



# ANNEX: 1990-2017 UK GREENHOUSE GAS EMISSIONS, FINAL FIGURES BY END USER

Statistical Release: National Statistics



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# Executive Summary

This publication is an extension of emissions estimates by source for 1990-2017 published in February earlier this year. It provides the latest estimates of 1990-2017 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. The main impact is to reallocate emissions from the energy supply sector to other sectors that use the energy. The total emissions presented here are consistent with the data published in February by source sectors. The uncertainty in UK greenhouse gas emissions is also presented by gas and sector.

## Key findings

- In 2017 it is estimated that 31 per cent of greenhouse gas emissions were from transport, making it the sector with the largest emissions on an end user basis. 27 per cent of emissions were from the business sector, 22 per cent from the residential sector and 10 per cent 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 per cent, based on uncertainty analysis of 2017 emissions which were published in February 2019.
- 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 are the most uncertain, followed by waste management and agriculture.

# Introduction

This Annex contains final estimates of 1990 to 2017 UK greenhouse gas emissions by end user sector, as well as uncertainty estimates for 2017 emissions by source sector and gas. These are a follow up to, and are consistent with, the final estimates of 1990 to 2017 emissions by source sector which were published on 5<sup>th</sup> February 2019.

Emissions by end user and by fuel type are incorporated into updated data tables published alongside the [Final UK Greenhouse Gas Emissions Statistics](#). Also published in the data tables is uncertainty analysis for 2017 emissions by gas and sector. Note that this Annex does not discuss 2017 emissions by fuel type, but these are included in the updated data tables published alongside this document.

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. 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 in the UK of a particular end-use sector or sub-sector (although emissions 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 2019.

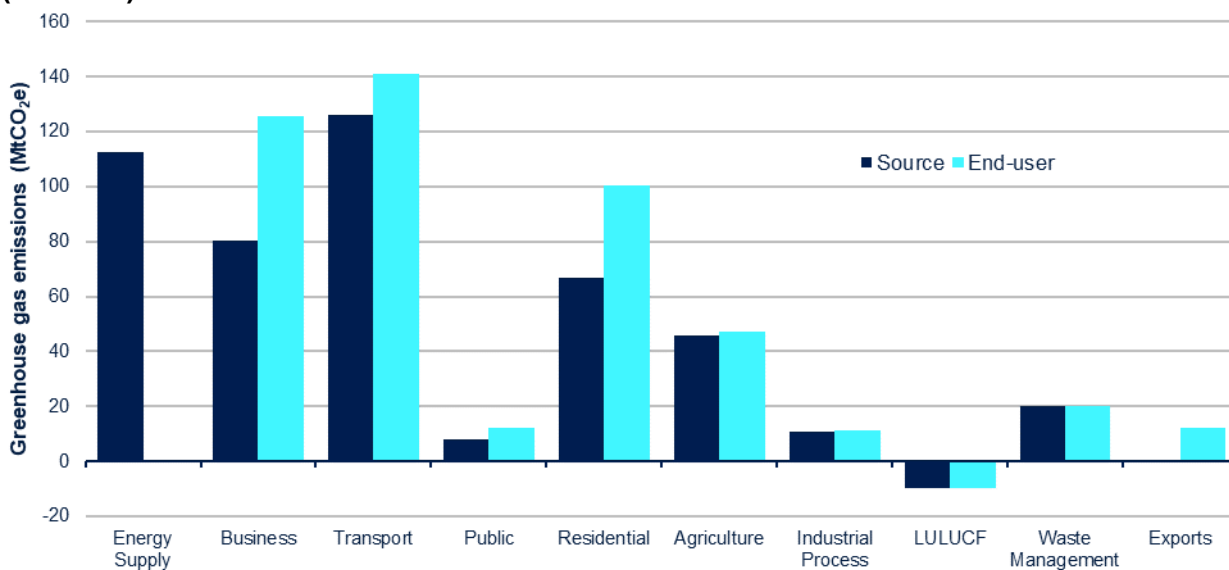
The uncertainty estimates are used to prioritise further research into improving emissions estimates, and more generally give users an indication of the robustness of the emissions estimates for different sectors. The geographic coverage of the uncertainty estimates includes the UK, Crown Dependencies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

# 1990-2017 total greenhouse gas emissions by end user

These results are based on and consistent with the breakdown by gas and sector of 2017 emissions by source which was published on 5<sup>th</sup> February 2019. Total 2017 greenhouse gas emissions for the UK were 460.2 million tonnes carbon dioxide equivalent (MtCO<sub>2</sub>e).

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: 2017 greenhouse gas emissions by source sectors and end user sectors, UK (MtCO<sub>2</sub>e)**



Source: Table 3, Final UK greenhouse gas emissions national statistics 1990-2017 Excel data tables

When looked at by end user sector, 31 per cent of greenhouse gas emissions in 2017 were from transport, 27 per cent from the business sector, 22 per cent from the residential sector and 10 per cent from agriculture. The remainder were attributable to the industrial processes, public, waste management 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.

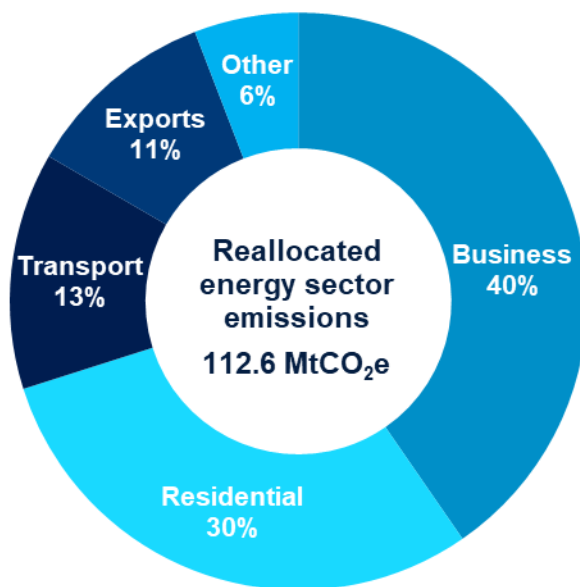
**Figure 2: Proportion of net greenhouse gas emissions in each end user sector, UK 2017**



Source: Table 3, Final UK greenhouse gas emissions national statistics 1990-2017 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 per cent and the residential sector accounting for 30 per cent of reallocated emissions as shown in figure 3 below.

**Figure 3: Breakdown of greenhouse gas emissions reallocated from the energy sector to the end user sectors, UK, 2017**



Source: Table 3, Final UK greenhouse gas emissions national statistics 1990-2017 Excel data tables

Data tables showing the full end user breakdown by sector, from 1990 to 2017, can be found on the [Final UK Greenhouse Gas Emissions Statistics](#) page of the Gov.uk website.

