Office for National Statistics

Statistical bulletin

Greenhouse gas emissions, UK: provisional estimates, 2023

Measuring the air emissions generated by UK economic activities.

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Next release:
To be announced

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1 . Main points

- Provisional 2023 UK greenhouse gas emissions on a residence basis decreased by 3.8% on 2022, having increased 1.2% in 2022.
- UK emissions were 487 million tonnes of carbon dioxide equivalent (Mt CO2e) in 2023 (provisional), 0.3% below emissions in 2020 during the coronavirus (COVID-19) pandemic.
- The energy sector saw the largest decrease of all industries, with emissions falling 15.4% to 70 Mt CO2e.
- The sector with the largest increase was transport, up 3.7% in 2023 compared with 2022; this is the smallest year-on-year change since 2019.
- Consumer expenditure remains the largest single contributor at 24.5% of total UK greenhouse gas emissions in 2023, followed by the transport sector at 17.2%.
- Intensity dropped to 0.18 thousand tonnes of carbon dioxide equivalent per million pounds of gross value added for the UK; overall emissions intensity increased the most for transport in 2023, up 20.0% from 2022.

In this release, we refer to residence-based emissions. This is one of three official measures of UK greenhouse gas emissions. Residence-based emissions largely do not account for imported emissions. Territorial emissions, published by the Department for Energy Security and Net Zero, is the measure used for greenhouse gas emissions targets.

2 . Greenhouse gas emissions

UK provisional greenhouse gas emissions on a residence basis were estimated to be at 487 million tonnes of carbon dioxide equivalent (Mt CO2e) in 2023. This is the lowest annual estimate since the start of the time series in 1990. It is below the previous low in 2020 during the coronavirus (COVID-19) pandemic, of 488 Mt CO2e.

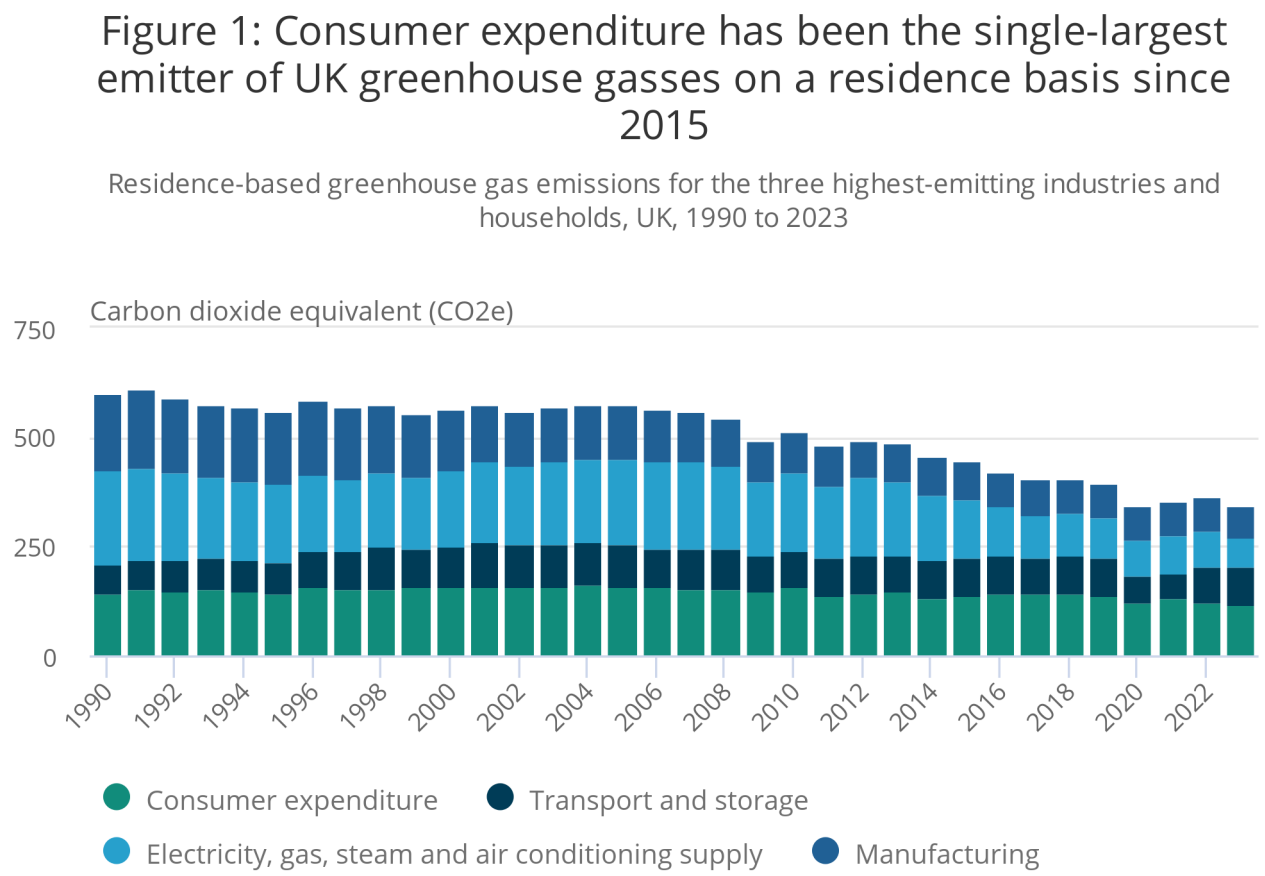
The energy industry was the largest contributor to this decrease in 2023, falling 15.4% from 2022. This can be attributed to a shift in fuel use from coal towards gas and renewables, as well as an increase in electricity imports.

