



Department
of Energy &
Climate Change

Background quality report

UK Greenhouse Gas Emissions Statistics

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Any enquiries regarding this publication should be sent to us at:
Climatechange.Statistics@decc.gsi.gov.uk.

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UK greenhouse gas emissions background quality report

1. Introduction

1.1 Background

This report provides a summary of quality issues relating to statistics on UK greenhouse gas (GHG) emissions. DECC's Official Statistics for UK emissions are based on the UK's greenhouse gas inventory (which is compiled by a consortium led by Ricardo-AEA, on behalf of DECC), and on DECC's energy statistics.

The UK GHG Inventory contains the UK's official reported greenhouse gas estimates. It is the key tool for understanding the origin and magnitude of UK emissions. It contains emissions of the Kyoto basket of greenhouse gases, reported in nine National Communication sectors. Emissions are reported in line with IPCC reporting requirements, and are used to measure the UK's progress towards international and domestic emissions targets, including the Kyoto Protocol, the UK Climate Change Act and the EU Effort Sharing Decision.

1.2 Publications, methodology and documentation

Final UK greenhouse gas emissions

A National Statistics publication reporting on UK GHG emissions by source from the latest GHG inventory is produced annually in February. Final emissions statistics for the same period on an end-user and fuel basis are published the following month.

The basic equation for estimating most emissions in our inventory is: activity data multiplied by an emission factor. Activity data can include the combustion of a given fuel at a power station, or the number of cows. An emission factor is the emissions per unit of activity, reflecting on the carbon content of the fuel for example. For some sources, the calculation of emissions is more complicated, and therefore a model is used to estimate emissions, e.g. in the transport sector.

The source data and methods used to derive UK GHG emission estimates have been developed to be consistent with methods defined within international guidance provided to all countries via the Inter-governmental Panel on Climate Change. The inventory reports UK emissions dating back to 1990 in a methodologically comparable time series.

The publication comprises a statistical release and detailed data tables¹. A detailed summary of the methodology used to compile the inventory is available in the National Inventory Report (NIR)².

Provisional annual and quarterly UK greenhouse gas emissions

A National Statistics publication reporting on provisional GHG emissions is published annually approximately 3 months after the end of the reporting year. Provisional estimates are calculated based on the latest energy statistics to give an early indication of emissions estimates for the most recent year, almost a year ahead of the publication of final inventory data.

Quarterly estimates of greenhouse gas emissions were published as “experimental statistics” from April 2012. They were rebadged as Official statistics from October 2014 following a detailed review of the methodology.

Provisional annual and quarterly estimates for carbon dioxide are calculated based on the most recent inventory data, combined with provisional inland energy consumption statistics published by DECC in Energy Trends. Data from energy trends is used to estimate the change in fuel use, in order to approximate the change in emissions, and for the quarterly series, the proportion of fuel used in a particular quarter, in order to produce quarterly emissions estimates from annual data. For the annual publication, an estimate of the non-carbon dioxide greenhouse gas emissions is produced based on trend. In the quarterly publication, a temperature adjusted series is also produced. More information on the methodology is given in the statistical release³ and in a separate methodology note⁴.

UK local authority and regional carbon dioxide estimates

This annual National Statistics publication provides the latest estimates of carbon dioxide emissions for Local Authority (LA) areas.

The dataset is based on end user carbon dioxide emissions as calculated in the final UK greenhouse gas inventory, which are spatially disaggregated to local authority level using a complex, sector specific methodology which is detailed in an accompanying technical report and summary.

The publication comprises a statistical release⁵, along with data tables, a detailed technical report and a methodology summary⁶.

Sub-national road transport consumption data and sub-national consumption of other fuels factsheets

These National Statistics cover fuel consumption rather than emissions, but the estimates are derived from data collected in order to produce the UK GHG inventory.

The sub national residual fuels dataset is a modelled dataset covering non-gas, non-electricity and non-road transport fuels from 2003 to the most recent year, at a devolved administration, regional and local authority level.

The sub national road transport dataset is a modelled dataset covering road transport fuel consumption in the UK, disaggregated to devolved administration, English regional and local authority levels.

Factsheets summarising both data sets and data tables in Excel format are produced by DECC^{7,8}. Detailed information on the methodology can be found in a sub national consumption methodology document⁹, as well as technical summaries for each data set^{10,11}.

1.3 Production and dissemination

The UK national emission estimates are prepared via a central database of activity data and emission factors, from which the UK emissions are extracted and reported in a variety of formats. For the annual publications, data is provided by Ricardo-AEA according to pre-determined timescales. For the provisional and quarterly publications, data from Energy Trends is provided to the UK GHG Emissions team on a restricted basis ahead of its publication.