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

UK, 2017

	<b>MtCO<sub>2</sub>e</b>				
	Carbon dioxide	Methane	Nitrous oxide	Fluorinated gases	Total
Business	109.1	2.3	1.1	13.0	125.6
Transport	138.8	0.7	1.4	0.0	140.9
Public	12.0	0.3	0.0	0.0	12.4
Residential	95.2	3.1	0.4	1.6	100.4
Agriculture	7.1	25.8	14.3	0.0	47.2
Industrial Processes	10.5	0.2	0.3	0.3	11.2
LULUCF	-11.3	0.0	1.4	0.0	-9.9
Waste Management	0.3	18.6	1.4	0.0	20.3
Exports	11.5	0.5	0.1	0.0	12.1
<b>Total</b>	<b>373.2</b>	<b>51.5</b>	<b>20.5</b>	<b>15.0</b>	<b>460.2</b>

Source: Tables 3, 4, 5, 6 and 7, Final UK greenhouse gas emissions national statistics 1990-2017 Excel data tables

**Table 2: Greenhouse gas emissions by end user sector**

UK, 1990-2017

	<b>MtCO<sub>2</sub>e</b>							
	1990	1995	2000	2005	2010	2015	2016	2017
Business	247.8	218.1	217.1	212.0	186.6	148.4	131.7	125.6
Transport	146.6	151.4	153.9	156.3	142.1	138.5	140.5	140.9
Public	31.5	28.9	24.4	22.4	19.0	14.5	13.4	12.4
Residential	171.3	157.1	158.2	162.4	155.9	113.3	107.3	100.4
Agriculture	57.8	56.1	53.0	50.6	47.2	47.1	47.0	47.2
Industrial Processes	63.3	53.6	29.2	21.3	13.5	13.3	11.1	11.2
LULUCF	0.3	-1.7	-3.9	-7.1	-9.1	-9.7	-9.8	-9.9
Waste Management	66.6	69.1	62.9	49.0	29.7	20.6	20.0	20.3
Exports	9.1	13.0	12.8	16.7	15.9	11.9	11.9	12.1
<b>Total</b>	<b>794.4</b>	<b>745.6</b>	<b>707.5</b>	<b>683.7</b>	<b>600.9</b>	<b>498.0</b>	<b>473.1</b>	<b>460.2</b>

Source: Table 3, Final UK greenhouse gas emissions national statistics 1990-2017 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 per cent of UK greenhouse gas end user emissions in 2017, 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.

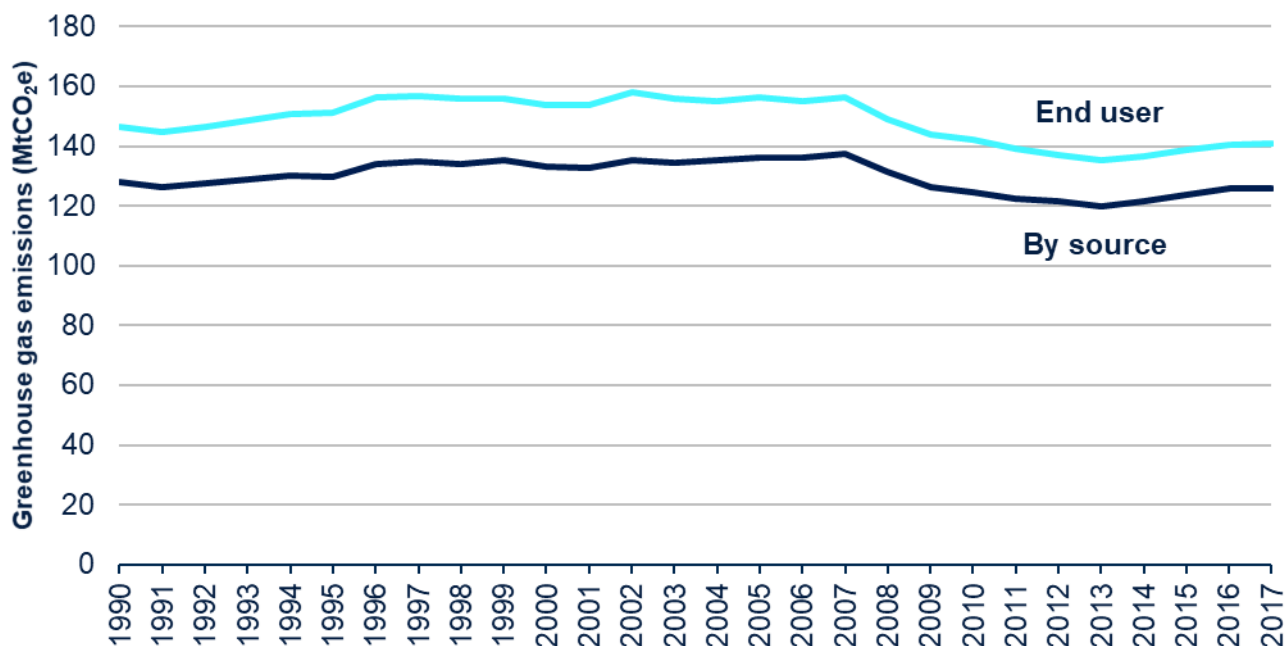
End user emissions from the transport sector are between 15 and 22 MtCO<sub>2e</sub> higher than emissions by source across the time series, so follow a very similar trend. Between 1990 and 2017, there has been relatively little overall change in the level of greenhouse gas emissions from the transport sector. After remaining at a similar level for a number of years 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 has been a small increase in emissions in recent years as road traffic has risen again.

**Table 3: Transport sector end user emissions by gas**  
UK, 1990-2017

	<b>MtCO<sub>2e</sub></b>							
	1990	1995	2000	2005	2010	2015	2016	2017
Carbon dioxide	142.5	147.0	150.5	153.8	140.2	136.6	138.5	138.8
Methane	2.5	2.2	1.5	1.0	0.8	0.7	0.6	0.7
Nitrous oxide	1.6	2.2	1.9	1.5	1.1	1.3	1.3	1.4
F gases	:	:	:	:	:	:	:	:
<b>Total</b>	<b>146.6</b>	<b>151.4</b>	<b>153.9</b>	<b>156.3</b>	<b>142.1</b>	<b>138.5</b>	<b>140.5</b>	<b>140.9</b>

Source: Tables 3, 4, 5, 6 and 7, Final UK greenhouse gas emissions national statistics 1990-2017 Excel data tables  
Note: A colon (:) means data are not available as there are no F gas emissions in this sector

**Figure 4: Greenhouse gas end user emissions from transport, UK, 1990-2017 (MtCO<sub>2</sub>e)**



Source: Table 3, Final UK greenhouse gas emissions national statistics 1990-2017 Excel data tables

## Business

The business sector was responsible for 27 per cent of UK greenhouse gas end user emissions in 2017, 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 2017, there was a general downward trend in greenhouse gas end user emissions from the business sector, resulting in an overall decrease of 49 per cent. Between 2016 and 2017 emissions decreased by 6.2 MtCO<sub>2</sub>e (5 per cent). This is larger than the decrease of 1.2 MtCO<sub>2</sub>e (2 per cent) seen in emissions by source from this sector between 2016 and 2017, 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 5 years. They have fallen by 30 per cent since 2012 compared to a 9 per cent 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.

