

5<sup>th</sup> February 2013



## STATISTICAL RELEASE

### 2011 UK GREENHOUSE GAS EMISSIONS, FINAL FIGURES

DECC today publishes final 2011 estimates of UK greenhouse gas emissions.

#### Greenhouse gas emissions - headline results

- In 2011, UK emissions of the basket of six greenhouse gases covered by the Kyoto Protocol were estimated to be 552.6 million tonnes carbon dioxide equivalent (MtCO<sub>2</sub>e). This was 7.0 per cent lower than the 2010 figure of 594.0 million tonnes. Between 2010 and 2011 the largest decreases were experienced in the residential sector, down 22.5 per cent (20.2 MtCO<sub>2</sub>e), and the energy supply sector, down by 6.5 per cent (13.3 MtCO<sub>2</sub>e). Emissions from the business, transport, industrial process and public sectors were also down slightly on 2010, but all other sectors were relatively stable compared to 2010 levels.
- Carbon dioxide (CO<sub>2</sub>) is the main greenhouse gas, accounting for about 83 per cent of total UK greenhouse gas emissions in 2011. In 2011, UK net emissions of carbon dioxide were estimated to be 458.6 million tonnes (Mt). This was around 7.9 per cent lower than the 2010 figure of 497.8 Mt. There were notable decreases in emissions from the residential sector, down by 23.3 per cent (20.2 Mt), and from the energy supply sector, down 6.7 per cent (13.2 Mt). Again, emissions from the business, transport and public sectors were slightly down on 2010, but all other sectors were relatively unchanged.
- The overall decrease in emissions in 2011 has primarily resulted from a fall in residential gas use, combined with a reduction in demand for electricity accompanied by lower use of gas and greater use of nuclear power for electricity generation. Although these factors mainly affected emissions of carbon dioxide, any change in CO<sub>2</sub> emissions is likely to drive a similar change in total emissions.
- All the sectoral breakdowns included in this statistical release are based on the source of the emissions, as opposed to where the end-user activity occurred. Emissions related to electricity generation are therefore attributed to power stations, the source of these emissions, rather than homes and businesses where electricity is used.

The headline results are shown in Table 1 and Figure 1 below. Note that the 2010 figures have been revised since the previous publication in February 2012; further details of this revision can be found later in this statistical release.

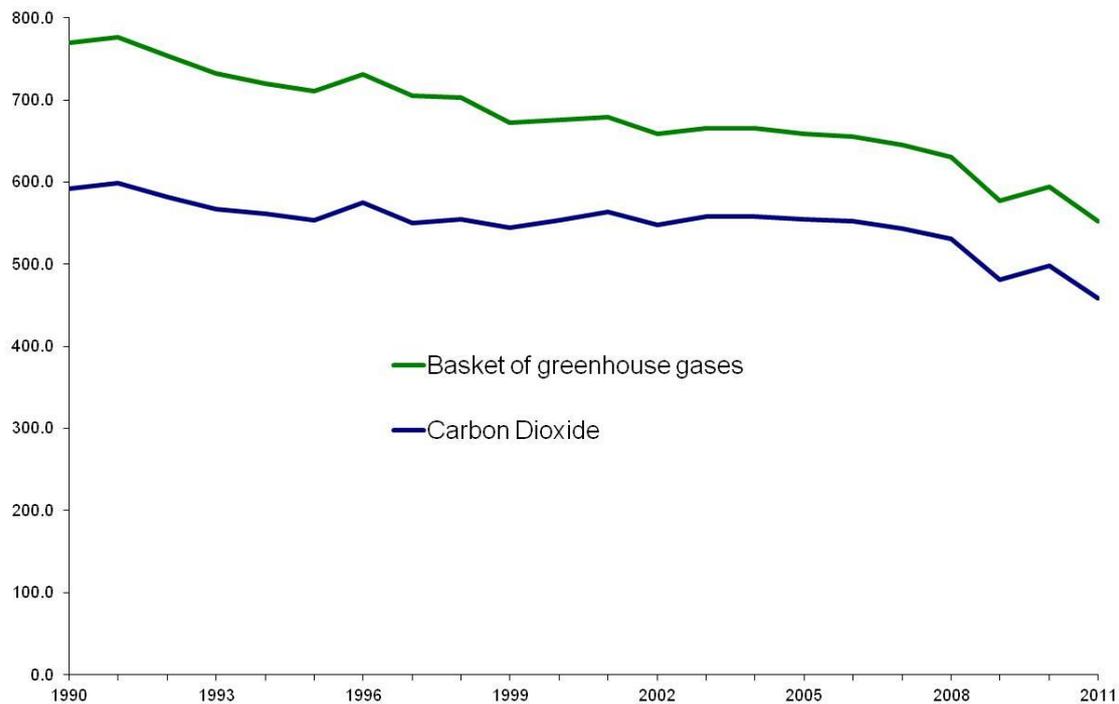
The time series for selected years since 1990 is shown in Table 21 towards the end of this statistical release.

