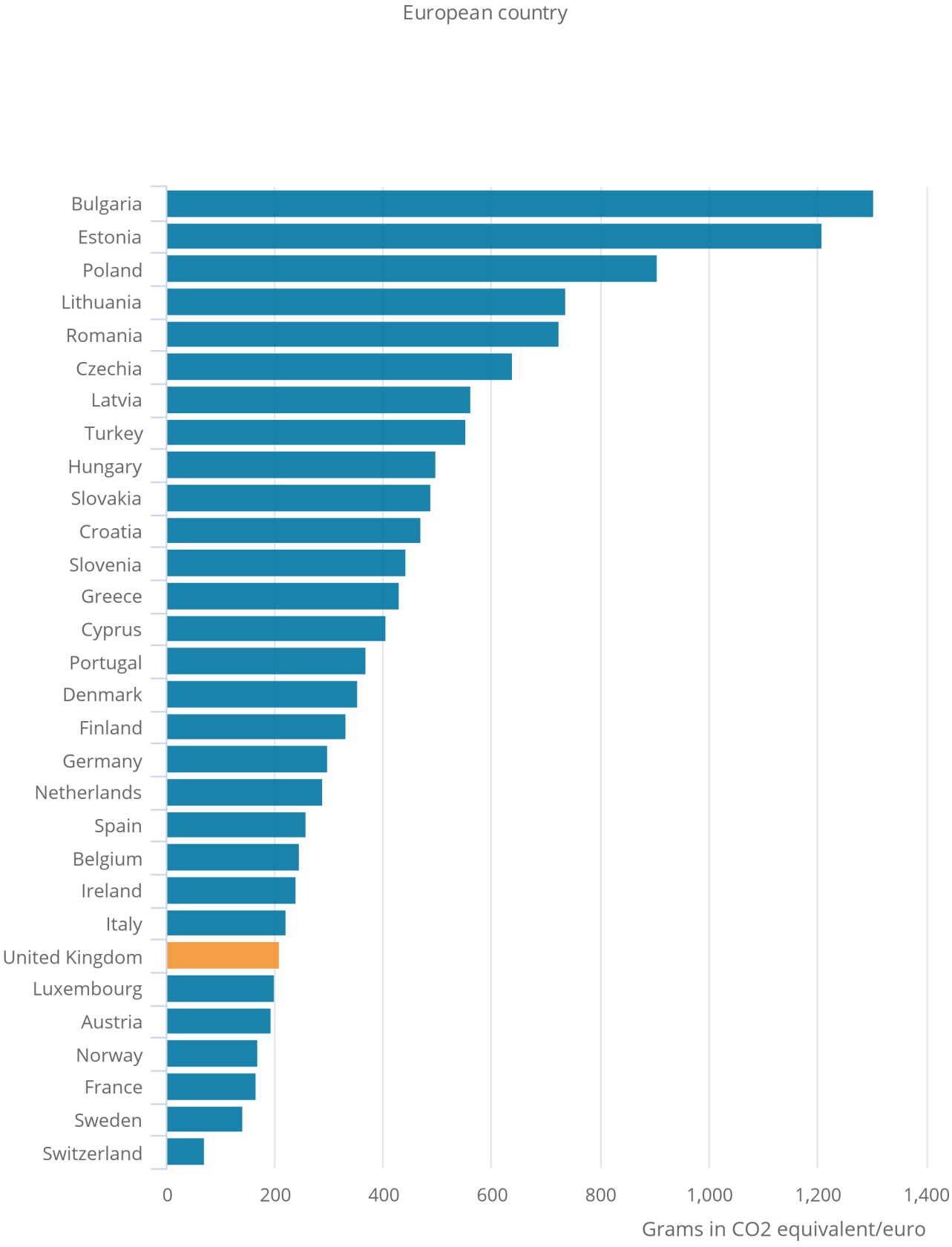
Greenhouse gas (GHG) emissions intensity[1] can be compared across European countries. In 2016[2] , while the UK was the third biggest emitter of GHGs (Figure 5) when compared with other EU countries, only six European countries emitted less when the size of their economy was taken into account, that is, GHG intensity (Figure 4).

Between 2008 and 2017, the UK reduced its GHG intensity in relation to other EU countries, moving from having the 10th-lowest GHG emissions intensity in 2008 to the 7th-lowest in 2016.

Figure 4: Greenhouse gas emissions intensity, 2016

European country

Figure 4: Greenhouse gas emissions intensity, 2016



Source: Eurostat

Notes:

1. Due to the unavailability of data on emissions of gasses for some countries, GHG emissions for European comparison include only carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O). Figures for the UK will therefore differ to those found in the rest of this bulletin.

