



Department  
of Energy &  
Climate Change

# Alternative approaches to reporting UK Greenhouse Gas Emissions

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This document is also available from our website at: <https://www.gov.uk/government/statistics/uk-greenhouse-gas-emissions-explanatory-notes>

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# Introduction

The UK government has published greenhouse gas (GHG) emissions statistics using three different approaches. These approaches are:

- Emissions based on the UK greenhouse gas inventory<sup>1</sup>, published by the Department of Energy and Climate Change (DECC) – this is used as the basis for our reporting to the European Commission (EC) and United Nations Framework Convention on Climate Change (UNFCCC), and forms the basis for reporting on progress towards our domestic and international emissions reduction targets. The inventory measures emissions on a “territorial” basis, so only includes emissions which occur within the UK’s borders.
- Emissions as measured by the UK Environmental Accounts<sup>2</sup>, published by the Office for National Statistics (ONS) - these measure GHG emissions on what is referred to as a “residents” basis, which means that the figures represent emissions caused by UK residents and industry whether in the UK or abroad, but exclude emissions within the UK which can be attributed to overseas residents and businesses.
- “Embedded emissions<sup>3</sup>”, published by the Department for Environment, Food and Rural Affairs (Defra) – these measure emissions on a “consumption” basis, and take account of the emissions embedded within the manufactured goods and services which the UK imports and exports.

These are prepared in accordance with an established annual timetable, and are published as Official Statistics. At present there is no internationally agreed basis for reporting consumption emissions. Only emissions published on a territorial basis are required for reporting internationally to the UNFCCC, the Kyoto Protocol and the EU.

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<sup>1</sup> Official statistics: Final UK greenhouse gas emissions  
<https://www.gov.uk/government/collections/final-uk-greenhouse-gas-emissions-national-statistics>

<sup>2</sup> UK Environmental Accounts  
<http://www.ons.gov.uk/ons/rel/environmental/uk-environmental-accounts/index.html>

<sup>3</sup> UK’s carbon footprint  
<https://www.gov.uk/government/publications/uks-carbon-footprint>

# Comparison of different methodologies

## UK greenhouse gas inventory

DECC's Official Statistics for UK emissions come from the UK's greenhouse gas inventory, which is compiled by Ricardo-AEA, on behalf of DECC. This measures emissions on a "territorial" basis, which effectively means that the figures represent emissions occurring within the UK's territorial boundaries. The figures included in the statistics cover emissions from within the UK and its Crown Dependencies (Jersey, Guernsey and the Isle of Man). The 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.

The UK has measured and reported its emissions of GHGs since 1988. These processes were revised and improved to support the UK's obligations under the UNFCCC, which entered into force in March 1994. It was within the framework of the UNFCCC that the Kyoto Protocol was negotiated in 1997. Most developed nations (including the UK as part of the EU) took on specific targets for limiting or reducing their GHG emissions. In ratifying the Kyoto Protocol, the UK committed itself to maintaining an inventory of GHG emissions, taking action to reduce them, and reporting regularly to the UNFCCC. Since 1990, both national and international reporting has been based on this inventory.

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.

Emissions are reported on this basis by DECC as National Statistics on the first Tuesday in February each year. Emissions are reported 13 months in arrears, i.e. emissions for calendar year  $t$  are reported in February of year  $t+2$ .

## UK Environmental Accounts

Since 1998 the ONS has also reported on UK greenhouse gas emissions as part of the Environmental Accounts. These are satellite accounts to the main UK National Accounts, and provide information on air pollution, energy consumption, oil and gas reserves, forestry, trade in basic materials, environmental taxation and spending on environmental protection by government, and commercial and domestic industries. The UK Environmental Accounts are based on a range of statistical information, covering natural resource use, financial expenditure on environmental protection, and revenues raised from environmental taxes. They use similar concepts and classifications of industries to those employed in the UK National Accounts, and

are governed by the recommended European Union and United Nations framework and standards for developing such accounts. They are used to inform sustainable development policy, to model impacts of fiscal or monetary measures and to evaluate the environmental performance of different industrial sectors.

The ONS rely on the outputs of data from the UK greenhouse gas inventory. However, with respect to the reporting of greenhouse gas emissions, there are a number of differences between the Environmental Accounts and the data compiled for UNFCCC purposes.

A significant difference in methodology exists in the reporting arrangements for emissions from international aviation and shipping. For UNFCCC purposes, in accordance with international guidelines, these are excluded from national totals on the grounds that there is as yet no international agreement on the way to allocate them to national inventories. These emissions are estimated but are reported as “memorandum” items, based on fuel use from UK international aviation and shipping bunkers. By contrast, the Environmental Accounts include international emissions relating to UK operators in national totals using the best available data. In the case of aviation, ONS utilise flight kilometre data which provide relatively accurate information on which to calculate aviation emissions, whilst for shipping it has to rely on the consumption of bunker fuels.