The quality assurance process undertaken by Ricardo-AEA is detailed in the UK Greenhouse Gas Emissions QA/QC plan, and also in Chapter 1 of the National Inventory Report (NIR). Data is also quality assured by DECC, with any issues raised with Ricardo-AEA for resolution. Provisional and summary calculation are produced by DECC, with QA measures built into the process. The statistical release is reviewed by the Head of Profession for final quality assurance and comments.

Pre-release access to the statistical release, briefing and data tables is granted 24 hours ahead in accordance with DECC's statement of compliance with pre-release access¹².

2. Relevance

2.1 Content

The UK final inventory data set contains emissions of the Kyoto basket of greenhouse gases (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride and nitrogen trifluoride) on a by source basis. This attributes emissions to the sector that emits them directly. Emissions are reported in line with IPCC reporting requirements¹³. Additionally, emissions are broken down by fuel type, and by end user. An end-user breakdown allows a more complete picture of emissions within a given sector, by allocating indirect emissions associated with energy supply to end use sectors.

For provisional annual and quarterly statistics, sectoral breakdowns are given on a carbon dioxide only basis. For the non-CO₂ GHGs an estimate is presented based on high level trends only. For the quarterly publication, other greenhouse gases are assumed to be the same as the previous quarter.

The sub national carbon dioxide statistics are compiled on an end user basis, which means that emissions are allocated to the sector in which they are used. A full dataset containing emissions within the bounds of each local authority is published, along with a second dataset containing a breakdown of emissions thought to be within the scope of influence of local authorities. Sectoral breakdowns are also provided.

The residual fuel consumption and road transport statistics dataset provides residual fuel consumption, and road transport fuel consumption in the UK at a local authority and regional level.

Residual fuels are defined as non-gas, non-electric and non-road transport energy consumption, and cover consumption of coal, petroleum, manufactured solid fuels and bioenergy and wastes.

2.2 Completeness

In the final inventory, estimates are reported for all pollutants, all relevant source categories and all years and for the entire territorial areas of Parties covered by the reporting requirements set forth in the provisions of the Convention and its protocols. A detailed assessment of completeness of the UK Greenhouse Gas Inventory can be found in the National Inventory Report, Annex 5.1².

The UK greenhouse gas inventory additionally reports on indirect greenhouse gases which do not form part of the Kyoto Protocol basket of greenhouse gases. In the UK, these gases are Nitrogen Oxides, Carbon Monoxide, Non-Methane Organic Volatile Compounds, and Sulphur dioxide. More information about indirect greenhouse gases can be found in the National Inventory Report, section 2.4².

Emissions from international aviation and shipping are not included in the UK's emissions total in accordance with UNFCCC guidelines¹³, but are reported in the inventory as a memo item. Further information can be found in the Final UK GHG statistical release¹.

The local authority emissions statistics cover carbon dioxide only, with no estimates made at local authority level for the remaining greenhouse gases.

The UK GHG inventory does not measure emissions on a "consumption" basis. "Embedded emissions", taking into account emissions embedded within the goods and services that the UK imports and exports, are produced by the Department for Environment, Food and Rural Affairs¹⁴.

2.3 Geographical coverage

The statistics cover emissions from within the UK and its Crown Dependencies (Jersey, Guernsey and the Isle of Man). The final emissions statistics also report on greenhouse gas emissions under the Kyoto Protocol, which is based on emissions in the UK, its Crown Dependencies, and those Overseas Territories (Bermuda, Cayman Islands, Falkland Islands, Gibraltar and Montserrat) that are party to the UK ratification of the Kyoto Protocol; and on emissions under UK carbon budget coverage (the UK only, without the Crown Dependencies).

The sub national emissions and fuel consumption statistics cover the UK, broken down by devolved administration, English region, and local authority.

2.4 User needs

The UK final inventory statistics provide the latest final inventory statistics and allow users to measure the UK's progress against international and domestic targets, including commitments under the Kyoto Protocol and the UK Climate Change Act 2008. More detail on progress against targets can be found in the final inventory statistical release and accompanying data tables¹.

The Greenhouse Gas Inventory is reported to The United Nations Framework Convention on Climate Change, the European Commission, the UK government and devolved administrations.

Provisional annual and quarterly estimates provide users with an early indication of emissions estimates, and are published nearly a year ahead of the publication of the final inventory statistics.