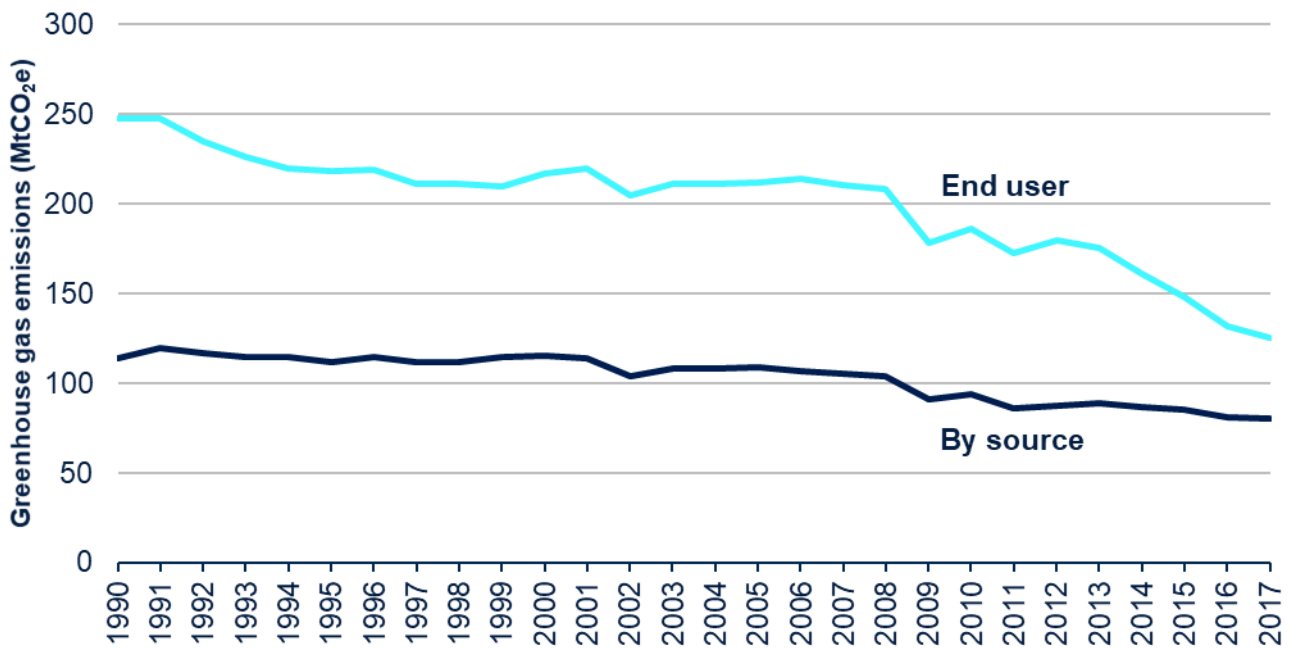
**Table 4: Business sector end user emissions by gas**

UK, 1990-2017

	<b>MtCO<sub>2</sub>e</b>							
	1990	1995	2000	2005	2010	2015	2016	2017
Carbon dioxide	229.8	203.3	202.7	194.9	166.8	129.8	114.4	109.1
Methane	15.5	11.7	7.4	4.8	3.7	2.7	2.3	2.3
Nitrous oxide	1.5	1.4	1.3	1.3	1.2	1.2	1.1	1.1
F gases	1.0	1.8	5.7	11.1	14.9	14.6	14.0	13.0
<b>Total</b>	<b>247.8</b>	<b>218.1</b>	<b>217.1</b>	<b>212.0</b>	<b>186.6</b>	<b>148.4</b>	<b>131.7</b>	<b>125.6</b>

Source: Table 3, 4, 5, 6 and 7, Final UK greenhouse gas emissions national statistics 1990-2017 Excel data tables

**Figure 5: Greenhouse gas end user emissions from business, UK, 1990-2017 (MtCO<sub>2</sub>e)**



Source: Table 3, Final UK greenhouse gas emissions national statistics 1990-2017 Excel data tables

## Residential

The residential sector was responsible for around 22 per cent of UK greenhouse gas end user emissions in 2017, 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 2017, 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 2016 and 2017, end user emissions in the residential sector decreased by 6.9 MtCO<sub>2e</sub> (6 per cent). This is a larger fall than the 4 per cent 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.

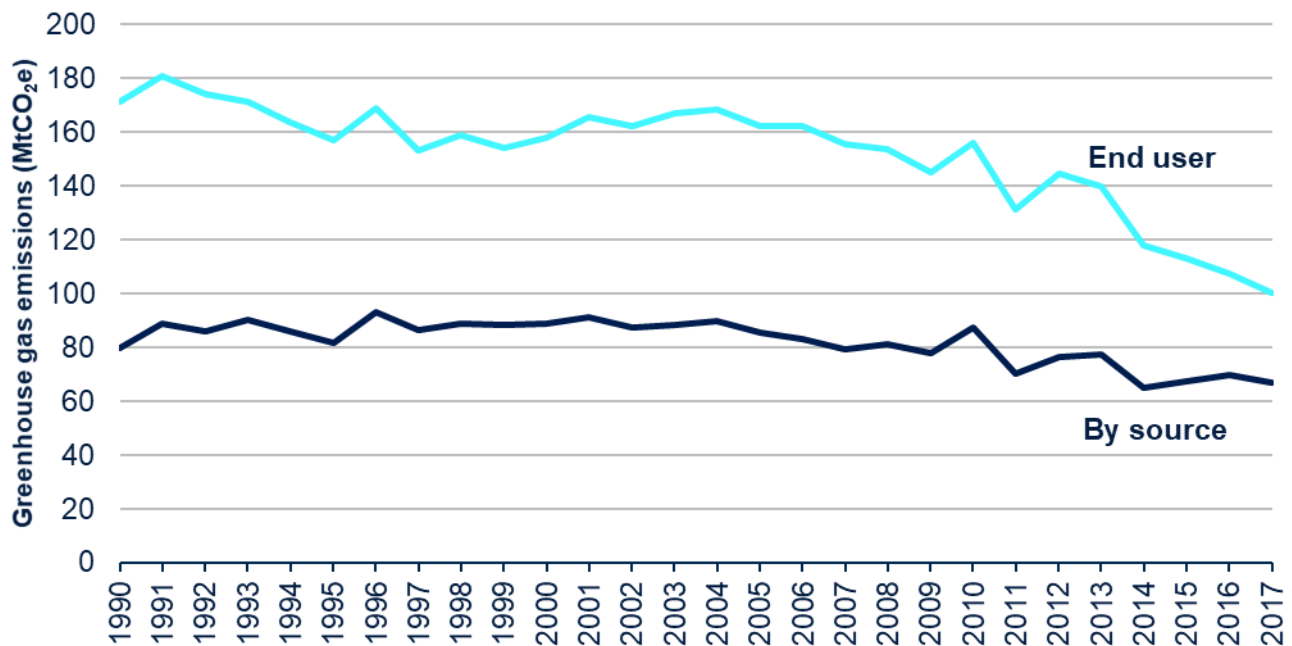
**Table 5: Residential sector end user emissions by gas**

