



Annex: 2018 UK Greenhouse Gas Emissions, final figures by end user and fuel type

26 March 2020

National Statistics

This publication is an extension of the UK territorial greenhouse gas emission estimates by source for 1990-2018 published in February earlier this year. It provides the latest estimates of 1990-2018 UK greenhouse gas emissions for end users and by fuel type, which are presented in carbon dioxide equivalent units throughout this statistical release. The end user breakdown reallocates emissions by source to where the “end-use” occurred. This means that emissions from the energy supply sector are reallocated to other sectors based on their energy use. The total emissions presented here are consistent with the data published in February by source sector. The uncertainty in UK greenhouse gas emissions is also presented by gas and by sector.

- In 2018 it is estimated that 31% of greenhouse gas emissions were from transport, making it the sector with the largest emissions on an end user basis. 27% of emissions were from the business sector, 22% from the residential sector and 10% from agriculture. The remainder were attributable to the industrial processes, public, waste management and exports sectors. The land use, land use change and forestry (LULUCF) sector acts as a net sink of emissions.
- Uncertainty in UK greenhouse gas emissions estimates is around 3%, based on uncertainty analysis of the 2018 emissions estimates which were published in February 2020. The uncertainty of UK greenhouse gas emissions estimates varies considerably by gas and sector. Carbon dioxide estimates have the least uncertainty associated with them while nitrogen trifluoride and perfluorocarbons estimates are the most uncertain. At sector level, LULUCF emissions estimates have the highest uncertainty, followed by waste management and agriculture.
- The UK has targets for reducing greenhouse gas emissions under the Climate Change Act 2008 known as carbon budgets, which set legally binding limits on the total amount of greenhouse gas emissions the UK can emit over five-year periods. Compliance with carbon budgets is not assessed by directly comparing the budget level against UK greenhouse gas emissions. Instead, the budget level is compared to the net UK carbon account, which takes account of international emissions trading. The latest figures show:
 - After taking account of units debited from the net UK carbon account as a result of the EU Emissions Trading System (ETS), the 2018 net UK carbon account was 476.2 MtCO_{2e}.
 - 2018 represents the first year of the third carbon budget. In order to meet the third carbon budget, the net UK carbon account must be on average lower than 508.8 MtCO_{2e} each year.

Contents

Introduction	3
1990-2018 total greenhouse gas emissions by end user	4
Transport	7
Business	8
Residential	9
Agriculture	10
Industrial processes	11
Public sector	12
Waste management and Land Use, Land Use Change and Forestry (LULUCF)	12
Exports	13
Uncertainties around the 2018 estimates	14
Progress against the first year (2018) of the third carbon budget	17
Revisions to 1970-2018 emissions estimates published in February 2020	19
Technical information	20
Coverage of emissions reporting	20
Revisions to the estimates of end user emissions	21
Embedded emissions	21
Further information	22
Future updates to greenhouse gas emissions estimates	22
Contact	22

Introduction

This Annex contains final estimates of 1990 to 2018 UK greenhouse gas emissions by end user sector and by fuel type, as well as uncertainty estimates for 2018 emissions by source sector and gas. These are a follow up to, and are consistent with, the final estimates of 1990 to 2018 emissions by source sector which were published on 4th February 2020.

Emissions by end user and by fuel type have now been incorporated as updates into the data tables published alongside the [Final UK Greenhouse Gas Emissions Statistics](#). In a change from previous years, these data have been published in separate tables rather than as additional sections in tables 3-7 in the data tables accompanying the publication. Table 17 now presents emissions by fuel type and gas, while tables 19 to 23 present emissions by end user category overall and for each gas. Also published in the data tables is uncertainty analysis for 2018 emissions by gas and sector.

The geographic coverage of emissions by end user and by fuel type in this report is UK only. For the purposes of reporting, greenhouse gas emissions are allocated into sectors as follows:

- Energy supply
- Business
- Transport
- Public
- Residential
- Agriculture
- Industrial processes
- Land use, land use change, and forestry (LULUCF)
- Waste management

When emissions are reported by source, emissions are attributed to the sector that emits them directly. The end user breakdown reallocates emissions by source to where the “end-use” occurred. The main impact is to reallocate emissions from the energy supply sector to other sectors that use the energy. Some emissions are also allocated to an “exports” category in the end user breakdown where the end-use is outside the UK. This is for emissions within the UK from the production of fuels (for example from a refinery or coal mine), which are subsequently exported or sent to bunkers for use outside the UK. This makes it possible to see the full emissions impact within the UK of a particular end-use sector or sub-sector (although emissions that occur outside the UK are excluded). This also enables the emissions to be further geographically disaggregated. Devolved administration and local authority carbon dioxide emissions estimates, based on the end user breakdown, will be published in June 2020.

The uncertainty estimates are used to prioritise further research into improving emissions estimates, and more generally give users an indication of the robustness of the emissions estimates for different sectors. The geographic coverage of the uncertainty estimates includes the UK, Crown Dependencies and Overseas Territories.

This Annex does not discuss emissions by fuel type, but these are included in the updated data tables published alongside this document. Note that we are considering changing the fuel categories presented in these statistics in future to provide more detail and bring them more in

line with the energy statistics BEIS publishes. We intend to set out the proposed new categories in an article in the June 2020 Energy Trends publication.

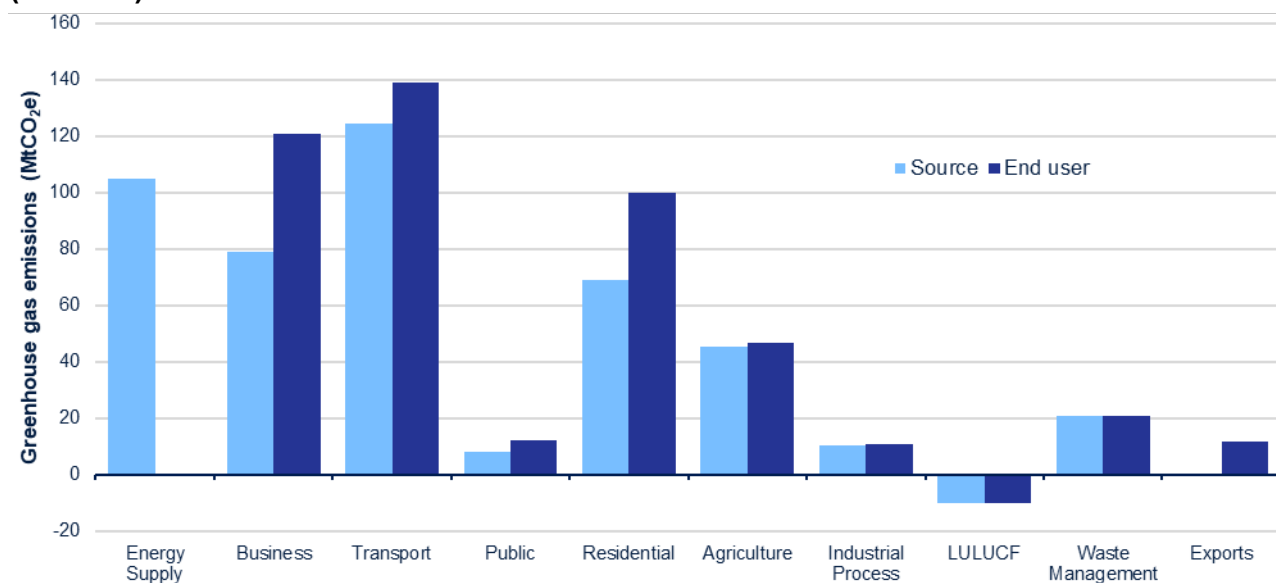
1990-2018 total greenhouse gas emissions by end user

In the [data tables](#) accompanying this publication, table 19 shows overall UK greenhouse gas emissions since 1990 by end user sector and source, while tables 20-23 show this breakdown for each individual gas.

These results are based on and consistent with the breakdown by gas and sector of 2018 emissions by source which was published on 4th February 2020. Total 2018 greenhouse gas emissions for the UK were 451.5 million tonnes carbon dioxide equivalent (MtCO₂e).