Also the ONS approach focuses attention on responsibility for emissions rather than the physical location of an emission. The statistics presented in the Environmental Accounts are measured on what is therefore referred to as a UK “residency” basis, as opposed to a “territorial” basis. This means that the Environmental Accounts includes emissions which UK residents and UK registered businesses are directly responsible for in other countries (e.g. on holiday), and discount emissions caused by foreign visitors and businesses in the UK. This therefore includes emissions related to activity by UK residents’ transport and travel overseas, and excludes emissions generated by non-residents’ transport and travel in the UK. The principle is that this is the same basis on which the UK National Accounts are produced, so environmental impacts can be directly compared with economic indicators such as Gross Output and Gross Domestic Product.

This means that the Environmental Accounts include international emissions relating to UK airlines in national totals using the best available data. For example, they include all emissions by British Airways (a British registered company) anywhere, but not from Ryanair (a Rep. of Ireland registered company) flights into, and out of, the UK.

The ONS prepare a “bridging table” to accompany the Environmental Accounts (EA) greenhouse gas emissions data. The purpose of this table is to clearly demonstrate the differences between the two time-series, by way of a breakdown which compares how each measure is compiled. The table shows in detail both the EA and UNFCCC GHG emissions time series from the base year of 1990, and works down through the differences between the EA and the UNFCCC measures through a series of subtractions and additions. Apart from the addition of international aviation and shipping, there is also a “Cross–Boundary adjustment”, which captures both the additional emissions in respect of UK residents as well as those to be deducted in respect of overseas visitors and businesses in the UK, and a further element

relating to the treatment of biomass. There are then further adjustments which relate to the Crown Dependencies and land-use change.

The bridging table for selected years up to 2012 is shown below. The data presented below may not be the latest data available and is presented here for the purposes of showing the differences between the datasets. For the latest versions of each dataset please see the relevant references listed for each within this report:

**Table 1: Bridging table for 1990 to 2012<sup>1</sup>**  
UK<sup>2</sup>, 1990-2012

	1990	1995	2000	2005	2010	2011	2012
							<b>MtCO<sub>2</sub>e</b>
<b>Environmental Accounts<sup>3</sup></b>	<b>814.5</b>	<b>768.9</b>	<b>750.4</b>	<b>755.9</b>	<b>680.2</b>	<b>642.0</b>	<b>656.3</b>
Less							
Bunker emissions	24.4	28.4	37.1	43.1	40.7	43.3	40.9
CO <sub>2</sub> biomass	3.1	5.4	7.2	12.5	20.8	21.5	22.2
Cross-boundary	11.7	12.0	16.1	25.7	13.2	14.6	12.6
Plus							
Crown Dependencies	1.7	1.9	1.9	1.6	1.7	1.6	1.7
LULUCF	1.9	1.5	-2.1	-5.7	-7.3	-7.5	-7.0
<b>DECC reported<sup>4</sup></b>	<b>778.9</b>	<b>726.6</b>	<b>689.8</b>	<b>670.5</b>	<b>599.8</b>	<b>556.7</b>	<b>575.4</b>
Plus							
Overseas territories	1.7	1.7	1.8	2.1	2.1	2.1	2.0
<b>UNFCCC reported<sup>5</sup></b>	<b>780.7</b>	<b>728.2</b>	<b>691.6</b>	<b>672.6</b>	<b>601.9</b>	<b>558.8</b>	<b>577.3</b>

Source: Table 1 sheet from [Alternative approaches to reporting UK greenhouse gas emissions: data tables and maps Excel spreadsheet](#)

Notes:

1. This table does not show the latest available data from each source but uses the first published occurrence of 1990-2012 data for the purposes of highlighting the differences between datasets.
2. This table includes emissions from the UK, Crown Dependencies and Overseas Territories where appropriate.
3. The Environmental Accounts figures used here are from the 2014 publication which includes emissions generated by UK residents and UK registered businesses in other countries and excludes emissions from foreign visitors and businesses.
4. The DECC reported figures used here are from the 2014 publication of the inventory which show emissions estimates from 1990-2012 and cover the UK and Crown Dependencies (excludes Overseas Territories).
5. The UNFCCC figures used here are from the 2014 publication of the inventory which show emissions estimates from 1990-2012 and cover the UK, Crown Dependencies and Overseas Territories.

The Environmental Accounts break down emissions using the Eurostat industry classification, which is based on the economic sector of the person or company responsible for the activity, rather than the activity itself. This is particularly relevant to transport emissions, which are attributed to the owner of the transport.