UK, 1990-2017

	MtCO <sub>2e</sub>							
	1990	1995	2000	2005	2010	2015	2016	2017
Carbon dioxide	156.2	145.2	149.0	154.5	148.9	107.5	101.9	95.2
Methane	14.3	10.7	6.7	4.9	4.5	3.6	3.2	3.1
Nitrous oxide	0.7	0.6	0.5	0.5	0.5	0.5	0.4	0.4
F gases	0.0	0.7	2.0	2.4	2.0	1.8	1.7	1.6
<b>Total</b>	<b>171.3</b>	<b>157.1</b>	<b>158.2</b>	<b>162.4</b>	<b>155.9</b>	<b>113.3</b>	<b>107.3</b>	<b>100.4</b>

Source: Tables 3, 4, 5, 6 and 7, Final UK greenhouse gas emissions national statistics 1990-2017 Excel data tables

**Figure 6: Greenhouse gas end user emissions from the residential sector, UK, 1990-2017 (MtCO<sub>2</sub>e)**



Source: Table 3, Final UK greenhouse gas emissions national statistics 1990-2017 Excel data tables

## Agriculture

The agriculture sector was responsible for 10 per cent of UK greenhouse gas end user emissions in 2017. Emissions of methane (55 per cent) and nitrous oxide (30 per cent) 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 electricity 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 18 per cent since 1990 due to a fall in animal numbers over the period, together with a decrease in synthetic fertiliser use. Between 2016 and 2017 there was a 1 per cent rise in emissions from the agriculture sector.

**Table 6: Agriculture sector end user emissions by gas**

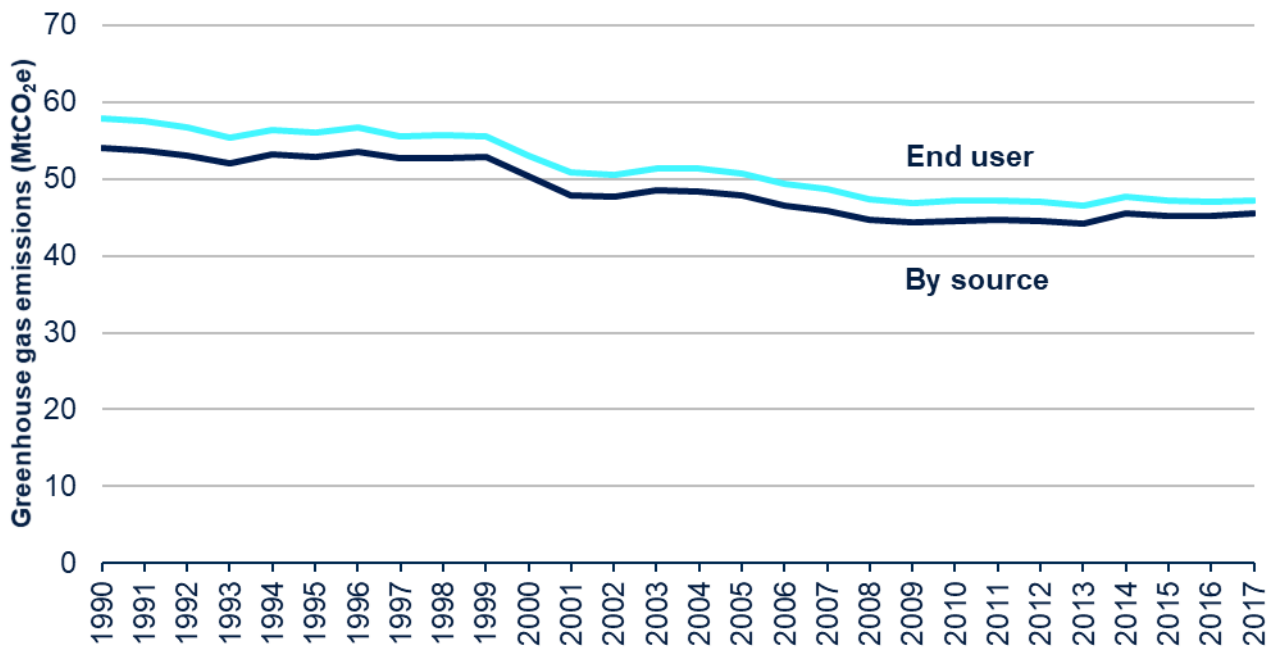
UK, 1990-2017

	<b>MtCO<sub>2e</sub></b>							
	1990	1995	2000	2005	2010	2015	2016	2017
Carbon dioxide	10.0	9.4	8.0	8.8	7.9	7.4	7.2	7.1
Methane	30.6	29.8	28.8	26.9	25.3	25.7	25.6	25.8
Nitrous oxide	17.2	16.8	16.2	14.9	14.0	14.1	14.1	14.3
F gases	:	:	:	:	:	:	:	:
<b>Total</b>	<b>57.8</b>	<b>56.1</b>	<b>53.0</b>	<b>50.6</b>	<b>47.2</b>	<b>47.1</b>	<b>47.0</b>	<b>47.2</b>

Source: Tables 3, 4, 5, 6 and 7, Final UK greenhouse gas emissions national statistics 1990-2017 Excel data tables

Note: A colon (:) means data are not available as there are no F gas emissions in this sector

**Figure 7: Greenhouse gas end user emissions from agriculture, UK, 1990-2017 (MtCO<sub>2e</sub>)**



Source: Table 3, Final UK greenhouse gas emissions national statistics 1990-2017 Excel data tables

## Industrial processes

The industrial process sector was responsible for 2 per cent of UK greenhouse gas end user emissions in 2017. 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 82 per cent 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).