The end user breakdown reallocates emissions by source to where the “end-use” occurred. The main impact is to reallocate emissions from the energy supply sector to other sectors, the business and residential sectors in particular. For example, emissions occurring at power stations in generating electricity are reallocated to where the electricity is actually consumed. It should be noted that the results shown by this breakdown are based on a number of assumptions, and we would therefore expect them to be subject to greater uncertainty than the breakdown of emissions by source.

Figure 1: Greenhouse gas emissions by source sectors and end user sectors, UK 2018 (MtCO₂e)



Source: Tables 3 and 19, Final UK greenhouse gas emissions national statistics 1990-2018 Excel data tables

When looked at by end user sector, 31% of greenhouse gas emissions in 2018 were from transport, 27% from the business sector, 22% from the residential sector and 10% from agriculture. The remainder were attributable to the industrial processes, public and exports sectors. No emissions are reallocated to the waste management or land use, land use change and forestry (LULUCF) sectors and hence they are assumed to be equal to the by source emissions. This means the LULUCF sector remains a net sink of emissions.

Figure 2: Proportion of net greenhouse gas emissions in each end user sector, UK 2018

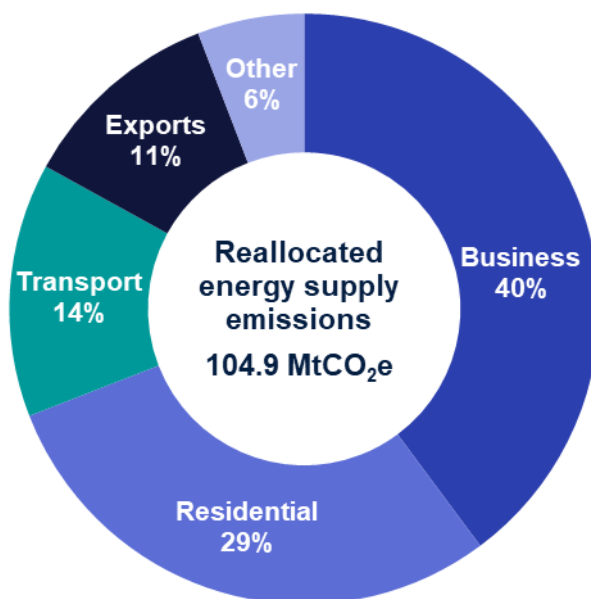


Source: Table 19, Final UK greenhouse gas emissions national statistics 1990-2018 Excel data tables

Note: Other includes Public, Industrial Processes and the Land Use, Land Use Change and Forestry (LULUCF) sectors (note that LULUCF acts as a net sink of emissions). The percentages may not sum to 100% due to rounding.

The majority of emissions from energy supply are reallocated to two sectors, with business accounting for 40% and the residential sector accounting for 29% of reallocated emissions as shown in figure 3 below.

Figure 3: Breakdown of greenhouse gas emissions reallocated from the energy supply sector to the end user sectors, UK 2018



Source: Table 3, Final UK greenhouse gas emissions national statistics 1990-2018 Excel data tables

Table 1: UK greenhouse gas emissions by gas and end user sector

UK, 2018

	MtCO₂e				
	Carbon dioxide	Methane	Nitrous oxide	Fluorinated gases	Total
Business	105.4	2.2	1.1	12.1	120.8
Transport	136.8	0.7	1.4	0.0	139.0
Public	11.8	0.3	0.0	0.0	12.2
Residential	94.8	3.2	0.4	1.5	99.9
Agriculture	7.2	25.5	14.3	0.0	46.9
Industrial Processes	10.0	0.1	0.3	0.2	10.7
LULUCF	-11.7	0.0	1.4	0.0	-10.3
Waste Management	0.2	19.0	1.4	0.0	20.7
Exports	11.0	0.5	0.1	0.0	11.7
Total	365.7	51.5	20.4	13.8	451.5

Source: Tables 19, 20, 21, 22 and 23, Final UK greenhouse gas emissions national statistics 1990-2018 Excel data tables

Table 2: Greenhouse gas emissions by end user sector

UK, 1990-2018

	MtCO₂e							
	1990	1995	2000	2005	2010	2015	2017	2018
Business	247.8	218.5	217.5	212.4	186.9	148.6	126.4	120.8
Transport	146.6	151.2	153.7	156.2	142.0	138.5	140.9	139.0
Public	31.5	28.9	24.4	22.4	19.1	14.5	12.3	12.2
Residential	171.3	157.1	158.1	162.3	155.9	113.3	100.0	99.9
Agriculture	57.8	56.0	53.0	50.6	47.2	47.1	47.5	46.9
Industrial Processes	63.3	53.7	29.3	21.4	13.6	13.3	11.4	10.7
LULUCF	-0.1	-2.3	-4.1	-7.2	-9.3	-10.0	-10.1	-10.3
Waste Management	66.6	69.3	63.1	49.1	29.7	20.7	20.4	20.7
Exports	9.2	13.1	12.9	16.8	15.9	12.0	12.3	11.7
Total	793.8	745.4	707.9	683.9	600.9	497.9	461.0	451.5

Source: Table 3, Final UK greenhouse gas emissions national statistics 1990-2018 Excel data tables

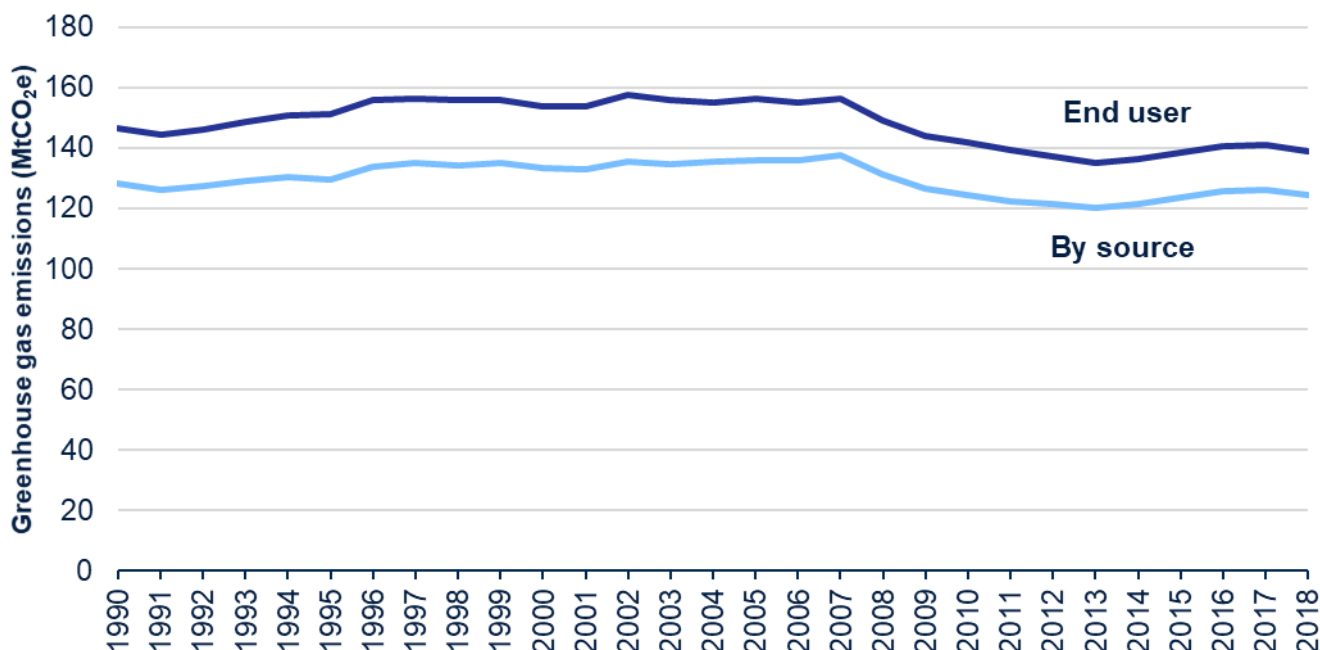
Details of changes over time for each sector are set out in the following sections of this statistical release. The commentary in these sections focuses on the differences between the end user and by source breakdowns. Further information on trends of emissions by source sector can be found in the statistics release of the [Final UK Greenhouse Gas Emissions Statistics](#).

