Department for Energy Security & Net Zero

UK Greenhouse Gas Emissions Statistics

Frequently Asked Questions

February 2025

Any enquiries regarding this publication should be sent to us at:
GreenhouseGas.Statistics@energysecurity.gov.uk

Contents

Publications

Q1 What are the main reports that the Department for Energy Security and Net Zero (DESNZ) publishes on the UK's greenhouse gas (GHG) emissions?

A1. DESNZ publishes a series of statistics showing "territorial" GHG emissions, meaning emissions that occur within the UK's borders. DESNZ's regular publications on emissions statistics are as follows:

Final UK GHG emission statistics:

Final UK emissions estimates are published annually, usually on the first Thursday of February. Estimates of the uncertainty of the figures and with energy supply emissions presented on an end-user basis are added in an annex on the final Thursday of March and estimates of emissions by Standard Industrial Classification (SIC) category on the final Thursday of June. The most recent estimates published each year relate to the calendar year two years earlier (e.g. the publication in 2024 showed emissions in years up to 2022).

UK emissions are broken down by source and end-user Territorial Emissions Statistics (TES) sector (see question 5), by fuel type and by SIC category. All the UK's domestic and international targets are monitored against the figures in this release, and they are consistent with the UK GHG inventory that is submitted to the United Nations Framework Convention on Climate Change (UNFCCC) each year.

This publication can be found on the UK territorial GHG emissions statistics page on gov.uk.

Provisional UK GHG emission statistics:

Provisional UK territorial emissions estimates are usually published annually on the last Thursday of March each year. Based on provisional energy use statistics, they provide a provisional estimate of emissions in the calendar year just gone, e.g. the publication in 2023 showed provisional estimates for emissions in 2022.

In this publication UK GHG emissions are broken down by source TES sector and by fuel type, and estimates are presented on a quarterly and a temperature adjusted basis.

This publication can be found on the UK territorial GHG emissions statistics page on gov.uk.

UK local authority and regional GHG emissions statistics:

Territorial GHG estimates by local authority and region are usually published annually on the last Thursday in June. The most recent estimates published each year relate to the calendar year two years earlier (e.g. the publication in 2024 covered emissions in years up to 2022). Since 2022, this publication has included estimates of methane and nitrous oxide, in addition to carbon dioxide, and estimates of emissions in National Park areas. Estimates of emissions in National Landscapes and Areas of Outstanding Natural Beauty have been included since 2024.

Emissions are broken down by the following end-user sectors:

- Industry
- Commercial
- Public sector
- Domestic
- Road transport
- Land use, land use change and forestry (LULUCF)
- Agriculture
- Waste

GHG emissions per capita and per square kilometre are also estimated for each local authority. This publication can be found on the UK local authority and regional GHG emissions statistics page on the gov.uk website.

Scope

Q2 Are provisional estimates produced at a sub-national level?

A2. A sub-national breakdown of provisional estimates is not produced since the underlying sub-national energy data are not available any earlier than when the local authority and regional GHG emissions statistics are produced.

Q3 What is the UK GHG Inventory?

A3. The UK GHG Inventory is a dataset of GHG emissions within the UK territory. It is a tool that provides insight into the sources and magnitudes of GHG emissions. It fulfils the UNFCCC reporting requirements the UK has under the Paris Agreement. Official Statistics based on it are published in February each year and the UK's national inventory submission to the UNFCCC is usually submitted each year on 15th April.

The UK GHG Inventory is compiled in line with international guidance from the International Panel on Climate Change (IPCC) and contains the UK's official estimates of GHG emissions from 1990 to the latest available year of reporting. The GHG emissions presented in the DESNZ Official Statistics publications are derived from the UK GHG Inventory, although generally only cover emissions within the UK and not in its Crown Dependencies or Overseas Territories, except where specified.

The UK GHG Official Statistics are published on the UK territorial GHG emissions statistics page on gov.uk and the UNFCCC inventory submissions are published on the National Atmospheric Emissions Inventory (NAEI) website.

Q4 Are data for the devolved administrations published by DESNZ?