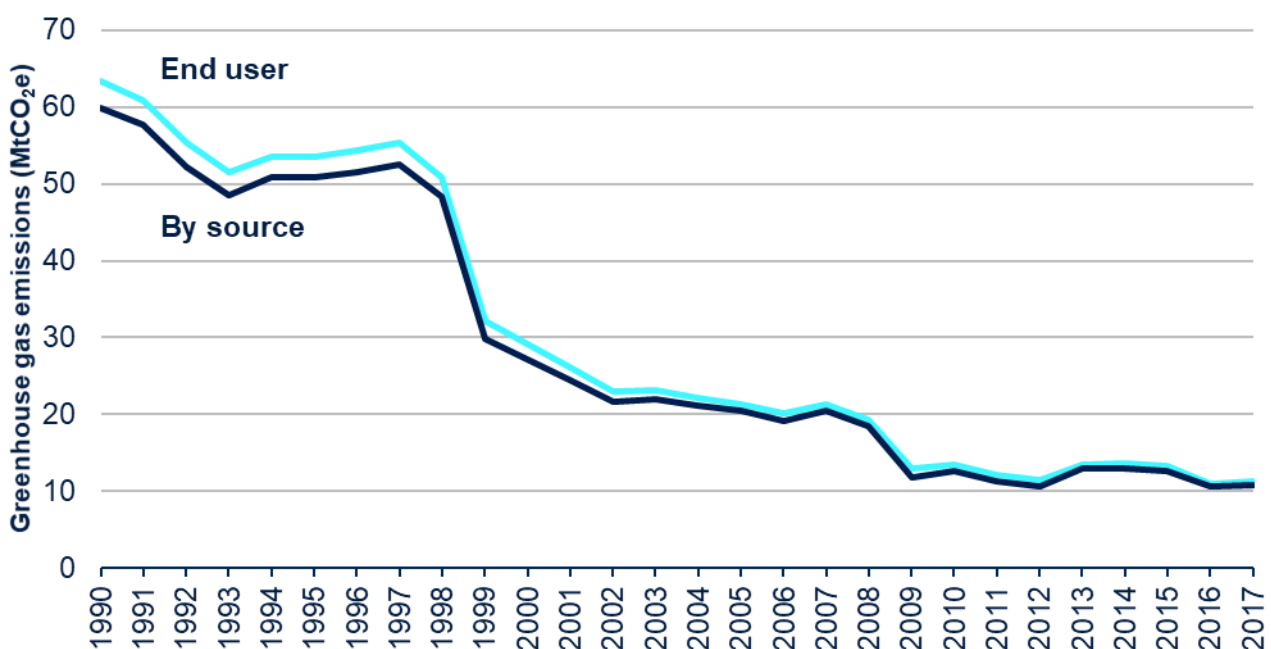
**Table 7: Industrial process sector end user emissions by gas**

UK, 1990-2017

	1990	1995	2000	2005	2010	2015	2016	2017
Carbon dioxide	20.9	18.9	18.1	16.7	11.2	12.5	10.4	10.5
Methane	2.2	1.7	1.1	0.5	0.4	0.2	0.2	0.2
Nitrous oxide	23.9	14.4	5.4	3.1	1.5	0.3	0.3	0.3
F gases	16.3	18.5	4.6	1.0	0.4	0.3	0.3	0.3
<b>Total</b>	<b>63.3</b>	<b>53.6</b>	<b>29.2</b>	<b>21.3</b>	<b>13.5</b>	<b>13.3</b>	<b>11.1</b>	<b>11.2</b>

Source: Tables 3, 4, 5, 6 and 7, Final UK greenhouse gas emissions national statistics 1990-2017 Excel data tables

**Figure 8: Greenhouse gas end user emissions from industrial processes, UK, 1990-2017 (MtCO<sub>2</sub>e)**



Source: Table 3, Final UK greenhouse gas emissions national statistics 1990-2017 Excel data tables

## Public sector

The public sector was responsible for 3 per cent of UK greenhouse gas end user emissions in 2017, 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 are roughly double emissions by source across the time series, due to the inclusion of emissions from electricity generation in the end user breakdown. However, 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.

**Table 8: Public sector end user emissions by gas**

UK, 1990-2017

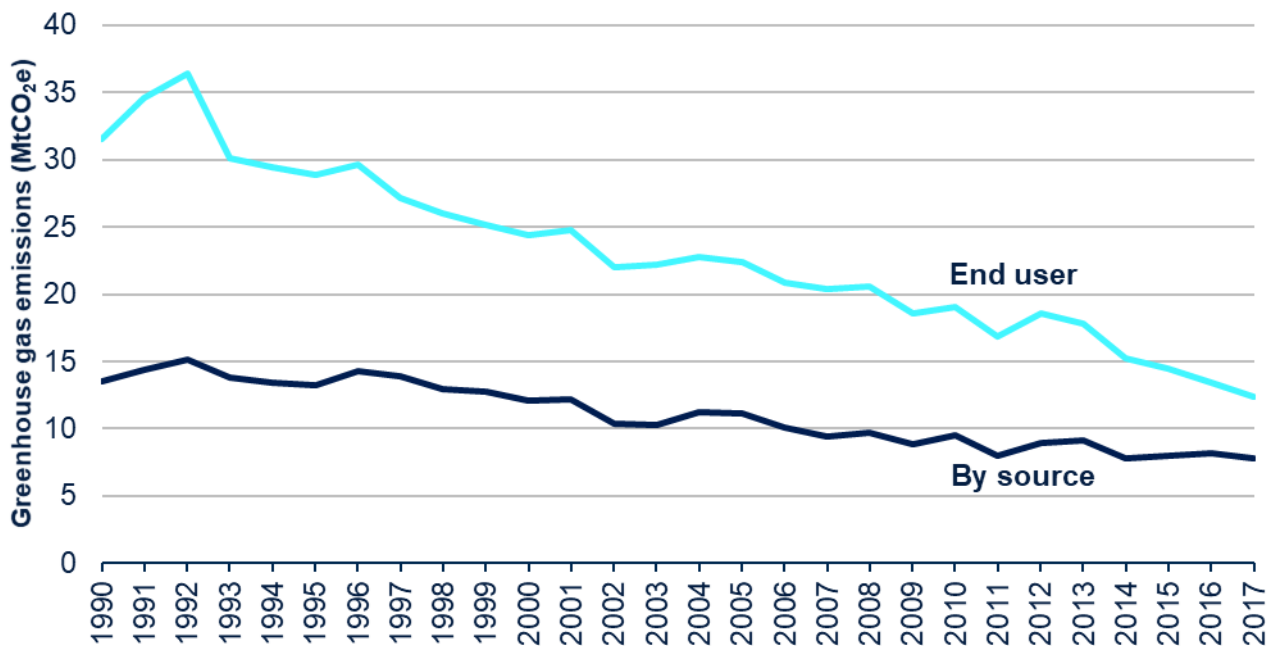
	<b>MtCO<sub>2</sub>e</b>							
	1990	1995	2000	2005	2010	2015	2016	2017
Carbon dioxide	29.2	27.1	23.4	21.7	18.5	14.1	13.0	12.0
Methane	2.1	1.7	0.9	0.6	0.5	0.4	0.3	0.3
Nitrous oxide	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
F gases	:	:	:	:	:	:	:	:
<b>Total</b>	<b>31.5</b>	<b>28.9</b>	<b>24.4</b>	<b>22.4</b>	<b>19.0</b>	<b>14.5</b>	<b>13.4</b>	<b>12.4</b>

Source: Table 3, 4, 5, 6 and 7, Final UK greenhouse gas emissions national statistics 1990-2017 Excel data tables

Note: A colon (:) means data are not available as there are no F gas emissions in this sector



**Figure 9: Greenhouse gas end user emissions from the public sector, UK, 1990-2017 (MtCO<sub>2</sub>e)**



Source: Table 3, Final UK greenhouse gas emissions national statistics 1990-2017 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 per cent of UK greenhouse gas end user emissions in 2017, 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 throughput<sup>1</sup> at refineries, which have fed through to increased exports rather than

<sup>1</sup> The capacity for refining crude oil over a given period of time

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 2016 and 2017, emissions from the exports sector increased by 0.2 MtCO<sub>2e</sub> (2 per cent).