Transport

The transport sector was responsible for around 31% of UK greenhouse gas end user emissions in 2018, almost entirely through carbon dioxide emissions, and making it the highest emitting sector on an end user basis. Emissions of carbon dioxide are closely related to the amount of fuel used, whilst nitrous oxide and methane emissions are influenced more by the vehicle type and age. The main source of emissions from this sector is the use of petrol and diesel in road transport.

End user emissions from the transport sector are between 15 and 22 MtCO₂e higher than emissions by source across the time series, so follow a very similar trend. Between 1990 and 2018, there has been relatively little overall change in the level of greenhouse gas emissions from the transport sector, with rising road traffic balancing out improvements in fuel efficiencies. After remaining at a similar level for over a decade transport emissions started falling in 2008 at around the time of the recession, when there was a fall in the volume of traffic on the roads. But this trend reversed after 2013 and there was an increase in emissions in recent years as road traffic rose again, until 2018 when there was a reduction.

Figure 4: Greenhouse gas end user emissions from transport, UK 1990-2018 (MtCO₂e)



Source: Tables 3 and 19, Final UK greenhouse gas emissions national statistics 1990-2018 Excel data tables

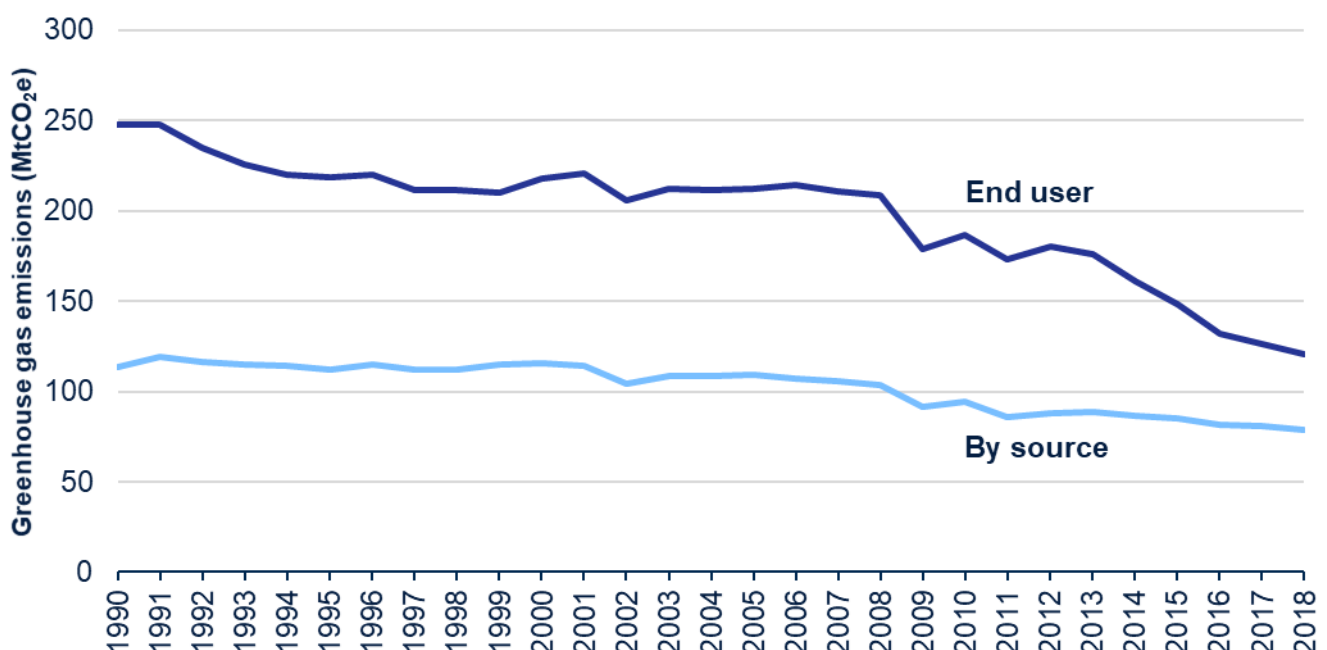
Business

The business sector was responsible for 27% of UK greenhouse gas end user emissions in 2018, with carbon dioxide being the most prominent gas. Emissions from this sector primarily relate to fossil fuel combustion in industry and commerce, although emissions of F gases from the use of fluorinated compounds in certain applications, particularly refrigeration and air-conditioning, are significant. The business sector is responsible for the majority of emissions from F gases.

Between 1990 and 2018 there was a general downward trend in greenhouse gas end user emissions from the business sector, resulting in an overall decrease of 51%. Between 2017 and 2018 emissions decreased by 5.5 MtCO_{2e} (4%). This is larger than the decrease of 2.1 MtCO_{2e} (3%) seen in emissions by source from this sector between 2017 and 2018, and is due to a reduction in emissions from electricity generation reallocated to this sector from the energy supply sector for the end user breakdown.

Overall, end user emissions have fallen more quickly since 1990 than emissions by source, particularly in the last 6 years. They have fallen by 33% since 2012 compared to a 10% fall in emissions by source over this period. This is due to the large reduction in emissions from power supply as a result of a shift away from the use of coal in electricity generation, resulting in a lower level of emissions being reallocated to this sector from the energy supply sector.

Figure 5: Greenhouse gas end user emissions from business, UK 1990-2018 (MtCO_{2e})



Source: Tables 3 and 19, Final UK greenhouse gas emissions national statistics 1990-2018 Excel data tables

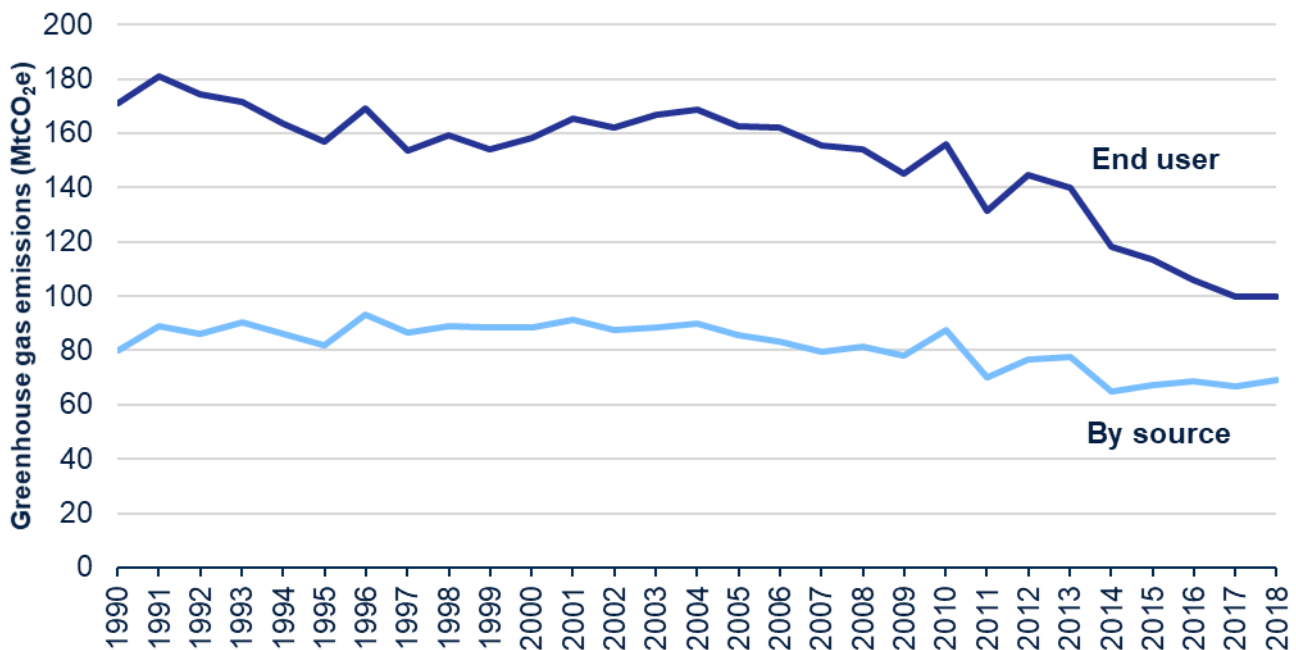
Residential

The residential sector was responsible for around 22% of UK greenhouse gas end user emissions in 2018, with carbon dioxide being the most prominent gas for this sector. Unlike emissions by source, which only cover activities related to residential fossil fuel use, emissions reported by end user also include emissions from residential electricity use which have been re-allocated from the energy supply sector.