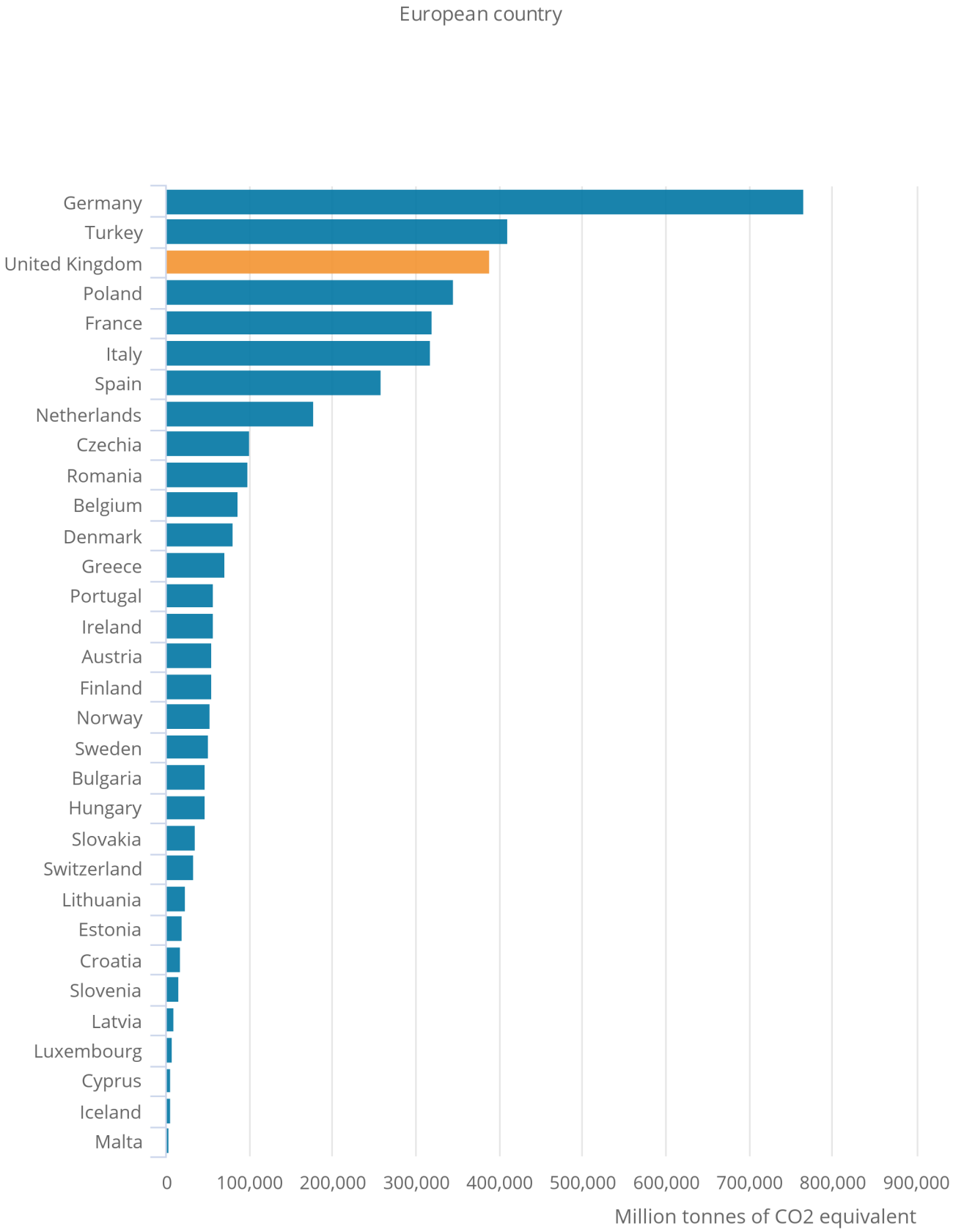
2. Greenhouse gas emissions intensity is calculated by dividing the level of greenhouse gas emissions by gross value added (GVA) in constant prices (or chain linked volumes). This is the difference between output and intermediate consumption for any given industry/sector. This means the difference between 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). Data are in constant prices with 2010 defined as the base year.

3. No data available for Malta. Iceland and Serbia for 2016.

Figure 5: Greenhouse gas emissions in million tonnes, 2016

European country

Figure 5: Greenhouse gas emissions in million tonnes, 2016



Source: Eurostat

Notes:

1. Due to the unavailability of data on emissions of gasses for some countries, greenhouse gas emissions for European comparison include only carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O). Figures for the UK will therefore differ to those found in the rest of this bulletin.