**Table 1: Emissions of greenhouse gases (MtCO<sub>2</sub>e)**

	2010	2011	Change
Total greenhouse gas emissions	594.0	552.6	-7.0%
Carbon dioxide emissions	497.8	458.6	-7.9%

Carbon dioxide emissions figures are for the UK and Crown Dependencies; Total greenhouse gas emissions figures also include some Overseas Territories. Emissions are reported as *net* emissions, to include removals from the atmosphere by carbon sinks.

**Figure 1: Emissions of greenhouse gases, 1990-2011 (MtCO<sub>2</sub>e)**



### Coverage of emissions reporting

The basket of greenhouse gases covered by the Kyoto Protocol consists of six gases: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride. These last three gases are collectively referred to as fluorinated compounds. 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 CO<sub>2</sub> from the atmosphere by *carbon sinks*. Carbon sinks are incorporated within the Land Use, Land Use Change and Forestry (LULUCF) sector, which covers afforestation, reforestation, deforestation and forest management. They are defined by the United Nations Framework Convention on Climate Change (UNFCCC) as “any process, activity or mechanism which removes a greenhouse gas, an aerosol or a precursor of a greenhouse gas from the atmosphere”.

Unless otherwise stated, any figures included in this release represent emissions within the UK and its Crown Dependencies (Jersey, Guernsey, and the Isle of Man).

Reporting of greenhouse gas emissions under the Kyoto Protocol 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. This now includes emissions from all direct flights and shipping between the UK and these Territories. The Kyoto Protocol also uses a narrower definition of carbon sinks than that applied for domestic UK CO<sub>2</sub> reporting, which therefore results in a slightly different total. These adjustments mean that the greenhouse gas basket reported for Kyoto differs slightly from the sum of the individual gases as shown.

Reporting of greenhouse gas emissions for the UK’s Carbon Budgets only includes emissions within the UK, and excludes both Crown Dependencies and Overseas Territories.

A more detailed summary of the coverage and breakdown can be found in the data tables which accompany this release.

## Emissions by gas and source sector

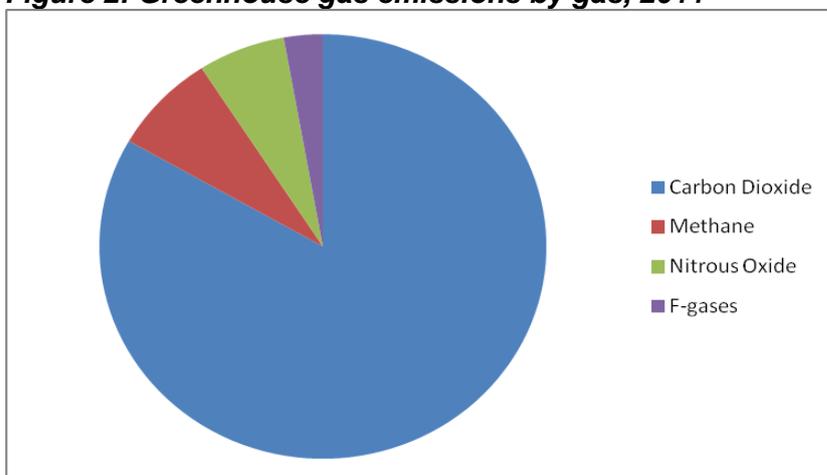
Greenhouse gas emissions are reported here in two ways: either by gas, or by the source sector of the emissions.