Local authority carbon dioxide statistics are produced to allow Local Authorities to monitor their emissions. Local Authorities are not mandated to have greenhouse gas emissions reductions targets, but some LAs do have such targets. These statistics allow LAs to track their GHG emissions trends over time, and measure progress against any targets they have. Sub national road transport and residual fuel data are also used by local authorities to understand and monitor local energy use as part of their energy strategies.

Users of emissions statistics include ministers, policy makers and analysts within the Department of Energy and Climate Change, policy makers within central government, Devolved Administrations and Local Authorities, Energy and climate change consultancy companies, non profit organisations/charities, international statistics organisations, academia, media and the public.

3. Relevance

3.1 Methodology

A statement of administrative sources used to compile national and official statistics is available on the gov.uk website¹⁵.

The methodology used to compile the UK national inventory is detailed in the National Inventory Report².

The methodology for the provisional annual and quarterly emissions statistics is summarised in the statistical releases, and in a separate methodology note³.

The local authority carbon dioxide emissions methodology is reported in a detailed technical report and separate methodology summary⁶.

Methodology for the sub national road transport consumption statistics, and the residual fuel statistics, is summarised in the sub national consumption methodology and guidance document⁹, and in technical reports produced by R-AEA^{10,11}.

3.2 Uncertainty and bias

The inventory is compiled to be as accurate as possible, meaning that steps are taken to ensure emissions are neither systematically overestimated nor underestimated, as far as can be judged and with uncertainties reduced as far as practicable.

Detailed notes regarding the uncertainty analysis undertaken for the final inventory can be found in Annex 7 of the National Inventory Report², in the provisional annual statistical release³ and in the data tables accompanying the final inventory statistics¹.

Provisional and quarterly estimates are compared to the final inventory figures and an analysis of this is detailed in the final inventory statistical release¹. Differences between the provisional and final estimates arise primarily due to revisions to other statistics on which these estimates were based, and methodological changes arising from developments to the inventory. Together these factors combine to give an uncertainty range in the provisional estimates of around +/-2 percent for total emissions.

Uncertainties are calculated for local authority carbon dioxide emissions, based on uncertainty in national emissions, uncertainty in the spatial distribution, and the proportion that each sector contributes to LA emissions. A summary of the uncertainty analysis, by sub sector, is presented in the detailed technical report⁶. The estimated percentage error is 3 percent or lower for 88 percent of LAs.

Factors affecting uncertainty in the sub national road transport consumption are detailed in the technical report¹⁰.

4. Timeliness and punctuality

4.1 Timeliness

The final UK greenhouse gas statistics are published with a 13 month lag. This is because of the time taken to compile and publish the UK GHGI. Emissions by fuel and end user, and local authority carbon dioxide emissions, are based on inventory data and are published later in the year, due to the time taken to compile them.

The table below details the publication timetable of each release, with examples.

Statistical release	Timeliness	Example
Final inventory	Published ~14 months after the end of the year covered. End user breakdown published a month later.	Final inventory to 2012 published in February 2014
Provisional annual emissions	Published ~3 months after the reported year	Provisional estimate of 2013 emissions published in March 2014
Quarterly emissions	Published ~3 months after the end of the quarter	Q1 2014 estimates published in early July 2014
Local authority carbon dioxide emissions	Published ~18 months after the end of the year reported	Emissions to 2012 published in June 2014
Sub national road transport consumption data	Published ~18 months after the end of the year reported	Data to 2012 published in June 2014
Sub national consumption of other fuels	Published ~21 months after of the year reported	Data to 2012 published in September 2014

4.2 Punctuality

All releases are published in accordance with a pre-announced release timetable. In accordance with the Code of Practice for Official Statistics, releases are published at 9.30am.

5. Accessibility and clarity

5.1 Accessibility

All statistical releases and accompanying documents and data tables are published on the relevant area of gov.uk. Data tables are provided in Excel format, although users may request other formats if they wish.

Users of assistive technology can request a version of the publications or data tables in a more accessible format by contacting DECC correspondence.

For the local authority carbon dioxide emissions statistics, local authorities are contacted to alert them to the publication of the statistics, and invited to contact us if they would like any further information about the drivers of trends in their locality.

5.2 Clarity

Each statistical release comprises a written statistical release containing a summary of the data, along with contextual information, and information about drivers of change in the data. For more expert users, data tables are provided. Some methodological information is summarised in the releases, but more technical methodological documents are provided for users who need this.