Emissions from the transport sector continue to rise, however these remain 3.6% below pre-coronavirus pandemic levels.

Emissions from consumer expenditure fell slightly in 2023 compared with 2022, but these remain the single largest contributor to greenhouse gas emissions on a residence basis. Consumer expenditure-related emissions associated with non-travel activities, such as heating, have previously dominated this category, but are now almost the same as for travel activities.

Figure 1: Consumer expenditure has been the single-largest emitter of UK greenhouse gasses on a residence basis since 2015

Residence-based greenhouse gas emissions for the three highest-emitting industries and households, UK, 1990 to 2023



Source: Ricardo Energy and Environment, UK Environmental Accounts from the Office for National Statistics

Notes:

1. Industry aggregations are based on the UK Standard Industrial Classification (SIC) 2007. Households include “consumer expenditure” and “activities of households as employers; undifferentiated goods and services – producing activities of households for own use” (for example, employing a cleaner and growing vegetables for your own consumption). 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.

2. Greenhouse gas emissions include carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF6) and nitrogen trifluoride (NF3).

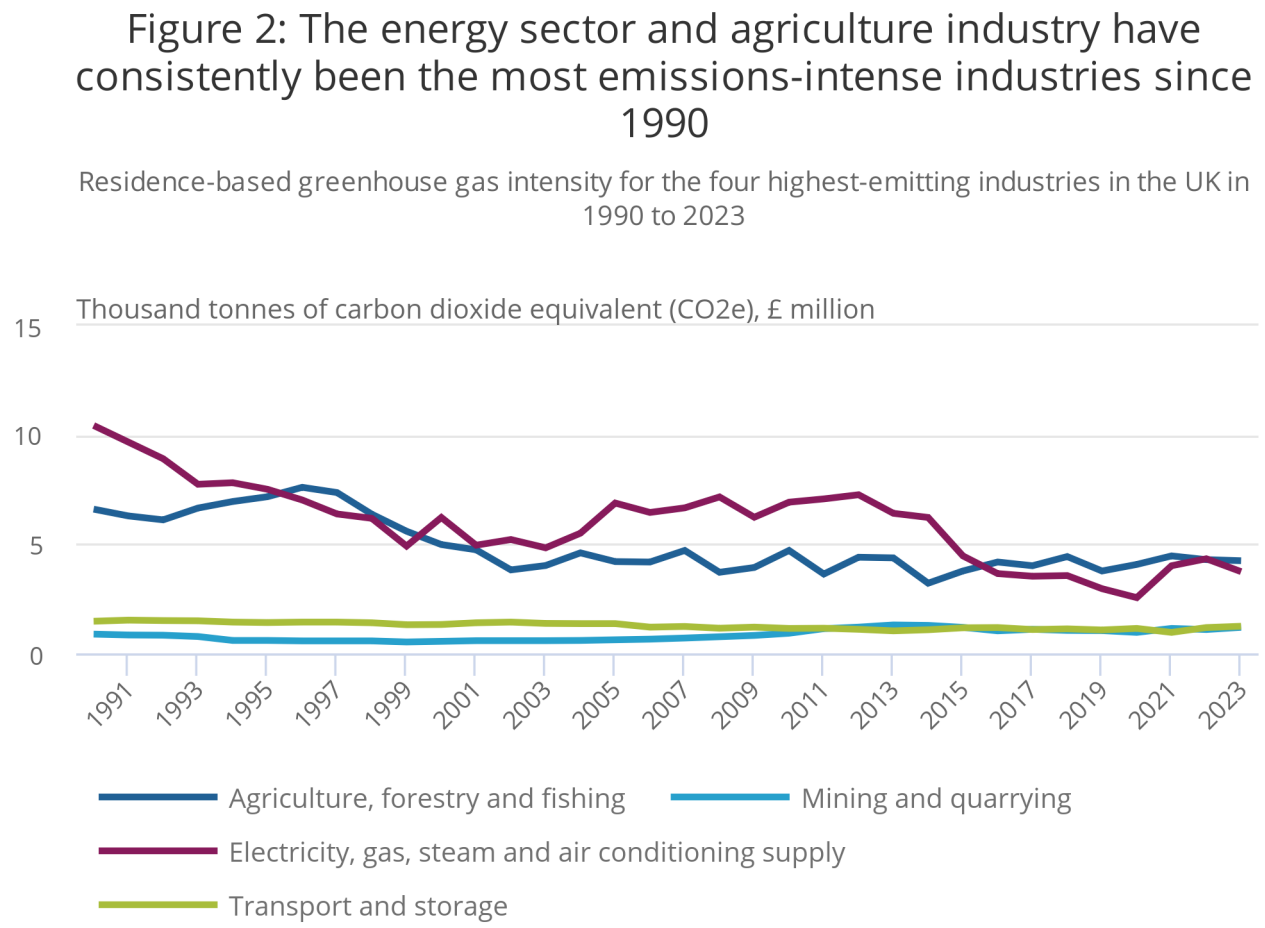
3 . Emissions intensity

Emissions intensity – emissions per unit of economic activity –was an estimated 0.18 thousand tonnes of carbon dioxide equivalent per million pounds of gross value added in 2023.