A4. GHG emissions data for England, Scotland, Wales, and Northern Ireland are produced by Ricardo on a consistent basis with the UK estimates that DESNZ publishes but for Scotland, Wales, and Northern Ireland they are published by the devolved administrations themselves, not DESNZ. They can be found on the following websites:

- Scotland – Scottish Government environment statistics
- Wales – StatsWales greenhouse gas emissions data
- Northern Ireland – Department of Agriculture, Environment and Rural Affairs Northern Ireland greenhouse gas Inventory

The devolved administration GHG inventories can also be found on the National Atmospheric Emissions Inventory (NAEI) website, including estimates for England.

Q5 What sectors are UK GHG emissions broken down by in the annual UK emission statistics publications?

A5. UK GHG emissions are primarily reported by Territorial Emissions Statistics (TES) sectors, on a source-basis. These sectors provide a more informative representation of GHG emissions than IPCC sectors which are used for international reporting of the UK GHG Inventory. Note that the TES sectors were introduced in 2024, prior to this the UK GHG emissions statistics were presented using National Communication (NC) sectors.

While the allocation of emissions to TES sectors is primarily determined on a source basis, in the final (and local authority) GHG emissions statistics the sectors are also presented with energy supply emissions on an end-user basis. The key difference is that in the latter, emissions related to energy supply (i.e. from the production and distribution of electricity and fuels) are instead reported under the relevant sector where the energy is used – combining the direct emissions, as seen in the source-based TES, with the indirect energy supply emissions to present net end-user emissions for each sector.

A full breakdown of emissions by sector can be found in Table 1.2 of the Excel tables in the most recent final statistics publication. End-user emissions can be seen in Table 7.1. Summaries of the emissions included in each TES sector are as follows:

Electricity supply	Emissions from power stations for electricity generation, including incinerators generating energy from waste. Excludes emissions from organisations generating their own electricity (autogeneration) even when exported to the electricity grid. These emissions are instead included in the sector in which they occur.
Fuel supply	Emissions from the supply of fuels, e.g. oil, gas and coal. Includes activities such as extraction, production, venting, flaring, processing (e.g. oil refining) and distribution. Excludes emissions from coke production which are instead included in the industry sector as coke is primarily used in the iron and steel industry.

Domestic transport	Emissions from road vehicles, domestic aviation and shipping (including military), fishing vessels, and railways. Also includes emissions from transport related mobile machinery (e.g. at airports and ports) and F gases from mobile air conditioning and refrigeration. International aviation and shipping emissions are not included in the national total, though are reported separately.
Buildings and product uses	Emissions from fuel combustion in residential, public, and commercial buildings, largely for heating. Also includes emissions from house and garden mobile machinery, anaesthetics, F gases from air conditioning, refrigeration, heat pumps, aerosols as well as other product uses. Excludes emissions from industrial buildings which are instead included in the industry sector.
Industry	Emissions from fuel combustion in the manufacturing and construction industries, industrial processes, and F gases from industrial refrigeration. Emissions from coke production are included in this sector as coke is primarily used in the iron and steel industry. Includes emissions from organisations generating their own electricity and heat (autogeneration) even when exported to the electricity grid or used in heat networks.
Agriculture	Emissions from agricultural machinery and fuel combustion, livestock (enteric fermentation and manure management) and agricultural soils (excluding carbon stock changes which are included in the LULUCF sector).
Waste	Emissions from the treatment and disposal of waste, such as landfill, composting, incineration without energy recovery and wastewater handling. Excludes emissions from incinerators generating energy from waste as these are reported in the electricity supply sector.
Land use, land use change and forestry (LULUCF)	Net carbon dioxide emissions from carbon stock changes in forestland, cropland, grassland, wetlands, settlements and harvested wood products. Other greenhouse gas emissions from drainage (excl. croplands and intensive grasslands) and rewetting of soils, nitrogen mineralisation associated with loss and gain of soil organic matter, and fires. As carbon stock changes are included in this sector, carbon dioxide emissions of biogenic origin (e.g. burning biomass for energy) are excluded from other sectors to avoid double counting of emissions.

Q6 Does DESNZ report any alternative sector splits for UK GHG emissions?

A6. Starting from the 2020 publication, presenting UK GHG emissions from 1990-2018, the final UK emissions statistics have been accompanied by supplementary tables showing annual UK GHG emissions split by Standard Industrial Classification (SIC). The SIC categorisation provides a detailed split of emissions by industrial sectors.