The ONS publish the Environmental Accounts as National Statistics in June or July each year. Emissions are reported 18 months in arrears, i.e. emissions for calendar year t are reported in June or July of year t+2.

## Embedded emissions

Neither of the two methods described above take account of the emissions “embedded” within the manufactured goods and services which the UK imports and exports. This method therefore captures what is sometimes referred to as the UK’s “carbon footprint” or “embedded emissions”. The calculation of emissions on a “consumption” basis, reporting on emissions embedded in goods and services across international borders, is considerably more challenging.

The UK Government has undertaken research into embedded emissions and the Department of Environment, Food and Rural Affairs (Defra) have published statistics on the UK’s Carbon Footprint that investigates the impact that UK consumption has on carbon dioxide emissions.

## Comparisons of reported emissions under the different approaches

The table and figure below show a comparison between the three different approaches to reporting UK emissions. The latest year for which Embedded Emissions are available is 2012; Greenhouse Gas (GHG) Inventory data used for UNFCCC reporting and Environmental Accounts data are available until 2013. However, the table and figure below both use 2012 data published in 2014 for all three different approaches to reporting emissions. Only carbon dioxide emissions are compared to allow for a comparison to be made against embedded emissions which do not publish data for all greenhouse gases but for carbon dioxide only. Some data are available for embedded emissions for all greenhouse gases but these are not published in enough detail to make a comparison.

**Table 2: Comparison between different approaches for CO<sub>2</sub> emissions<sup>1</sup>**  
UK<sup>2</sup>, 1990-2012

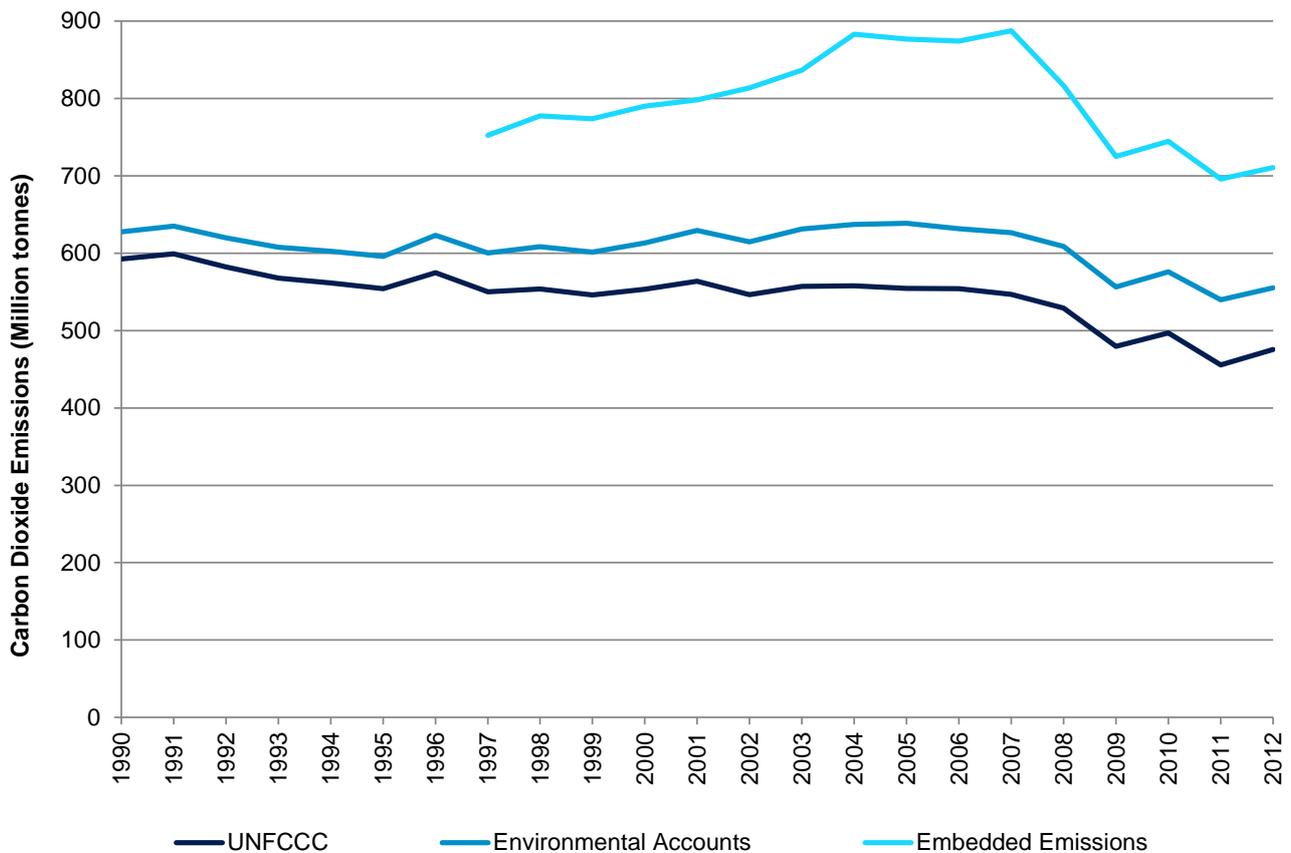
	MtCO <sub>2</sub>						
	1990	1995	2000	2005	2010	2011	2012
UNFCCC <sup>3</sup>	592.5	554.3	553.7	554.6	497.0	455.8	475.7
Environmental Accounts <sup>4</sup>	627.6	596.1	613.4	638.7	576.1	539.8	555.4
Embedded Emissions <sup>5</sup>	-	-	790.1	877.0	744.8	696.1	710.8