Between 1990 and 2018, there has been considerable variation in greenhouse gas end user emissions from year to year in the residential sector. Both the end user and by source emissions from this sector are heavily influenced by external temperatures. End user emissions have seen a bigger overall decrease since 1990 than by source emissions, due to a decrease in emissions from electricity consumption which are included in the residential end user sector but are in the energy supply sector for the emissions by source. This is a result of changes in the mix of fuels being used to generate electricity, with a shift away from coal towards gas and an increase in the use of renewables over this period.

Between 2017 and 2018, end user emissions in the residential sector remained at around the same level, with a small fall of 0.1 MtCO₂e (0.1%) between these years, compared to a 4% decrease in residential emissions by source. This is due to a reduction in emissions from power supply resulting in lower emissions from electricity generation being reallocated to this sector from the energy supply sector, whereas emissions by source rose due to the increased use of gas for heating during the colder winter in 2018.

Figure 6: Greenhouse gas end user emissions from the residential sector, UK 1990-2018 (MtCO₂e)



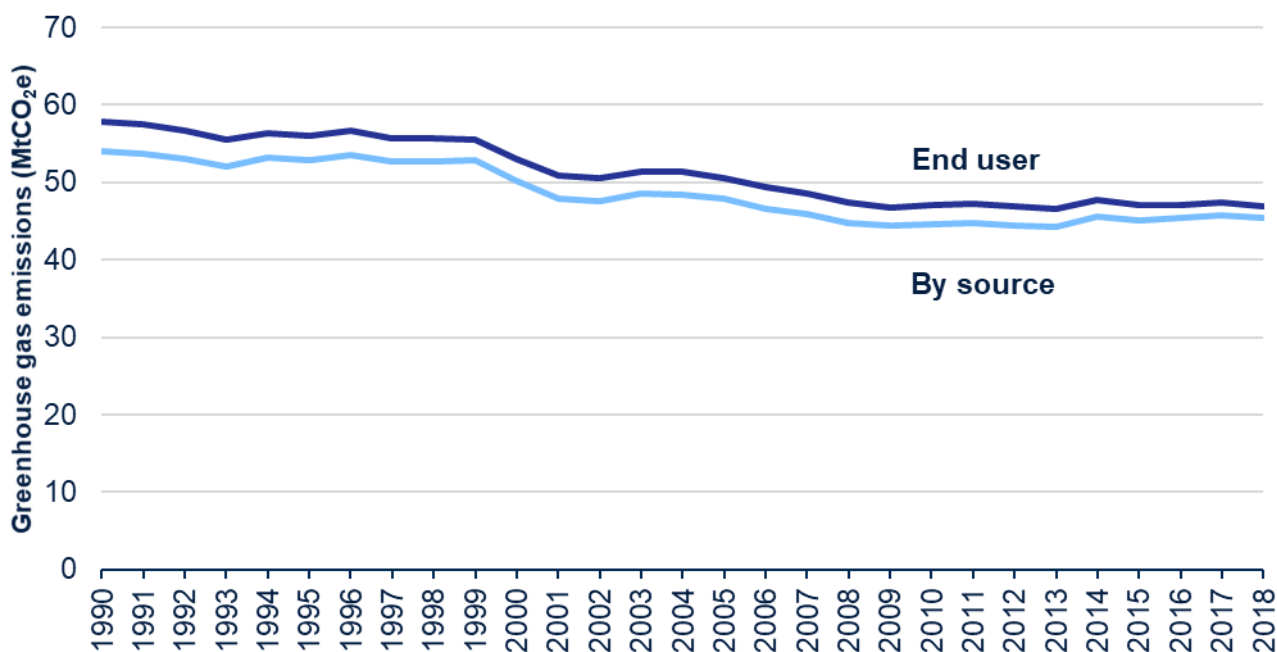
Source: Tables 3 and 19, Final UK greenhouse gas emissions national statistics 1990-2018 Excel data tables

Agriculture

The agriculture sector was responsible for 10% of UK greenhouse gas end user emissions in 2018. Emissions of methane (54%) and nitrous oxide (30%) dominate this sector. End user and by source emissions are very similar for this sector due to the fact that only a small proportion of emissions are as a result of energy use. The most significant sources are emissions of methane due to enteric fermentation from livestock, particularly cattle, and nitrous oxide emissions related to the use of fertilisers on agricultural soils.

End user emissions follow a similar trend to by source emissions. Emissions have decreased by 19% since 1990 due to a fall in animal numbers over the period, together with a decrease in synthetic fertiliser use. Between 2017 and 2018 there was a 1% decrease in emissions from the agriculture sector.

Figure 7: Greenhouse gas end user emissions from agriculture, UK 1990-2018 (MtCO₂e)



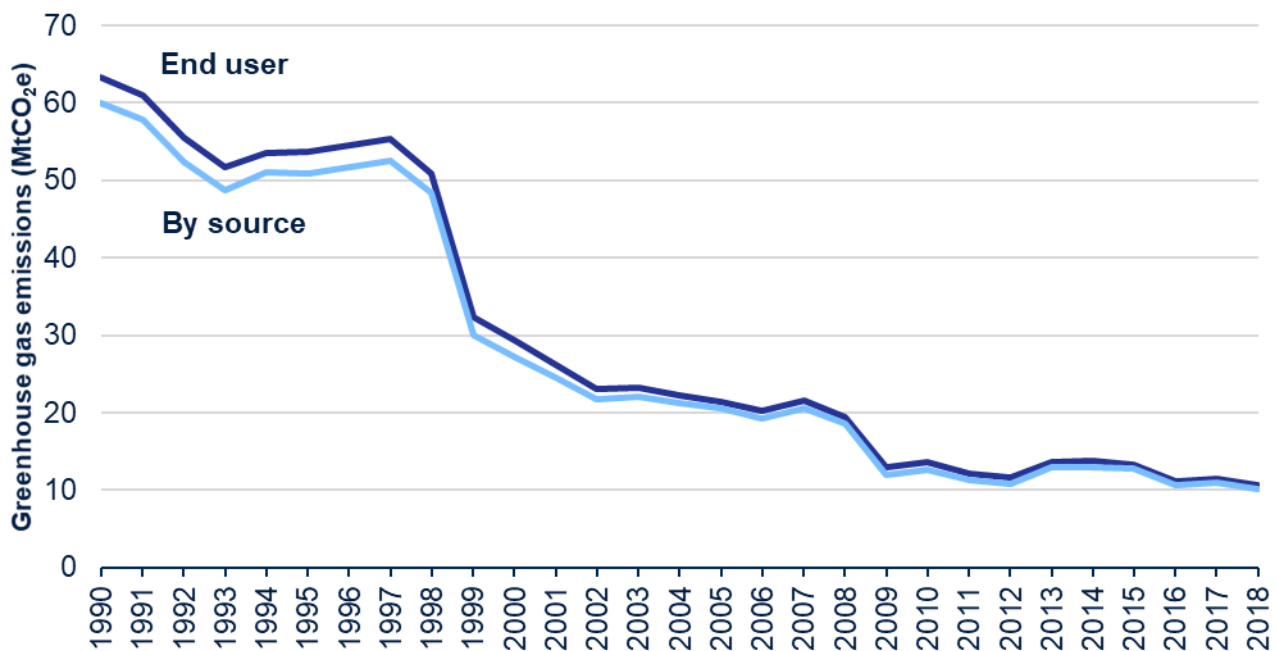
Source: Tables 3 and 19, Final UK greenhouse gas emissions national statistics 1990-2018 Excel data tables

Industrial processes

The industrial process sector was responsible for 2% of UK greenhouse gas end user emissions in 2018. The main source of emissions is cement production, with other processes such as sinter, lime, iron and steel production also contributing significantly.