The underlying data comprising the UK GHG Inventory are also available to sufficient detail such that many different categorisations can be made to suit different purposes.

Q7 What gases are included in the emissions statistics?

A7. The inventory covers the basket of seven GHGs that contribute to global warming, as required for emissions reporting under the Paris Agreement. These are:

- carbon dioxide (CO2)
- methane (CH4)
- nitrous oxide (N2O)
- hydrofluorocarbons (HFCs)
- perfluorocarbons (PFCs)
- sulphur hexafluoride (SF6)
- nitrogen trifluoride (NF3)

These last four gases are collectively referred to as fluorinated gases (or F gases).

In accordance with international reporting, each of these gases is weighted by its global warming potential (GWP), so that total GHG emissions can be reported on a consistent basis. The GWP for each gas is defined as its warming influence relative to that of carbon dioxide over a 100-year period. GHG emissions are then presented in carbon dioxide equivalent units.

The GWPs on which the UK GHG Inventory (and GHG emissions statistics) are based are subject to change as international guidelines are updated. A list of each GHG with their corresponding GWPs is published in table 6.4 in the final UK GHG statistics tables.

Q8 Why are there different territorial emissions totals reported for the UK?

A8. The UK's emissions reduction targets and international reporting requirements are based on territorial emissions estimates but can differ in geographical scope and handling of particular sectors. The main geographical coverages currently used are:

- UK Official Statistics - The geographical coverage of these statistics is based on the UK only, i.e. England, Scotland, Wales and Northern Ireland.

- Convention (UNFCCC) commitment – Under the UNFCCC, the UK must report its emissions plus those Crown Dependencies and Overseas Territories which have had the UK ratification of the Convention extended to them. These are currently the Crown Dependencies of Jersey, Guernsey and the Isle of Man and the Overseas Territories of the Cayman Islands, Falkland Islands, Bermuda and Gibraltar.

- Paris Agreement commitment – The UK's progress against its Paris Agreement commitment is based on a geographical coverage of the UK, the Crown Dependencies of Jersey, Guernsey and the Isle of Man and the Overseas Territory of Gibraltar, which is currently the only Overseas Territory that is party to the Paris Agreement.

- Domestic carbon budgets set under the UK Climate Change Act are based on the UK only, excluding all emissions from the UK's Crown Dependencies and Overseas Territories.

Q9 Are there alternative methods of estimating UK GHG emissions other than the territorial emissions reported in the UK GHG Inventory (and DESNZ statistics)?

A9. In addition to the territorial emission estimates, two alternative measures of the UK's GHG emissions are published by the Office for National Statistics (ONS) and the Department for Environment, Food and Rural Affairs (Defra):

- ONS publishes emissions on a "residence" basis in the UK Environmental Accounts. The figures represent emissions caused by UK residents and businesses whether in the UK or abroad but exclude emissions within the UK which can be attributed to overseas residents and businesses.

- Defra publishes the UK's carbon footprint. This estimates emissions on a "consumption" basis, meaning it covers emissions associated with the consumption of goods and services by households in the UK. It includes estimates of emissions associated with each stage of the supply chain for those goods and services, regardless of where they occur, while excluding emissions occurring in the UK that are associated with the consumption of goods and services by households outside the UK.

It is important to understand the differences between reported emissions and the different approaches to measuring emissions to ensure that the correct data are used for specific purposes of reporting or analysis. ONS has published an article that compares these different measures of the UK's GHG emissions in more detail.

Q10 Why do we report territorial rather than consumption emissions figures?

A10. The UK produces estimates of both its territorial emissions (published by DESNZ) and its consumption emissions (published by Defra). The DESNZ statistics follow the agreed international approach for estimating and reporting GHG emissions under the UNFCCC, which is for countries to report the emissions produced within their territories. This ensures that different countries are reporting their emissions on a similar basis. These emissions do not, therefore, include emissions from the manufacture of goods imported into the UK, which are reported in the country they were manufactured in, and vice versa.

All of the UK's emission reduction targets are based on territorial emissions. Statistics on UK consumption emissions are published by Defra.

Methodology

Q11 How are emissions estimated?