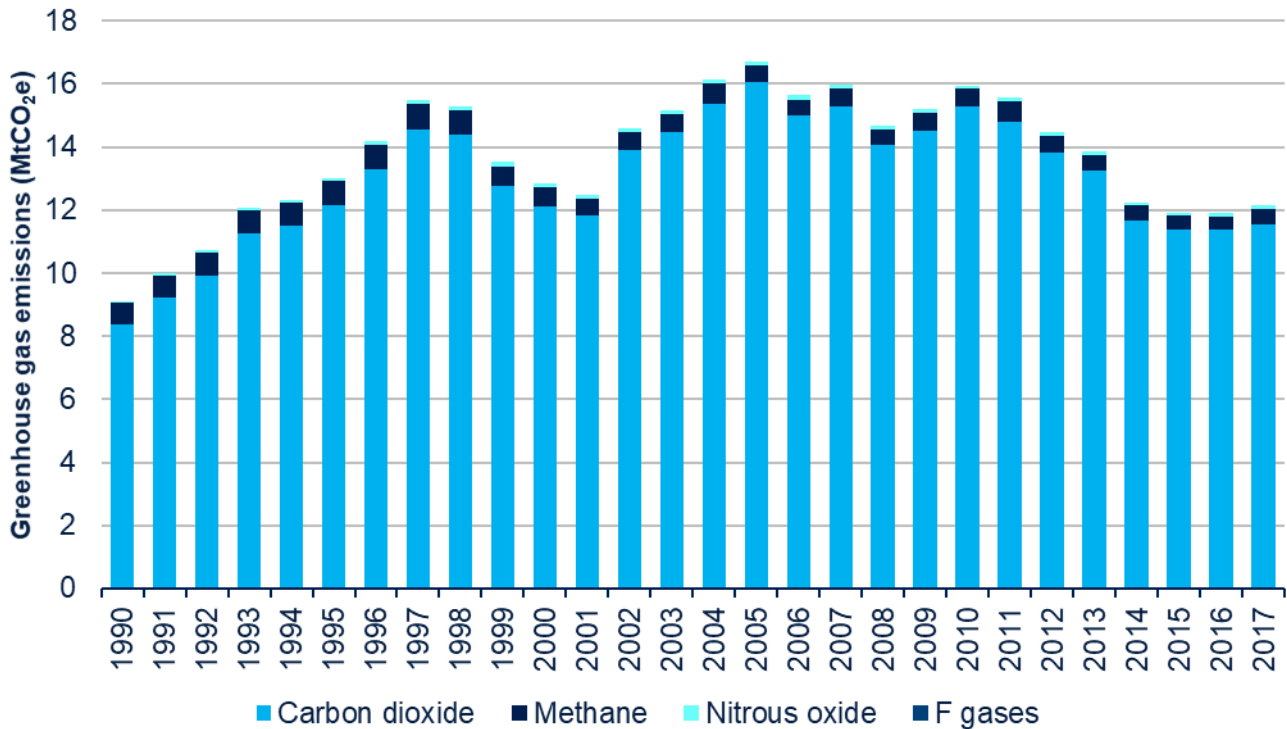
**Table 9: Exports sector emissions by gas**

UK, 1990-2017

	MtCO <sub>2e</sub>							
	1990	1995	2000	2005	2010	2015	2016	2017
Carbon dioxide	8.4	12.1	12.1	16.0	15.3	11.4	11.4	11.5
Methane	0.7	0.8	0.6	0.5	0.5	0.4	0.4	0.5
Nitrous oxide	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
F gases	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Total</b>	<b>9.1</b>	<b>13.0</b>	<b>12.8</b>	<b>16.7</b>	<b>15.9</b>	<b>11.9</b>	<b>11.9</b>	<b>12.1</b>

Source: Table 3, 4, 5, 6 and 7, Final UK greenhouse gas emissions national statistics 1990-2017 Excel data tables

**Figure 10: Greenhouse gas end user emissions from the exports sector, UK, 1990-2017 (MtCO<sub>2e</sub>)**



Source: Table 3, Final UK greenhouse gas emissions national statistics 1990-2017 Excel data tables

## Uncertainties around the 2017 estimates

This section sets out the uncertainty ranges associated with the final 2017 emissions estimates by source, which were published on 5<sup>th</sup> February 2019.

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 difference<sup>2</sup> 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 per cent confidence interval. In terms of the uncertainty model, this means that 95 per cent 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. For gases, carbon dioxide estimates have the least 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 2017 is estimated to be 3 per cent. There is a continual programme to improve this uncertainty and in 2017 there has been a notable improvement in the uncertainty estimates for the LULUCF sector due to methodological improvements. There has also been a reduction in the uncertainty estimate for the energy supply sector due to the fall in the use of coal in 2017, the fuel type with the highest level of uncertainty in its emissions, while the uncertainty estimate for agriculture emissions has reduced due to an improvement in the method for estimating the uncertainty. Further details can be found in the UK's National Inventory report which is due to be published on 15<sup>th</sup> April 2019<sup>3</sup>.

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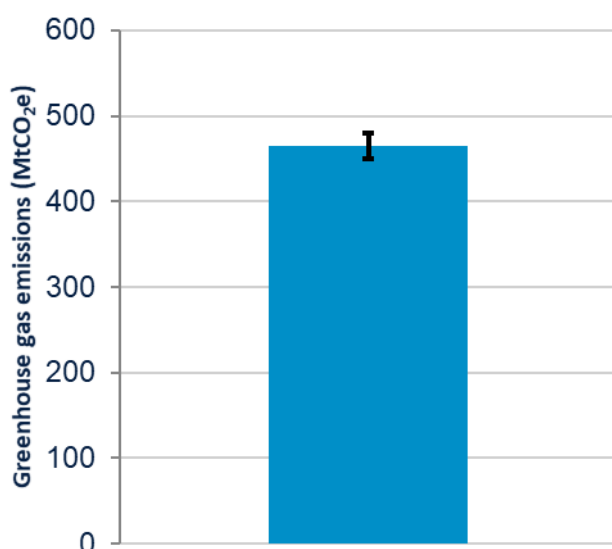
<sup>2</sup> Statistical difference is explained on page 5 of the Energy Balance: Methodology note: <https://www.gov.uk/government/publications/energy-balance-methodology-note>

<sup>3</sup> Previous UK National Inventory Report: <https://unfccc.int/process/transparency-and-reporting/reporting-and-review-under-the-convention/greenhouse-gas-inventories-annex-i-parties/national-inventory-submissions-2018>

The uncertainty in the trend in emissions reductions between 1990 and 2017, expressed as a 95 per cent confidence interval, is estimated to be a percentage reduction of between 39 and 45 per cent, with a central estimate of a 42 per cent reduction in emissions from 1990 to 2017.