Notes for:

1. Due to the unavailability of data for F gasses for some countries, GHG emissions for European comparison include only carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O). Figures for the UK will therefore differ to those found in the datasets associated with this bulletin.

2. Data for 2017 are not available for all countries, so comparisons are made on 2016 estimates.

6 . Carbon dioxide intensity monitored by the Sustainable Development Goals

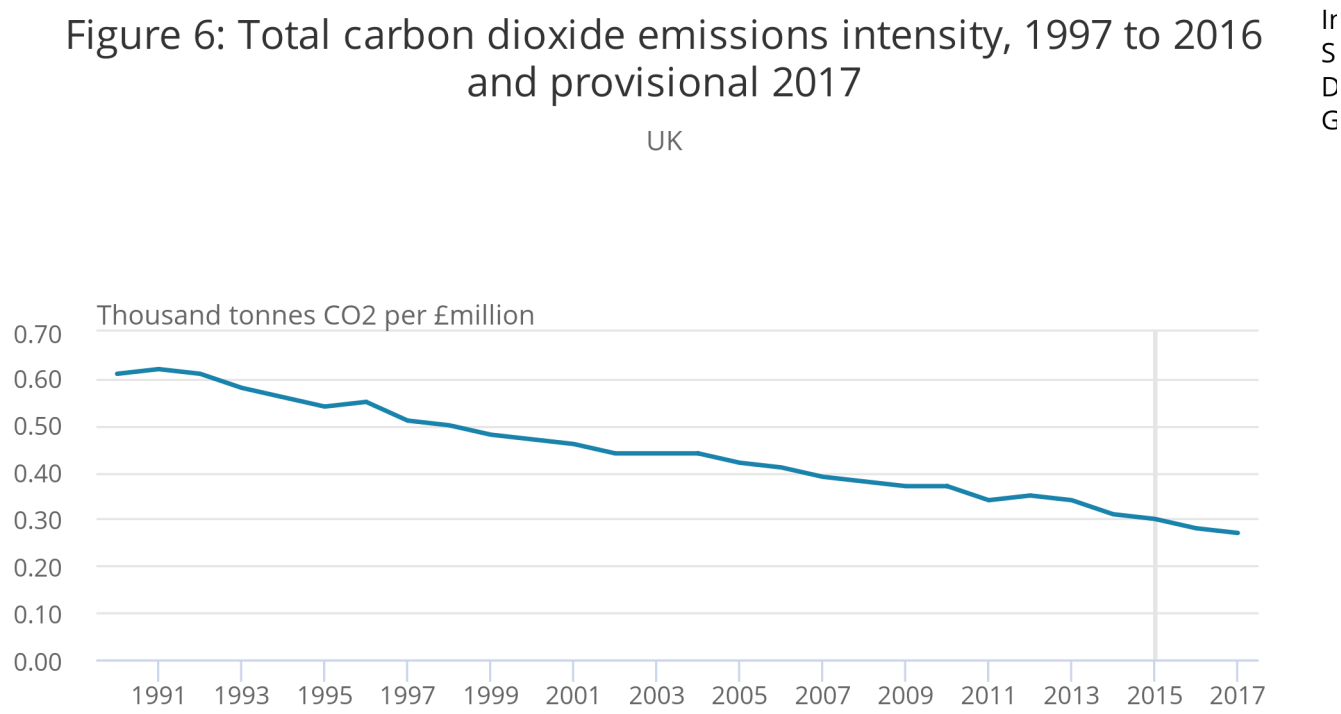
Air emissions are part of the Sustainable Development Goals (SDGs). These were introduced in 2015 and are a universal set of 17 Goals designed to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030. More information about SDGs can be found on the UN website.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

In particular, air emissions are monitored under “Indicator 9.4.1: CO2 emission per unit of value added”, or CO2 intensity 1. Carbon dioxide (CO2) is the main greenhouse gas and tends to drive any change in emissions. The aim is to reduce the amount of CO2 emissions through the use of sustainable, efficient and clean industrial processes and technologies.

Figure 6 shows CO2 intensity has reduced steadily over time. Between 1997 and 2017, there has been a decrease of 48%. Between 2016 and 2017 there was a reduction of 4%.

Figure 6: Total carbon dioxide emissions intensity, 1997 to 2016 and provisional 2017

UK



Source: Ricardo Energy and Environment, Office for National Statistics - Environment Accounts

Notes:

1. Carbon dioxide intensity is calculated by dividing the level of carbon dioxide emissions by gross value added (GVA) in constant prices. This is the difference between output and intermediate consumption for any given industry/sector. 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). Data are in constant prices with 2016 defined as the base year.