A11. It is impractical to directly measure emissions from every exhaust, chimney, and acre of land in the UK, so GHG emission estimates are based on a series of models that estimate emissions from different sources.

The source data and methods used to derive UK GHG emission estimates have been developed to be consistent with methods defined within international guidance[1]. All countries that report to the UNFCCC are required to use these estimation methods to ensure that the emissions for each country are complete and comparable.

The basic equation for estimating most sources of emissions is:

$$Emission\ Factor\ \times Activity\ Data = Emission\ Estimate$$

For example, to estimate CO2 emissions from vehicles the activity data might be the total number of kilometres travelled by that type of vehicle and the emission factor the amount of CO2 emitted per kilometre.

The UK GHG Inventory uses the best available data from UK and international research for each emission source. The approach used is largely defined by the availability of data and the significance of the emission source to the overall UK emissions totals: more detailed methods are used for the high-emitting sources, whilst simpler methods can be used for minor sources, consistent with international guidance.

The emission factor is the emission per unit of activity. Emission factors for energy sources are either dependent on the fuel characteristics (for emissions of CO2) or how the fuel is burned, for example the size and efficiency of equipment used. For other sources, the emission factor can be dependent on a range of parameters, such as feed characteristics for livestock or the chemical reactions taking place for industrial process emissions.

Emission factors are typically derived from measurements on a number of representative sources and the resulting factor applied to all similar sources in the UK. For some sources, the calculation of emissions is more complicated, and therefore a model is used to estimate emissions.

For example, emissions of methane from waste disposed to landfills are estimated using a model that reflects the fact that the emissions occur over a long timeframe from the initial disposal of the waste, and that emissions are affected by the level of capture and utilisation of the landfill methane produced. The carbon fluxes (emissions and sinks) from land use, land use change and forestry are also modelled.

[1] 2006 IPCC Guidelines for National Greenhouse Gas Inventories: https://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html
2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands (Wetlands Supplement): https://www.ipcc-nggip.iges.or.jp/public/wetlands/index.html
2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol (KP Supplement): https://www.ipcc-nggip.iges.or.jp/public/kpsg/index.html

Table 6.2 of the most recent final GHG emissions tables gives summary information on the methodology used to estimate different parts of the inventory, with detailed methodology provided in the National Inventory Document (NID) that is submitted to the UNFCCC each year[2].

Q12 How are energy statistics related to emissions statistics?

A12. Activities such as energy and fuel consumption related to homes, businesses and transport result in GHG emissions. The large majority of data on activities such as these is taken from the Digest of UK Energy Statistics (DUKES) publication.

This numerical activity data can be used to estimate different GHG emissions (for carbon dioxide, methane, and nitrous oxide) by applying the relevant emissions factors. These emissions factors are dependant, for example, on the activity and the fuel type. Fuels include burning oil and diesel.

In the UK GHG inventory, emissions related to electricity generation can be estimated using energy consumption data from power stations, and then as above by applying the relevant emissions factors depending on the fuel used.

Q13 What are the different datasets used to estimate emissions?

A13. The UK's GHG Inventory is based on data from a range of sources:

- Digest of UK Energy Statistics (DUKES)
- The Environment Agency's Pollution Inventory
- Data held by other environmental regulators
- Industry
- Independent experts
- Other public sector bodies

A complete list of data sources used in each of the sectors reported in the UK GHG inventory is described in table 6.2 of the most recent final GHG emissions tables.

Q14 How are provisional emissions estimates calculated?

A14. The provisional UK GHG emissions estimates are usually published annually, on the last Thursday in March. This coincides with the publication of the March edition of Energy Trends, which is the first quarterly release of statistics covering UK energy use in the most recent calendar year and is the main basis for the provisional emissions estimates.

The provisional emissions figures are not estimated using the full GHG Inventory methodology. Instead, estimates of emissions related to energy use are based on the change in energy use

[2] The latest UK National Inventory Document (NID) can be found on the UNFCCC website: https://unfccc.int/reports.

between year x-2 (the final year in the latest inventory) and year x-1 (the year for which the provisional estimates are being made) in the Energy Trends data. For example, if domestic gas use has increased by 1%, we assume that emissions from domestic gas use will have increased by 1%. To produce quarterly emissions estimates from annual data the proportion of fuel used in each quarter is used.