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.

**Figure 11: Illustration of uncertainty in estimates of UK Greenhouse Gas emissions, UK, Crown Dependencies and Overseas Territories, 2017 (MtCO<sub>2</sub>e)**



Source: Table 10, Final UK greenhouse gas emissions national statistics 1990-2017 Excel data tables

**Table 10: Uncertainty in estimates of 2017 UK greenhouse gas emissions by gas**  
UK, Crown Dependencies and Overseas Territories, 2017

	2017 emissions	Uncertainty around 2017 estimate, expressed as a 95% confidence interval	
		Lower bound	Upper bound
		MtCO <sub>2</sub> e	
Carbon dioxide	376.7	365.7	387.4
Methane	51.9	44.4	61.8
Nitrous oxide	20.7	17.6	24.8
Hydrofluorocarbons	14.2	12.9	15.5
Perfluorocarbons	0.4	0.3	0.5
Sulphur hexafluoride	0.5	0.5	0.6
Nitrogen trifluoride	0.0	0.0	0.0
<b>Total</b>	<b>464.4</b>	<b>450.4</b>	<b>479.2</b>

Source: Table 10, Final UK greenhouse gas emissions national statistics 1990-2017 Excel data tables

Note:

- 2017 estimates are presented as the central estimate from the model used to calculate uncertainties. These differ slightly from the actual emissions estimates.
- The total 2017 central estimate for Table 10 differs from the total 2017 estimate for Table 11 in this annex due to the weighting of Global Warming Potentials (GWP) when estimating uncertainties by gas.

**Table 11: Uncertainty in estimates of 2017 UK greenhouse gas emissions by sector**

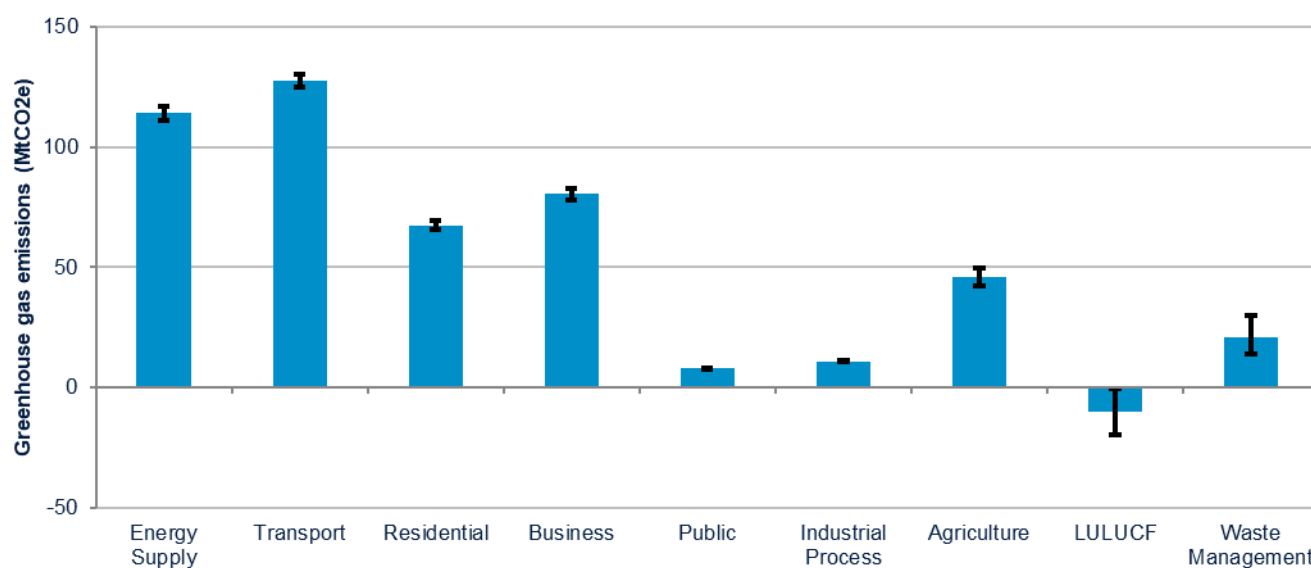
UK, Crown Dependencies and Overseas Territories, 2017

	2017 emissions	Uncertainty around 2017 estimate, expressed as a 95% confidence interval	
		Lower bound	Upper bound
Energy supply	113.9	111.1	116.8
Transport	127.5	125.0	130.0
Residential	67.4	65.4	69.4
Business	80.5	78.0	82.9
Public	7.8	7.5	8.1
Industrial processes	10.8	10.5	11.3
Agriculture	45.9	42.3	49.8
Land use, land use change and forestry (LULUCF)	-9.9	-19.6	-0.4
Waste management	20.6	14.1	30.1
<b>Total</b>	<b>464.5</b>	<b>450.9</b>	<b>479.0</b>

Source: Table 11, Final UK greenhouse gas emissions national statistics 1990-2017 Excel data tables

Note:

- 2017 estimates are presented as the central estimate from the model used to calculate uncertainties. These differ slightly from the actual emissions estimates.
- The total 2017 central estimate for Table 11 differs from the total 2017 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, 2017 (MtCO<sub>2</sub>e)**

Source: Table 11, Final UK greenhouse gas emissions national statistics 1990-2017 Excel data tables

Note:

- The error bars on the chart represent the uncertainty range (in this case, the 95% confidence interval) around the 2017 total greenhouse gas emissions central estimates for each sector.

# Revisions to 1990-2017 emissions estimates published in February 2019

At the same time that this annex was published, four minor revisions were made to the estimates of greenhouse gas emissions by source published on 5<sup>th</sup> February 2019. These do not affect the overall UK totals but are all cases where emissions were included in the incorrect source categories or in the incorrect sector.

Emissions from biogas use for autogeneration were previously included in the 'Other industrial combustion and electricity' source category in the business sector. These have been moved to the power stations source category in the energy supply sector, which is seen as more appropriate, and this has led to a small change in the emissions recorded in these two categories and the overall totals for these two sectors. This has led to the changes set out in table 12 to the totals across all greenhouse gases. Biogas use for autogeneration produces methane and nitrous oxide emissions, so there are also minor changes to the equivalent totals for these two gases.

**Table 12: Revisions to energy supply and business sector emissions**

UK, 1990-2017

	MtCO <sub>2</sub> e							
	1990	1995	2000	2005	2010	2015	2016	2017
<b>Energy supply sector</b>								
Revised total	277.9	238.0	221.6	231.5	207.4	145.3	121.8	112.6
Change from previous total	0.000	0.000	~0.000	~0.000	~0.000	0.001	0.002	0.002
<b>Power stations</b>								
Revised total	204.2	163.9	159.5	174.0	158.1	105.0	83.0	73.1
Change from previous total	0.000	0.000	~0.000	~0.000	~0.000	0.001	0.002	0.002
<b>Business sector</b>								
Revised total	114.0	111.8	115.4	108.9	94.1	85.1	81.4	80.1
Change from previous total	0.000	0.000	~0.000	~0.000	~0.000	-0.001	-0.002	-0.002
<b>Other industrial combustion and electricity</b>								
Revised total	79.0	73.2	76.3	68.5	54.3	45.1	44.9	45.6
Change from previous total	0.000	0.000	~0.000	~0.000	~0.000	-0.001	-0.002	-0.002

~0.000 indicates where a value is non-zero but is less than 0.0005 MtCO<sub>2</sub> in magnitude.