The end user emissions from this sector are only slightly higher than emissions by source, and follow a very similar trend, with a decrease of around 83% since 1990. This is mainly due to a large reduction in emissions from adipic acid production and halocarbon production between 1998 and 1999 (combined emissions from which are now almost zero).

Figure 8: Greenhouse gas end user emissions from industrial processes, UK, 1990-2018 (MtCO₂e)



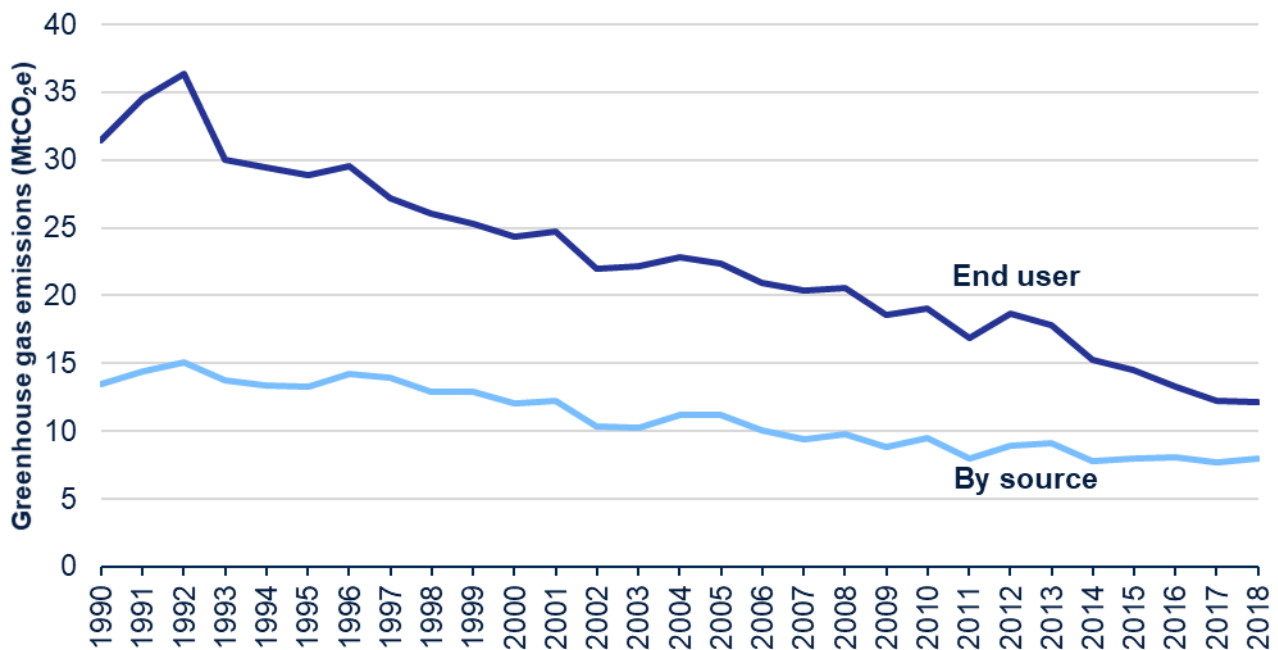
Source: Tables 3 and 19, Final UK greenhouse gas emissions national statistics 1990-2018 Excel data tables

Public sector

The public sector was responsible for 3% of UK greenhouse gas end user emissions in 2018, with carbon dioxide making up almost all of these emissions. Emissions can fluctuate from year to year as they are influenced by external temperatures.

End user emissions from the public sector were approximately double the emissions by source across much of the time series, although this has fallen to around 50% higher in 2018. This is due to the inclusion of emissions from electricity generation in the end user breakdown. The difference between end user and by source emissions has been decreasing in recent years due to a reduction in emissions from electricity generation reallocated to this sector from the energy supply sector. Since 1990 end user emissions have shown a more pronounced decrease than emissions by source, driven by a reduction in emissions from electricity generation.

Figure 9: Greenhouse gas end user emissions from the public sector, UK, 1990-2018 (MtCO₂e)



Source: Tables 3 and 19, Final UK greenhouse gas emissions national statistics 1990-2018 Excel data tables

Waste management and Land Use, Land Use Change and Forestry (LULUCF)

For the waste management and LULUCF sectors, emissions measured by end user are the same as those measured by source, since no emissions from the energy supply sector are reallocated to these sectors.

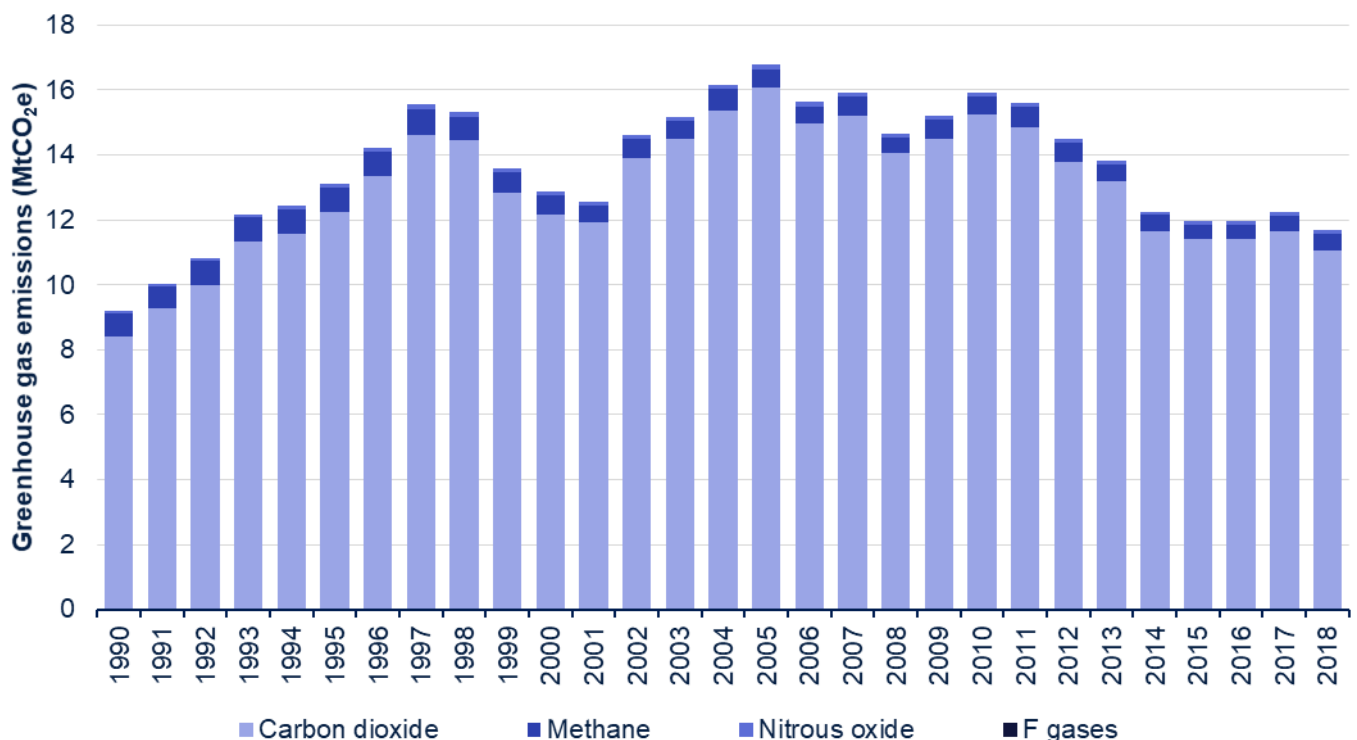
Exports

The exports sector represents emissions associated with the production of fuels within the UK (for example, from a refinery or a coal mine) which are subsequently exported or sent to bunkers for use outside the UK. Since these fuels are ultimately used for activities which occur outside the UK, it would not be appropriate to allocate the emissions from their production to any of the other end user sectors, so they are reported under a separate, additional sector.