Because there is limited data available at that time for emissions not related to energy use, provisional estimates of other emissions are based on a simple approach, either assuming that emissions will change from the previous year's total in proportion to the estimates in the most recent DESNZ Energy and emissions projections, or assuming that those emissions remain unchanged from the year before. More information on the methodology is given in the statistical release and in a separate methodology note on the publication page

These provisional emissions estimates will be subject to revision when the final estimates are published around 10 months later, in February of the following year. However, they provide an early indication of emissions in the most recent full calendar year. Overall, the year-on-year percentage change indicated by the provisional figures has usually been within a percentage point of the change shown by the final figures.

Q15 Why are the final emissions estimates different from the provisional emissions statistics published one year earlier?

A15. The differences between the provisional and final estimates arise primarily due to revisions to other statistics on which these estimates were based, use of actual data to estimate emissions not related to energy use, which are only estimated in a simplistic way in the provisional estimates, and methodological changes to the way emissions are calculated.

Q16 Why is the whole time series of historical emissions revised every year?

A16. Each year, when the UK GHG Inventory (on which these emissions statistics are based) is extended to add another year, it is updated to include:

- Emission estimates for any new sources identified in the UK.
- Revised estimates for sources where there is an improved understanding of existing emission sources, e.g., where research identifies that new data are available, or a new, more accurate estimation methodology is developed.
- Data revisions, for example to energy statistics (in the Digest of UK Energy Statistics (DUKES)) or updates to UK manufacturing statistics.

Time series consistency is one of the overarching principles of inventory compilation, therefore any changes or improvements that relate to the first two points listed must be applied to the whole time series. Any changes related to data revisions must be applied to all years where the revision has occurred. It is therefore not appropriate to compare the Inventory from one year with that from another – the latest Inventory represents a single consistent data series going back to 1990.

The UK GHG Inventory has an improvement programme which is used to manage changes to the inventory. A list of possible improvements is compiled each year based on findings from

external reviews of the Inventory, suggestions from the Inventory compilers (e.g. where a new dataset has been identified that should be investigated), or input from other stakeholders.

The list is prioritised, with items related to the completeness of the Inventory considered most important. Specific research is conducted to address the highest priority improvement items to ensure that the inventory is continually improved, minimising uncertainties and meeting all of the requirements of the UK's international reporting commitments.

Q17 Why are emissions from international aviation and shipping not included in UK GHG emissions totals?

A17. Under international emissions reporting guidelines agreed by the UNFCCC, international aviation and shipping emissions are not included in countries' emissions totals that are submitted to the UNFCCC. Instead, Parties to the UNFCCC are required to act to limit or reduce emissions from international services working through the International Civil Aviation Organization (ICAO) and International Maritime Organization (IMO), the international organisations responsible for formulating policies and setting targets for reducing emissions from international aviation and shipping respectively.

Emissions from international aviation and shipping can be estimated from refuelling from bunkers at UK airports and ports, and these estimates are included in a table in our emissions statistics and are reported to the UNFCCC as 'memo' items in national GHG inventories. However, it is important to note that whether emissions from refuelling at UK-based international aviation and shipping can be used as an accurate estimate of UK international aviation and shipping emissions will depend on what assumptions are being made about how to allocate international aviation and shipping emissions to different countries.

International aviation and shipping emissions are not included in the UK's international emission targets or in its first five carbon budget targets. However, in 2021 the UK government set the Sixth Carbon Budget (covering 2033-37) to include the UK's share of international aviation and shipping emissions, as recommended by the Climate Change Committee. It has not yet been determined how these emissions will be defined in legislation.

Q18 Why are carbon dioxide emissions from fuels of biogenic origin not included in UK GHG emissions totals at the point of combustion?

A18. Under international emissions reporting guidelines agreed by the UNFCCC, emissions of CO2 from fuels of biogenic origin (e.g. wood) are not counted at the point of release towards the UK's emissions total that is submitted to the UNFCCC, but are instead reported as 'memo' items in national GHG inventories. This is to avoid double counting, as they are instead reported as a net change in carbon stock in the LULUCF sector of the country in which the biomass is harvested.