Source: Table 3 (revised and original), Final UK greenhouse gas emissions national statistics 1990-2017 Excel data tables

In compiling the statistics, a misallocation occurred in the methane emissions from goat, deer and horse livestock waste. This led to emissions from horse wastes being overstated and those from goats and deer understated, though it did not affect the overall totals for emissions

from the agriculture sector. Table 13 shows the new totals for all emissions from these source categories and the sizes of the changes that have occurred.

**Table 13: Revisions to animal waste emissions**

UK, 1990-2017

	MtCO <sub>2</sub> e							
	1990	1995	2000	2005	2010	2015	2016	2017
<b>Goats - wastes</b>								
Revised total	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Change	-0.022	-0.026	-0.039	-0.040	-0.040	-0.038	-0.037	-0.037
<b>Horses - wastes</b>								
Revised total	0.140	0.161	0.226	0.243	0.240	0.230	0.227	0.225
Change	0.022	0.026	0.039	0.040	0.040	0.038	0.037	0.037
<b>Deer - wastes</b>								
Revised total	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001
Change	~0.000	~0.000	~0.000	~0.000	~0.000	~0.000	~0.000	~0.000

~0.000 indicates where a value is non-zero but is less than 0.0005 MtCO<sub>2</sub> in magnitude.

Source: Table 3 (revised and original), Final UK greenhouse gas emissions national statistics 1990-2017 Excel data tables

Carbon dioxide emissions from incidental lubricant combustion in engines were previously included in a source category in the road transport category in the transport sector. However, a small proportion of these emissions were actually from marine engines, so these have been separated into a separate source category and included in the shipping category rather than road transport. Table 14 shows the emissions from these new categories. This change does not affect the overall emissions from the transport sector.

**Table 14: Revisions to emissions from incidental lubricant combustion in engines in transport sector**

UK, 1990-2017

	MtCO <sub>2</sub> e							
	1990	1995	2000	2005	2010	2015	2016	2017
<b>Previous category</b>								
Incidental lubricant combustion in engines	0.206	0.216	0.216	0.223	0.216	0.219	0.224	0.227
<b>Revised categories</b>								
Incidental lubricant combustion in road engines	0.173	0.182	0.198	0.210	0.208	0.217	0.221	0.224
Incidental lubricant combustion in marine engines	0.033	0.035	0.018	0.013	0.008	0.003	0.003	0.003

Source: Table 3 (revised and original), Final UK greenhouse gas emissions national statistics 1990-2017 Excel data tables

The 'Small-scale waste burning' source category was previously included in the waste management sector, but has been moved to the residential sector since these are residential emissions. This category only includes emissions in Guernsey. These emissions are not estimated elsewhere as data availability for activity in the UK and the other Crown Dependencies and Overseas Territories is limited. In the UK, small-scale waste burning is not considered a major source of emissions. Moving these emissions into the residential sector therefore does not affect the UK sector totals, only the sector totals that also include the Crown Dependencies that are shown in table 15 of the data tables accompanying this publication. Table 15 below shows the change this has made to these totals.

**Table 15: Revisions to animal waste emissions**

UK and Crown Dependencies, 1990-2017

							<b>MtCO<sub>2</sub>e</b>		
		1990	1995	2000	2005	2010	2015	2016	2017
<b>Residential</b>									
	Revised total	80.3	81.9	89.0	86.1	87.9	67.8	70.2	67.3
	Change	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
<b>Waste management</b>									
	Revised total	66.8	69.3	63.0	49.2	29.9	20.8	20.2	20.5
	Change	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002

Source: Table 15 (revised and original), Final UK greenhouse gas emissions national statistics 1990-2017 Excel data tables



# Background 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)<sup>4</sup>, and which are used in international reporting tables which are submitted to the United Nations Framework Convention on Climate Change (UNFCCC)<sup>5</sup> 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 2017 uncertainties estimates which include Crown Dependencies and Overseas Territories, and all figures are expressed in millions of tonnes of carbon dioxide equivalent (MtCO<sub>2e</sub>).

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 2017, 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.

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<sup>4</sup> <https://www.ipcc-nggip.iges.or.jp/>

<sup>5</sup> <https://unfccc.int/>

## 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 2016. Further details of these revisions can be found in Final UK Greenhouse Gas Emissions Statistics, which covered 2017 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 and exports. Embedded emissions capture what is sometimes 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 considerably more challenging. Statistics on the UK’s Carbon Footprint<sup>6</sup> are available from the Department for Environment, Food and Rural Affairs (Defra).

## Future updates to greenhouse gas emissions estimates

On Thursday 27<sup>th</sup> June 2019 BEIS will publish estimates of carbon dioxide emissions by local authority for 2017.

On Tuesday 4<sup>th</sup> February 2020 final 1990-2018 UK greenhouse gas emissions estimates will be published by source sector.

On Thursday 27<sup>th</sup> March 2020 the 1990-2018 UK emissions estimates will be updated to include estimates by end user and by fuel type, and provisional 2019 emissions estimates will be published.

## Further information

Further information on UK greenhouse gas emissions statistics, including Excel tables with additional data on UK emissions, can be found on the Gov.uk website at:

<https://www.gov.uk/government/collections/uk-greenhouse-gas-emissions-statistics>

## Background notes

1. A full set of data tables can be accessed via the [Final UK greenhouse gas emissions national statistics](#) pages of the Gov.uk website.

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<sup>6</sup> UK’s Carbon Footprint: <https://www.gov.uk/government/statistics/uks-carbon-footprint>

2. This statistical release and the related data tables are the first release of data from the National Atmospheric Emissions Inventory (NAEI) for 1970-2017, produced for BEIS and the Devolved Administrations by Ricardo Energy & Environment. Additional results will be released as they become available. For further information on the UK Greenhouse Gas Inventory, see the [NAEI website](#).
3. The UK's National Inventory Report (NIR) for 1990-2017 will be submitted to the United Nations Framework Convention on Climate Change (UNFCCC) on 15<sup>th</sup> April 2019. The report will contain national greenhouse gas emissions estimates for 1990-2017 and descriptions of the methods used to produce the estimates. Previous reports can be found on the [NAEI website](#).
4. The [background quality report](#) provides a summary of quality issues relating to statistics on UK greenhouse gas (GHG) emissions.

This publication is available from: [www.gov.uk/government/collections/final-uk-greenhouse-gas-emissions-national-statistics](http://www.gov.uk/government/collections/final-uk-greenhouse-gas-emissions-national-statistics)

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