This figure has remained stable over the last couple of years. It is the lowest estimate of emissions intensity since 1990, the start of this series, and down 71% between 1990 and 2023.

Figure 2: The energy sector and agriculture industry have consistently been the most emissions-intense industries since 1990

Residence-based greenhouse gas intensity for the four highest-emitting industries in the UK in 1990 to 2023



Source: Ricardo Energy and Environment, UK Environmental Accounts from the Office for National Statistics

Notes:

1. Greenhouse gas emissions intensity is calculated by dividing the level of greenhouse gas emissions by Gross Value Added (GVA). GVA 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 are chained volume measures, in constant prices with 2019 as the base year. All emissions intensity figures are calculated excluding consumer expenditure (often referred to as 'households' in the article accompanying this dataset).

2. As part of Blue Book 2022, the 2020 data went through the supply use balancing process where output and intermediate consumption are accurately measured.

4 . Data on environmental accounts

Atmospheric emissions: acid rain precursors by industry and gas
Dataset | Released 17 October 2024
The emissions of sulphur dioxide, nitrogen oxide, ammonia and total acid rain precursors, by industry (Standard Industrial Classification (SIC) 2007 group - around 130 categories), UK, 1990 to 2022 and (provisional) 2023.

Atmospheric emissions: greenhouse gas emissions by industry and gas
Dataset | Released 17 October 2024
The emissions of carbon dioxide, methane, nitrous oxide, hydro-fluorocarbons, perfluorocarbons, sulphur hexafluoride, nitrogen trifluoride and total greenhouse gas emissions, by industry (SIC 2007 group - around 130 categories), UK, 1990 to 2022 and (provisional) 2023.

Atmospheric emissions: greenhouse gas emissions intensity by industry
Dataset | Released 17 October 2024
Greenhouse gas and carbon dioxide emissions intensity - the level of emissions per unit of economic output, by industry (SIC 2007 group - around 130 categories), UK, 1990 to 2022 and (provisional) 2023.

Atmospheric emissions: other pollutants by industry and gas
Dataset | Released 17 October 2024
The emissions of Particulate Matter 10 (PM10), Particulate Matter 2.5 (PM2.5), carbon monoxide, non-methane volatile organic compound, Benzene and 1,3-Butadiene, by industry (SIC 2007 group - around 130 categories), UK, 1990 to 2022 and (provisional) 2023.

5 . Data sources and quality

These provisional estimates form part of the UK Environmental Accounts. The UK Environmental Accounts are "satellite" or "extended" accounts, aligned with, but not part of, the main UK National Accounts. They are compiled in accordance with the System of Environmental Economic Accounting (SEEA), as detailed on the United Nations website, which closely follows the UN System of National Accounts (SNA).

All 2023 data in this release are provisional. To produce provisional 2023 greenhouse gas and other air emissions data, we update 2022 data on activities (for example, distance in kilometers driven by cars) using information on production activities for 2023, where available. We use appropriate proxy information if necessary. We then apply emission factors from 2023 that estimate the mass of emissions associated with those activities (by type of gas or pollutant).

Air emissions

The air accounts in the UK Environmental Accounts are compiled by Ricardo Energy and Environment on behalf of the Office for National Statistics (ONS).

The main source of information for this reporting is the National Atmospheric Emissions Inventory (NAEI). This provides air emissions data, calculated from activity data and emission factors, for all relevant sources in the UK as a starting point for generating the air emissions accounts.

The residence principle is then applied to these datasets, which assigns the emissions to an industrial classification based on Standard Industrial Classification: SIC 2007.

Quality

More quality and methodology information on strengths, limitations, appropriate uses, and how the data were created is available in the Environmental accounts on air emissions quality and methodology information (QMI).

Accredited official statistics

These accredited official statistics were independently reviewed by the Office for Statistics Regulation in April 2012. They comply with the standards of trustworthiness, quality and value in the Code of Practice for Statistics and should be labelled "accredited official statistics".

6 . Related links

UK Environmental Accounts: 2023
Statistical bulletin | Released 5 June 2024
Final 2022 estimates. Measuring the contribution of the environment to the economy, impact of economic activity on the environment, and response to environmental issues

Estimates of quarterly greenhouse gas emissions (residence basis), UK: Quarter 1 (Jan to Mar) 2024
Statistical bulletin | Released 8 August 2024
Estimates of greenhouse gas emissions using the Chow-Lin regression -based temporal disaggregation method. These are official statistics in development.

7 . Cite this statistical bulletin

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