The exports sector was responsible for around 3% of UK greenhouse gas end user emissions in 2018, with carbon dioxide representing the majority of these emissions.

Emissions from the exports sector increased during most of the 1990s, largely driven by changes in throughput¹ at refineries, which have fed through to increased exports rather than increased deliveries to the domestic market. Since then the overall trend has varied, with emissions having fallen in recent years compared to the peaks in the mid to late 2000s. Between 2017 and 2018, emissions from the exports sector decreased by 0.6 MtCO_{2e} (5%).

Figure 10: Greenhouse gas end user emissions from the exports sector, UK, 1990-2018 (MtCO_{2e})



Source: Tables 3 and 19, Final UK greenhouse gas emissions national statistics 1990-2018 Excel data tables

¹ The capacity for refining crude oil over a given period of time

Uncertainties around the 2018 estimates

In the [data tables](#) accompanying this publication, table 10 shows the uncertainty in the 2018 UK greenhouse gas emissions estimates by gas and table 11 shows it by source sector.

This section sets out the uncertainty ranges associated with the final 2018 emissions estimates by source, which were published on 4th February 2020.

Estimates of uncertainty are produced each year, broken down by sector and gas. The emissions estimates are compiled such that uncertainty is reduced as much as possible, meaning that estimates should not be consistently more or less than the actual totals. Estimates of uncertainty allow users to see how reliable the emissions estimates are and give them an idea of what we do and do not know.

The uncertainty analysis takes into account a number of different known sources of uncertainty associated with emissions factors and activity data, for example, the statistical difference² between energy supply and demand reported in the [Digest of UK Energy Statistics](#). The different sources of uncertainty are then entered into a model using specialist software which produces uncertainty estimates by running the model a large number of times.

The uncertainties are expressed as a 95% confidence interval. In terms of the uncertainty model, this means that 95% of the simulated values fell between the intervals shown below in tables 10 and 11.

The uncertainty estimates vary a lot between different sectors and gases. Among the different greenhouse gases, carbon dioxide estimates have the lowest uncertainty associated with them while nitrogen trifluoride and perfluorocarbons estimates are the most uncertain. At sector level, the land use, land use change and forestry (LULUCF), waste management and agriculture sectors are the most uncertain; as shown in figure 12.

The overall uncertainty around total greenhouse gas emissions for 2018 is estimated to be 3%. There is a continual programme to improve this uncertainty and in 2018 there has been a notable improvement in the uncertainty estimates for the LULUCF sector due to methodological improvements. Further details can be found in the UK's National Inventory report which is due to be published on 15th April 2020³.

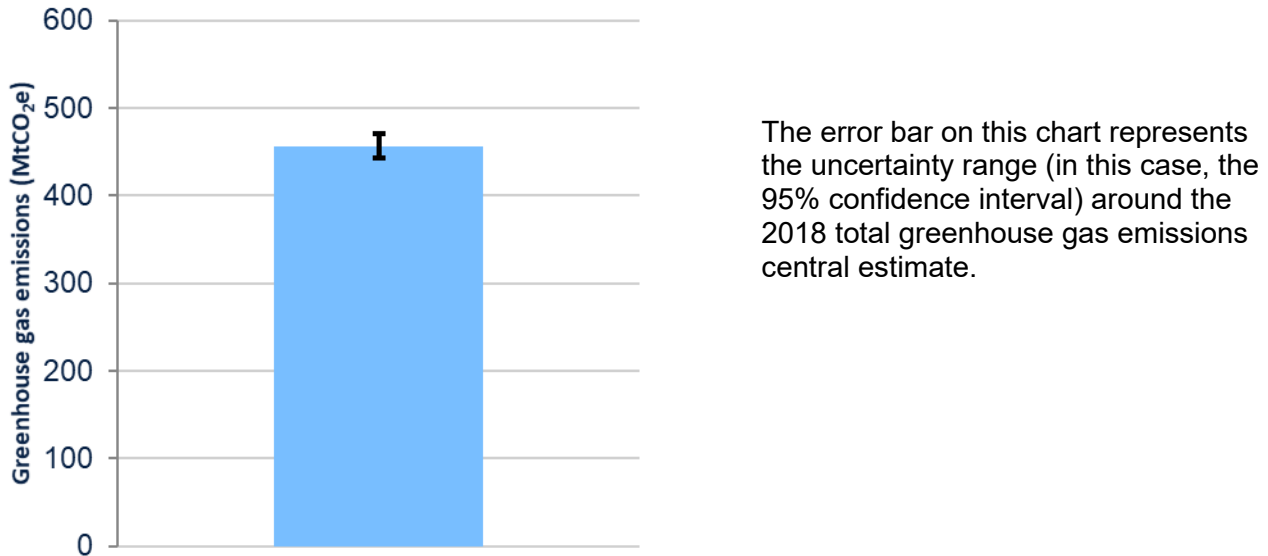
The uncertainty in the trend in emissions reductions between 1990 and 2018, expressed as a 95% confidence interval, is estimated to be a percentage reduction of between 40% and 46%, with a central estimate of a 43% reduction in emissions from 1990 to 2018.

The geographic coverage of the uncertainty estimates includes the UK, Crown Dependencies and Overseas Territories. Uncertainties are not calculated for different geographical coverages but uncertainty estimates for the UK only would be expected to be very similar.

² Statistical difference is explained on page 5 of the Energy Balance: Methodology note: <https://www.gov.uk/government/publications/energy-balance-methodology-note>

³ Previous UK National Inventory Report: https://naei.beis.gov.uk/reports/reports?report_id=981

Figure 11: Illustration of uncertainty in estimates of UK Greenhouse Gas emissions, UK, Crown Dependencies and Overseas Territories, 2018 (MtCO₂e)



Source: Table 10, Final UK greenhouse gas emissions national statistics 1990-2018 Excel data tables

Table 3: Uncertainty in estimates of 2018 UK greenhouse gas emissions by gas

UK, Crown Dependencies and Overseas Territories, 2018

	MtCO ₂ e		
	2018 emissions	Uncertainty around 2018 estimate, expressed as a 95% confidence interval	
		Lower bound	Upper bound
Carbon dioxide	369.2	359.6	379.0
Methane	51.9	44.4	61.9
Nitrous oxide	20.8	17.7	25.0
Hydrofluorocarbons	13.1	11.9	14.3
Perfluorocarbons	0.3	0.2	0.4
Sulphur hexafluoride	0.5	0.5	0.6
Nitrogen trifluoride	0.0	0.0	0.0
Total	455.9	442.8	470.1

Source: Table 10, Final UK greenhouse gas emissions national statistics 1990-2018 Excel data tables

Note:

- 2018 estimates are presented as the central estimate from the model used to calculate uncertainties. These differ slightly from the actual emissions estimates.
- The total 2018 central estimate for Table 10 differs from the total 2018 estimate for Table 11 in this annex due to the weighting of Global Warming Potentials (GWP) when estimating uncertainties by gas.