GHG reduction targets

Q19 What emissions reduction targets does the UK have?

A19. The UK has several domestic and international emissions reduction targets, which are set out below.

Domestic targets:

The UK has domestic targets for reducing GHG emissions under the Climate Change Act 2008 (CCA). The CCA established a long-term legally binding framework to reduce emissions and commits the UK to achieving a 100% reduction in emissions (to net zero) by 2050. The CCA also commits the UK to carbon budgets, which are legally binding limits on total GHG emissions over five-year periods.

The first carbon budget ran from 2008-12. In 2014, the UK met the budget, with emissions 36 million tonnes carbon dioxide equivalent (MtCO2e) below the limit of 3,018 MtCO2e. The second carbon budget ran from 2013-17. In 2019, the UK met the budget, with emissions 384 MtCO2e below the limit of 2,782 MtCO2e. In 2024 the UK met the third carbon budget, covering the period 2018-22, with emissions 391 MtCO2e below the cap of 2,544 MtCO2e.

Further information on carbon budget accounting and performance can be found in the final UK GHG emissions statistics publications.

Projected performance against future carbon budgets can be found in the latest UK Energy and emissions projections publication.

International targets:

Under the Paris Agreement, the UK is required to set emission reduction targets every five years known as Nationally Determined Contributions (NDCs). For its First NDC, the UK has committed to reduce total net greenhouse gas emissions by at least 68% in 2030, compared to 1990 levels. For its Second NDC, the UK has committed to reduce total net greenhouse gas emissions by at least 81% in 2035, compared to 1990 levels.

Further information on international emission reduction targets can be found in the final UK GHG emissions statistics publications.

Other questions

Q20 Where can I find global CO2 / GHG emissions statistics?

A20. For global figures, we suggest looking on the International Energy Agency (IEA) website, or using the Climate Analysis Indicators Tool (CAIT) produced by the World Resources Institute.

GHG emissions estimates submitted by countries to the UNFCCC can also be found on the UNFCCC website.

Q21 What are the UK's emissions reporting requirements?

A21. Each year, the UK has a set of requirements, which are summarised below:

- The UK's national emissions inventory is compiled in line with international guidance from the International Panel on Climate Change:
    - IPCC 2006 GHG Inventory Guidelines;
    - IPCC 2013 KP Supplement;
    - IPCC 2013 Wetlands Supplement

The inventory is compiled within the framework of the UK's National Inventory System.

- As an Annex 1 Party to the UNFCCC and under its Paris Agreement commitment, the UK must submit its Inventory to the UNFCCC by 15 April each year. This is in the form of a NID and Common Reporting Tables (CRTs).
- In order to meet the UK's Carbon Budgets, an Annual Statement of Emissions is submitted to the UK Parliament in March each year.
- The headline results from the inventory are also published as Accredited Official Statistics and are presented for direct public access on the gov.uk website.

Q22 What is the Code of Practice for Statistics?

A22. The Code of Practice for Statistics sets out the professional standards which Official Statistics are expected to meet. Official Statistics are fundamental to good government, to the delivery of public services and to decision-making in all sectors of society.

The Code is consistent with the United Nations Fundamental Principles of Official Statistics and the European Statistics Code of Practice. It is also consistent with the Civil Service core values of integrity, honesty, objectivity, and impartiality. The Statistics and Registration Service Act 2007 brings all Official Statistics under the remit of the UK Statistics Authority, and with that the need to observe the Code of Practice.

Official Statistics can be accredited following a formal assessment of their compliance with the UK Statistics Authority's Code of Practice for Statistics. Accredited Official Statistics status

means that the statistics meet the highest standards of trustworthiness, quality, and public value.

The UK GHG emissions statistics series published by DESNZ went through a full assessment of compliance in 2014. They more recently went through a compliance check by the Office for Statistics Regulation in 2018.

For further information about the UK Statistics Authority and the Code of Practice, please see the UK Statistics Authority website.

This publication is available from: www.gov.uk/government/publications/uk-greenhouse-gas-emissions-explanatory-notes

If you need a version of this document in a more accessible format, please email alt.formats@energysecurity.gov.uk. Please tell us what format you need. It will help us if you say what assistive technology you use.