2. All emissions intensity figures exclude consumer expenditure.

3. Note about 2017 being provisional data.

Between 1997 and 2017, all sectors except mining and quarrying reduced their CO2 emissions intensity, compared with all sectors reducing their overall greenhouse gas emissions intensity. Between 2016 and 2017, 80% of sectors reduced their CO2 emissions intensity.

In 2017, the energy supply sector was the most CO2 emissions-intensive, with 3.35 thousand tonnes of CO2 per £million. This differs to greenhouse gas (GHG) emissions intensity, where the agriculture, forestry and fishing sector had higher levels of intensity in 2016 and 2017. This is because the agriculture, forestry and fishing sector has higher levels of non-CO2 emissions, in particular ammonia (CH4) and nitrous oxide (N2O). Between 1997 and 2017, the energy supply sector had a reduction of 46% in CO2 emissions intensity. It also had the greatest reduction of all sectors between 2016 and 2017, at 8%.

Notes for: Carbon dioxide intensity monitored by the Sustainable Development Goals

1. Carbon dioxide emissions intensity is calculated by dividing the level of carbon dioxide emissions by gross value added (GVA) in constant prices. This is the difference between output and intermediate consumption for any given industry or sector. 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). Data are in constant prices with 2016 defined as the base year. All emissions intensity figures exclude consumer expenditure.

7 . Links to other related statistics

The UK Environmental Accounts

The UK Environmental Accounts are satellite accounts to the UK National Accounts and show how the environment contributes to the economy (for example, through the extraction of raw materials), the impact that the economy has on the environment (for example, energy consumption and air emissions) and how society responds to environmental issues (for example, through taxation and expenditure on environmental protection). More detailed analysis on greenhouse gas (GHG) emissions for 1997 to 2016, including analysis of consumer expenditure, can be found in the publication UK Environmental Accounts: 2018 and associated datasets.

UK air emissions statistics (territory basis)

UK greenhouse gas emissions data on a territory basis (PDF, 855KB) , which are reported to the United Nations Framework Convention on Climate Change (UNFCCC) and the United Nations Economic Commission for Europe (UNECE), are calculated by the Department for Business, Energy and Industrial Strategy (BEIS). These include emissions that occur within the UK's territorial boundaries. The final 2017 estimates are released today (5 February 2019). Tables that illustrate the differences between UK Environmental Accounts estimates and UNFCCC and UNECE estimates can be found in the emissions bridging table. A further explanation of the difference (PDF, 253KB) is also available.

Eurostat Air Emission Accounts

Eurostat undertakes annual data collections, which are covered by Regulation (EU) 691/2011 consolidated version. There are three AEA datasets available:

- Air emissions accounts by industry and household
- Air emissions accounts totals bridging to emission inventory totals
- Emissions of greenhouse gases and air pollutants induced by final use of classification of product by activity: CPA08 products (input-output analysis)

Details and links to data can be found on Eurostat's Air Emission Accounts webpage.

8 . Quality and methodology

This section contains useful definitions, details of the nowcasting methodology used for 2017 provisional figures and links to more detailed quality and methodology reports on air emissions.

Useful definitions

Greenhouse gas emissions include carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydro-fluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF6) and nitrogen trifluoride (NF3). These gases are widely believed to contribute to global warming and climate change. The potential of each greenhouse gas to cause global warming is assessed in relation to a given weight of CO2 so all greenhouse gas emissions are measured as carbon dioxide equivalents (CO2e).

Greenhouse gas emissions intensity is calculated by dividing the level of greenhouse gas emissions by gross value added (GVA) in constant prices. This is the difference between output and intermediate consumption for any given industry or sector. 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). Data are in constant prices with 2016 defined as the base year. All emissions intensity figures exclude consumer expenditure.

Nowcasting methodology

2017 estimates are provisional and have been calculated using a nowcasting method. As with the main 2016 Air and Energy Accounts, these are calculated on a basis which is consistent with SEEA requirements, and comparable with the existing time series.

The “nowcasting” estimates use as a base year the 2016 activity data used to report the 2016 UK data where available, and appropriate proxy data where not. Emission factors developed in the 2016 Accounts were applied to this data such that the eventual scaling for each Standard Industrial Classification: SIC 2007 sector and each pollutant is specifically based on the relative significance of emissions contributions by the various sources within the classification.

The provisional estimates for the 2017 air emissions accounts do not use the Business, Energy and Industrial Strategy (BEIS) provisional or final 2017 greenhouse gas (GHG) statistics. However, comparisons have been made to ensure they are in line (within expected margins).

Quality and Methodology Information report

A more detailed Quality and Methodology Information report on Air Emission Accounts is available. This contains important information on:

- the strengths and limitations of the data and how it compares with related data
- uses and users of the data
- how the output was created
- the quality of the output including the accuracy of the data