Table 4: Uncertainty in estimates of 2018 UK greenhouse gas emissions by sector

UK, Crown Dependencies and Overseas Territories, 2018

	MtCO₂e		
	2018 emissions	Uncertainty around 2018 estimate, expressed as a 95% confidence interval	
		Lower bound	Upper bound
Energy supply	106.4	103.7	109.2
Transport	125.8	123.2	128.3
Residential	69.6	67.5	71.7
Business	79.3	77.0	81.8
Public	8.0	7.7	8.3
Industrial processes	10.2	9.9	10.7
Agriculture	45.7	42.1	49.8
Land use, land use change and forestry (LULUCF)	-10.0	-18.1	-1.8
Waste management	20.9	14.2	30.5
Total	455.9	443.2	469.6

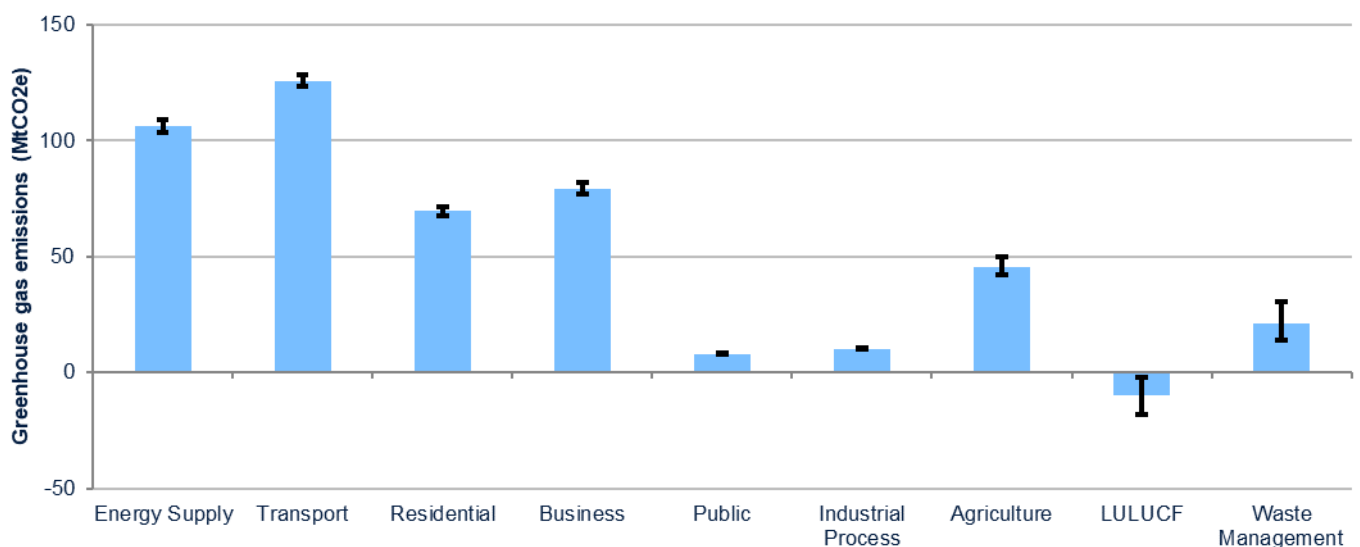
Source: Table 11, Final UK greenhouse gas emissions national statistics 1990-2018 Excel data tables

Note:

- 2018 estimates are presented as the central estimate from the model used to calculate uncertainties. These differ slightly from the actual emissions estimates.
- The total 2018 central estimate for Table 11 differs from the total 2018 estimate for Table 10 in this annex due to the weighting of Global Warming Potentials (GWP) when estimating uncertainties by gas.

Figure 12: Illustration of uncertainty in estimates of UK Greenhouse Gas emissions by sector

UK, Crown Dependencies and Overseas Territories, 2018 (MtCO₂e)



Source: Table 11, Final UK greenhouse gas emissions national statistics 1990-2018 Excel data tables

Note: The error bars on the chart represent the uncertainty range (in this case, the 95% confidence interval) around the 2018 total greenhouse gas emissions central estimates for each sector.

Progress against the first year (2018) of the third carbon budget

In the [data tables](#) accompanying this publication, table 9 shows the UK's progress against its domestic and international targets.

Note: Progress against the first year (2018) of the third carbon budget would usually have been included in the initial release of final greenhouse gas emissions statistics published on 4th February 2020, however it was not possible to include as the carbon accounting regulations for 2018 had not been laid in Parliament at that time.

The UK has targets for reducing greenhouse gas emissions under the Climate Change Act 2008 known as carbon budgets, which set legally binding limits on the total amount of greenhouse gas emissions the UK can emit over five-year periods.

Compliance with carbon budgets is not assessed by directly comparing the budget level against UK greenhouse gas emissions. Instead, the budget level is compared to the net UK carbon account, which takes account of international emissions trading and is defined for each period in carbon accounting regulations⁴.

The latest figures show:

- After taking account of units debited from the net UK carbon account as a result of the EU Emissions Trading System (ETS), the 2018 net UK carbon account was 476.2 MtCO₂e.
- 2018 represents the first year of the third carbon budget. In order to meet the third carbon budget, the net UK carbon account must be on average lower than 508.8 MtCO₂e each year⁵.

Detailed information on how the 2018 net UK carbon account is calculated will be published in the Annual Statement of Emissions for 2018, due to be published by BEIS on 31st March 2020.

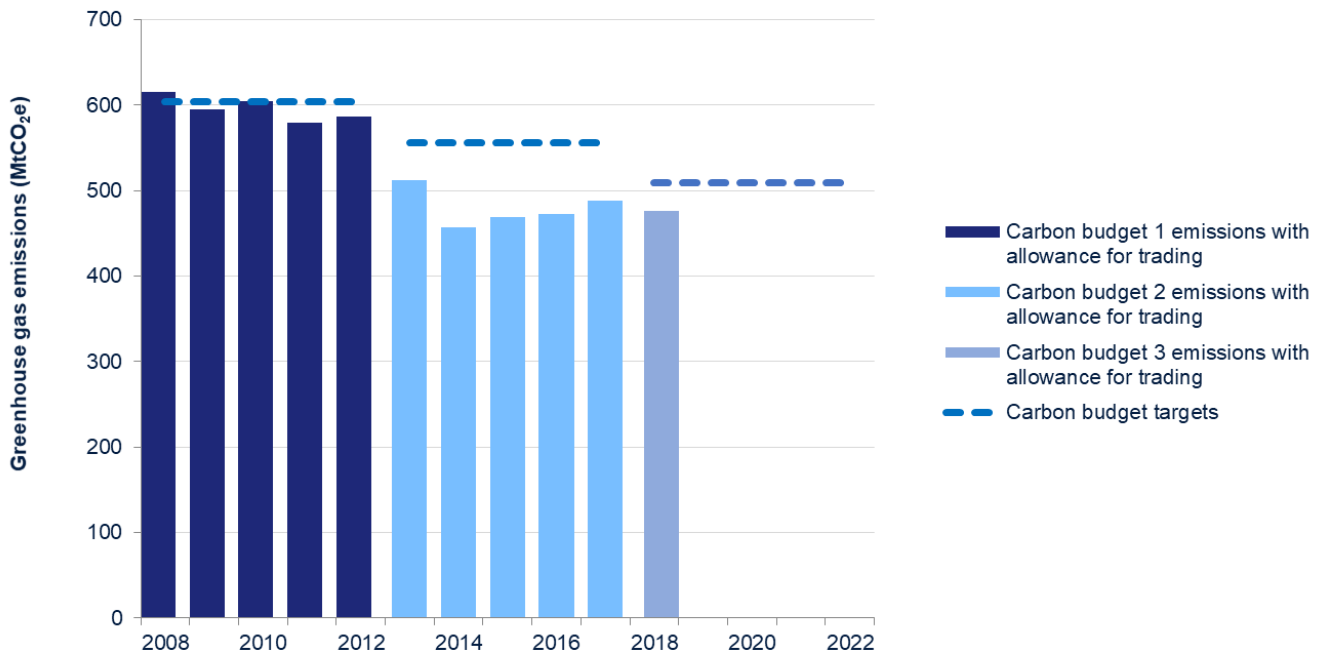
Further information on carbon budgets and other international emissions reduction targets can be found in the 'UK performance against emissions reduction targets' section of the final greenhouse gas emissions statistics published on 4th February 2020.

⁴ Carbon accounting regulations for the first carbon budget (2008-12): <http://www.legislation.gov.uk/uksi/2009/1257/contents/made>
Carbon accounting regulations for the second carbon budget (2013-17):
<http://www.legislation.gov.uk/uksi/2015/775/contents/made>
Carbon accounting regulations for the first year (2018) of the third carbon budget (2018-22):
<http://www.legislation.gov.uk/uksi/2020/115/contents/made>

⁵ Based on the level of the third carbon budget (2018-22), as legislated in 2009 (2,544.0 MCO₂e):
<https://www.legislation.gov.uk/uksi/2009/1259/contents/made>. The level of the budget has since been conditionally raised to 2,631.9 MtCO₂e, through the decision to carry forward 87.9 MtCO₂e of over-achievement from the second carbon budget period:
<https://www.theccc.org.uk/publication/letter-carry-forward-of-surplus-emissions-lord-deben-to-chris-skidmore-mp/>

Figure 13: UK's progress towards meeting carbon budgets

UK, 2008-2018 (MtCO_{2e})



Source: Table 9, Final UK greenhouse gas emissions national statistics 1990-2018 Excel data tables

Revisions to 1970-2018 emissions estimates published in February 2020

At the same time this annex was published, two minor revisions were made to the estimates of greenhouse gas emissions by source published on 4th February 2020. These do not affect the overall UK or sector totals for 1990-2018, but the UK CO₂ totals for years prior to 1990 are affected.