6. Coherence and comparability

6.1 Consistency across time

Estimates for any different inventory years, pollutants and source categories are made in such a way that differences in the results between years and source categories reflect real differences in emissions. Annual emissions, as far as possible, should be calculated using the same method and data sources for all years, and resultant trends should reflect real fluctuations in emissions and not the changes resulting from methodological differences.

The input data for the end user estimates are compiled as part of the national inventory as reported to the UNFCCC.

Updates are made each year to the complete time series to take account of new methods and data (EFs and activity data).

Final inventory data is reported in a methodologically comparable time series dating back to 1990.

6.2 Consistency with related data sets

All the National Statistics are broadly consistent with the UK's GHG inventory.

The UK Digest of Energy Statistics (DUKES) is a key data source for the inventory, however inventory data is not always fully consistent with DUKES due to the use of different methodology (due to the need to comply with international guidelines) or supplementary data sources.

The quarterly and provisional statistics are based on the same methodology and are therefore consistent with each other, however, there may be differences between the provisional annual estimate and subsequent quarterly series due to in-year revisions to the underlying energy data. Information about the impact of revisions is included in the quarterly statistical release¹⁶.

The local authority carbon dioxide dataset is derived from the national inventory, but there are some differences between the data sets and these are outlined in the statistical release and in the accompanying excel files⁵.

There are differences between the sub national road transport statistics and DUKES because the sub national statistics are based on fuel consumption, while DUKES is based on fuel sales. The differences are covered in more detail in the sub national fact sheet⁷.

There are differences between the sub national residual fuel consumption statistics and DUKES, due to differences in methodology, which are detailed in the sub national fact sheet⁸.

The UK GHG emissions statistics are based on territorial emissions. However, emissions estimates are also published on a UK residents basis and on a consumption emissions basis. Differences between the various approaches are summarised in the 'Alternative approaches to UK greenhouse gas emissions report'¹⁷.

6.3 Differences in geographical coverages

The standard geographical coverage in the UK GHG emissions statistics is the UK and Crown Dependencies. However, different geographical coverages are also reported for reporting against specific GHG emissions reductions targets. More information on geographical coverages can be found in the Introduction to the Inventory¹⁸, and the document “Alternative approaches to emissions reporting” and accompanying data table¹⁷. Geographical coverages are clearly stated in each statistical release and accompanying data set.

7. Trade offs

There is a trade off between timeliness and accuracy in publishing annual greenhouse gas emissions statistics. Final inventory data is published approximately 14 months after the end of the reporting year, as the methodology used is complex and time consuming. In order to bridge the gap between the publication of final inventory data, provisional emissions estimates are published 3 months after the end of the reporting year. The provisional estimates are based on the final inventory combined with UK energy consumption data for the intervening year, and are therefore not compiled with the same level of detail as the final inventory.

8. Assessment of user needs and perceptions

More information on users of DECC’s greenhouse gas emissions statistics can be found in the Statement of User Needs¹⁹.

DECC recognise that these users will have different needs and welcome views from both internal and external customers through the Climate Change Statistics Mailbox (Climatechange.Statistics@decc.gsi.gov.uk). Contact details for specific publications are also provided within each statistical release.

Further information about DECC’s user engagement policies can be found in the Customer Service and Engagement statement published on gov.uk²⁰.

A survey of users of all of DECC’s statistics was conducted in 2012, with the outcomes published on gov.uk²¹.

9. Performance, cost and respondent burden

The data used to produce the GHG emissions statistics largely comes from the UK GHG inventory and from other Official Statistics. The UK is required by the UN and the EC to produce an annual GHG inventory, so using the data to produce Official Statistics does not add an additional respondent burden. The work of producing the statistics themselves is done by a team of 3 individuals within DECC.

10. Confidentiality, transparency and security

The transparency of emission reporting is fundamental to the effective use, review and continuous improvement of the inventory. To this end, clear documentation is available and reporting is at a level of disaggregation that sufficiently allows individuals or groups other than the designated emission expert or the compiler of the inventory to understand how the inventory was compiled and assure it meets good practice requirements.

Much of the data used to compile the inventory is publicly available. Where organisations have provided information on the condition that the data remains confidential, these sources are reported in combination. Where detailed data is required, for example due to a freedom of information request, any elements of confidential data in the set are identified and suppressed.

For the local authority carbon dioxide emissions, some data from large gas consumers is suppressed in order to comply with non-disclosure agreements. Estimates of emissions from the excluded sites are calculated using other data, and this process is detailed in the technical report⁶.

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Department of Energy & Climate Change
3 Whitehall Place
London SW1A 2AW
www.gov.uk/decc
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