Source: Table 2 and Figure 1 sheet from [Alternative approaches to reporting UK greenhouse gas emissions: data tables and maps Excel spreadsheet](#)

Notes:

1. This table does not show the latest available data from each source but uses the first published occurrence of 1990-2012 data for the purposes of highlighting the differences between datasets.
2. This table includes emissions from the UK, Crown Dependencies and Overseas Territories where appropriate.
3. The UNFCCC figures used here are from the 2014 publication of the inventory which show emissions estimates from 1990-2012 and cover the UK, Crown Dependencies and Overseas Territories.
4. The Environmental Accounts figures used here are from the 2014 publication which includes emissions generated by UK residents and UK registered businesses in other countries and excludes emissions from foreign visitors and businesses.
5. The Embedded Emissions figures used here are from the 2014 publication of UK carbon footprint statistics which show UK CO<sub>2</sub> emissions estimates from 1997-2012.

**Figure 1: Comparison of UK CO<sub>2</sub> Emission Reporting: UNFCCC, Environmental Accounts and Embedded emissions 1990-2012 (MtCO<sub>2</sub>)**



Source: Table 2 and Figure 1 sheet from [Alternative approaches to reporting UK greenhouse gas emissions: data tables and maps Excel spreadsheet](#)

Note: This graph does not present the latest available data from each source but uses the first published occurrence of 1990-2012 data for the purposes of highlighting the differences between datasets.

The tables below show the breakdown of emissions by territory and aviation between UK and Gibraltar for information purposes. Aviation between UK and Guernsey, Jersey and Isle of Man can be found in final UK greenhouse gas emissions official statistics<sup>4</sup>.

<sup>4</sup> Final UK greenhouse gas emissions official statistics <https://www.gov.uk/government/collections/final-uk-greenhouse-gas-emissions-national-statistics>

**Table 3: Total GHG Emissions in the UK, Guernsey, Jersey, Isle of Man and Gibraltar<sup>1</sup>**  
 UK, Crown Dependencies and Overseas Territories, 2012<sup>2</sup>

Territory	Category	MtCO <sub>2</sub> e
		2012 <sup>3</sup>
United Kingdom	United Kingdom	573.7
Guernsey	Crown Dependency	0.5
Jersey	Crown Dependency	0.5
Isle of Man	Crown Dependency	0.8
Gibraltar	Overseas Territory	0.4
<b>Total</b>		<b>575.8</b>

Source: Table 3 sheet from [Alternative approaches to reporting UK greenhouse gas emissions: data tables and maps Excel spreadsheet](#)

Note:

1. This data is not published elsewhere in DECC statistics.
2. This table does not present the latest available data but uses the first published occurrence of 2012 data.
3. These figures include aviation and shipping between UK and Crown Dependencies and UK and Gibraltar. However, they exclude aviation and shipping between UK and other Overseas Territories.

**Table 4: Aviation and Shipping between the UK and Gibraltar<sup>1</sup>**  
 UK and Gibraltar, 2012<sup>2</sup>

Territory	Description	MtCO <sub>2</sub> e
		2012
Gibraltar	Aircraft between UK and Gibraltar	0.027
	Shipping between UK and Gibraltar	0.029
	<b>Gibraltar Total</b>	<b>0.056</b>
United Kingdom	Aircraft between UK and Gibraltar	0.032
	Shipping between UK and Gibraltar	0.026
	<b>United Kingdom Total</b>	<b>0.059</b>

Source: Table 4 sheet from [Alternative approaches to reporting UK greenhouse gas emissions: data tables and maps Excel spreadsheet](#)

Note:

1. This data is not published elsewhere in DECC statistics.
2. This table does not present the latest available data but uses the first published occurrence of 2012 data.

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