In compiling the statistics, a misallocation occurred between two emissions categories in the LULUCF sector. Most emissions from change in carbon stock from croplands remaining as croplands were allocated to the 'Forest land remaining forest land' category instead. This led to emissions from cropland remaining cropland being understated and the size of the net sink provided by forest land remaining forest land being lower than it should be. Table 5 shows the new totals for all emissions from these source categories and the sizes of the changes that have occurred.

Table 5: Revisions to forest land and cropland net emissions

UK, 1990-2018

	MtCO ₂ e							
	1990	1995	2000	2005	2010	2015	2017	2018
Forest land remaining forest land								
Revised total	-14.37	-16.68	-17.75	-18.61	-19.55	-18.07	-18.21	-18.12
Change	-3.23	-3.58	-3.96	-5.07	-5.96	-6.03	-6.09	-6.09
Cropland remaining cropland								
Revised total	3.25	3.64	3.97	5.07	5.93	6.00	6.11	6.09
Change	+3.23	+3.58	+3.96	+5.07	+5.96	+6.03	+6.09	+6.09

Source: Table 3 (revised and original), Final UK greenhouse gas emissions national statistics 1990-2018 Excel data tables

An error in compiling the statistics published in February meant that a large number of source categories were missing carbon dioxide emissions prior to 1990 that should have had them included in table 4 in the tables accompanying the release. These include sources in every sector other than LULUCF (for which estimates are not made prior to 1990) and substantially increase the totals back to a similar level to those in last year's publication.

Table 6 shows the impact of these revisions on the sector totals and overall. No figures after 1989 were affected.

Table 6: Revisions to carbon dioxide emissions by sector

UK, 1970-1989

	MtCO₂				
	1970	1975	1980	1985	1989
Revised sector totals					
Energy supply	262.7	246.7	264.5	237.0	235.9
Business	191.4	152.0	126.3	105.3	111.3
Transport	80.0	83.5	93.0	100.6	122.4
Public	24.3	19.5	19.7	18.3	13.8
Residential	98.7	83.0	84.8	88.6	78.5
Agriculture	6.2	5.5	5.2	5.0	5.0
Industrial processes	28.2	28.4	19.1	20.9	20.4
LULUCF	:	:	:	:	:
Waste management	1.5	1.5	1.5	1.5	1.3
Grand Total	693.0	620.0	614.2	577.1	588.6
Change from total published in February					
Energy supply	+7.5	+6.1	+4.6	+6.1	+5.1
Business	+47.4	+22.6	+17.9	+18.0	+15.2
Transport	+18.3	+15.1	+13.3	+13.2	+14.6
Public	+7.3	+3.7	+3.7	+3.2	+2.2
Residential	+67.2	+45.5	+35.9	+33.7	+23.5
Agriculture	+0.5	+0.2	+0.1	+0.1	+0.1
Industrial processes	+0.0	+0.7	+1.2	+1.3	+1.3
LULUCF	:	:	:	:	:
Waste management	+0.3	+0.3	+0.3	+0.3	+0.3
Grand Total	+148.6	+94.2	+77.0	+75.9	+62.3

Source: Table 4 (revised and original), Final UK greenhouse gas emissions national statistics 1990-2018 Excel data tables

Note: No estimates are made for carbon dioxide emissions/removals from the LULUCF sector prior to 1990.

Technical information

Coverage of emissions reporting

This annex largely covers end user emissions, meaning emissions are reallocated from the source to where the “end-use” occurred. The main impact is to reallocate emissions from the energy supply sector to other sectors, i.e. the business and residential sectors in particular. These high-level sectors are made up of a number of more detailed sectors, which follow the definitions set out by the Intergovernmental Panel on Climate Change (IPCC)⁶, and which are

⁶ <https://www.ipcc-nggip.iges.or.jp/>

used in international reporting tables which are submitted to the United Nations Framework Convention on Climate Change (UNFCCC)⁷ every year.

The basket of greenhouse gases covered by the Kyoto Protocol consists of seven gases: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride and nitrogen trifluoride. The last four gases are collectively referred to as fluorinated gases or F gases. In accordance with international reporting and carbon trading protocols, each of these gases is weighted by its global warming potential (GWP), so that total greenhouse gas 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. Greenhouse gas emissions are then presented in carbon dioxide equivalent units.

Carbon dioxide is reported in terms of net emissions, which means total emissions minus total removals of carbon dioxide from the atmosphere by carbon sinks. Carbon sinks are defined by the UNFCCC as “any process, activity or mechanism which removes a greenhouse gas, an aerosol or a precursor of a greenhouse gas from the atmosphere”. The LULUCF sector is a net sink for the UK.

In this annex emissions are reported from within the UK only, apart from the 2018 uncertainties estimates which include Crown Dependencies and Overseas Territories, and all figures are expressed in millions of tonnes of carbon dioxide equivalent (MtCO_{2e}).

References to the ‘UK Greenhouse Gas Inventory’ refer to the consistent time series of emissions from 1990 to the most recent year which is updated annually and reported to the UN and the EU. The figures in these statistics are consistent with the UK’s greenhouse gas inventory for 1990-2018, although the inventory reported to the UN includes emissions from certain Overseas Territories and Crown Dependencies which are excluded from these statistics except where specifically stated.

Revisions to the estimates of end user emissions

It should be noted that the historical time series of emissions by end user is revised each year to reflect any revisions made to either the estimates of emissions by source or the other energy consumption data used in the end user emissions calculation. In this publication, this has resulted in revisions to end user emissions figures for all years up to and including 2017. Further details of these revisions can be found in Final UK Greenhouse Gas Emissions Statistics, which covered 2018 UK greenhouse gas emissions by source.

Embedded emissions

End user emissions do not take account of the emissions “embedded” within the manufactured goods and services which the UK imports, only energy supply emissions that occur within the UK get reallocated to end users. Embedded emissions are instead captured in what is referred to as the UK’s “carbon footprint”. This calculation of emissions on a “consumption” basis, reporting on emissions embedded in goods and services across international borders, is

⁷ <https://unfccc.int/>

considerably more challenging. Statistics on the UK's carbon footprint⁸ are available from the Department for Environment, Food and Rural Affairs (Defra).

Further information

Future updates to greenhouse gas emissions estimates

On Thursday 25th June 2020 BEIS will publish estimates of carbon dioxide emissions by local authority for 2018.

In February 2021 final 1990-2019 UK greenhouse gas emissions estimates will be published by source sector.

In March 2021 the 1990-2019 UK emissions estimates will be updated to include estimates by end user and by fuel type, and provisional 2020 emissions estimates will be published.

Contact

- Responsible statistician: Christopher Waite
- Email: climatechange.statistics@beis.gov.uk
- Media enquiries: 020 7215 1000
- Public enquiries: 020 7215 8285

⁸ UK's Carbon Footprint: <https://www.gov.uk/government/statistics/uks-carbon-footprint>



© Crown copyright 2020

This publication is licensed under the terms of the Open Government Licence v3.0 except where otherwise stated. To view this licence, visit nationalarchives.gov.uk/doc/open-government-licence/version/3 or write to the Information Policy Team, The National Archives, Kew, London TW9 4DU, or email: psi@nationalarchives.gsi.gov.uk.

Where we have identified any third-party copyright information you will need to obtain permission from the copyright holders concerned.

This publication is available from: <https://www.gov.uk/government/collections/final-uk-greenhouse-gas-emissions-national-statistics>

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