When broken down by gas, UK emissions are dominated by carbon dioxide, which accounted for about 83 per cent of the UK's greenhouse gas emissions in 2011. Weighted by global warming potential, methane accounted for about 8 per cent of UK emissions and nitrous oxide for about 6 per cent of emissions in 2011. Fluorinated gases accounted for the remainder, around 3 per cent.

Looking instead at the breakdown by sector, in 2011 35 per cent of greenhouse gas emissions were from the energy supply sector, 21 per cent from transport, 16 per cent from business, 13 per cent from the residential sector and 9 per cent from agriculture. The other 6 per cent were attributable to the remaining sectors; waste management, industrial process, the public sector and LULUCF.

Figures 2 and 3 below show the breakdown of 2011 UK greenhouse emissions by gas and sector. Note that Figure 3 does not include emissions from the LULUCF sector, since in 2011 this sector acted as a net sink, and emissions were therefore effectively negative.

**Figure 2: Greenhouse gas emissions by gas, 2011**



**Figure 3: Greenhouse gas emissions by source sector, 2011 (excluding LULUCF)**

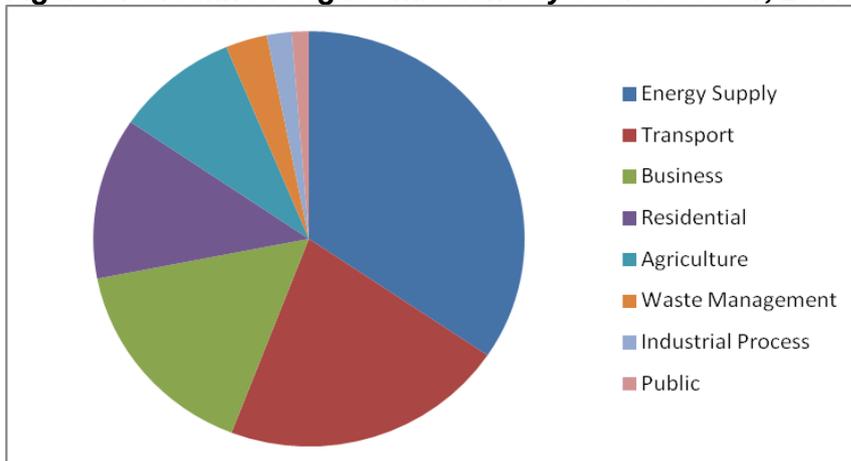


Table 2 below shows the two-way breakdown of 2011 emissions by both gas and source sector, in absolute terms. Table 3 then shows how these figures translate into percentages of the UK's total emissions. Note that emissions from the LULUCF sector have been excluded from Table 3, since in 2011 these were effectively negative.

**Table 2: Breakdown of 2011 UK greenhouse gas emissions by gas and sector (MtCO<sub>2</sub>e)**

	Carbon dioxide	Methane	Nitrous oxide	Fluorinated gases	Total
Energy Supply	182.2	7.3	1.5	0.0	190.9
Transport	117.4	0.1	1.0	0.0	118.5
Business	75.6	0.2	0.9	12.4	89.1
Residential	66.4	0.5	0.1	2.7	69.7
Agriculture	4.2	17.9	29.2	0.0	51.2
Waste Management	0.3	15.8	1.3	0.0	17.3
Industrial Process	9.5	0.1	0.2	0.4	10.2
Public	7.1	0.0	0.0	0.0	7.1
LULUCF	-3.9	0.0	0.6	0.0	-3.3
Total	458.6	41.9	34.7	15.5	550.7

**Table 3: Breakdown of 2011 UK greenhouse gas emissions by gas and sector (% of total UK emissions, excluding LULUCF)**

	Carbon dioxide	Methane	Nitrous oxide	Fluorinated gases	Total
Energy Supply	32.9%	1.3%	0.3%	0.0%	34.5%
Transport	21.2%	0.0%	0.2%	0.0%	21.4%
Business	13.6%	0.0%	0.2%	2.2%	16.1%
Residential	12.0%	0.1%	0.0%	0.5%	12.6%
Agriculture	0.8%	3.2%	5.3%	0.0%	9.2%
Waste Management	0.0%	2.8%	0.2%	0.0%	3.1%
Industrial Process	1.7%	0.0%	0.0%	0.1%	1.8%
Public	1.3%	0.0%	0.0%	0.0%	1.3%
Total	83.5%	7.6%	6.2%	2.8%	100.0%

## Emissions by sector

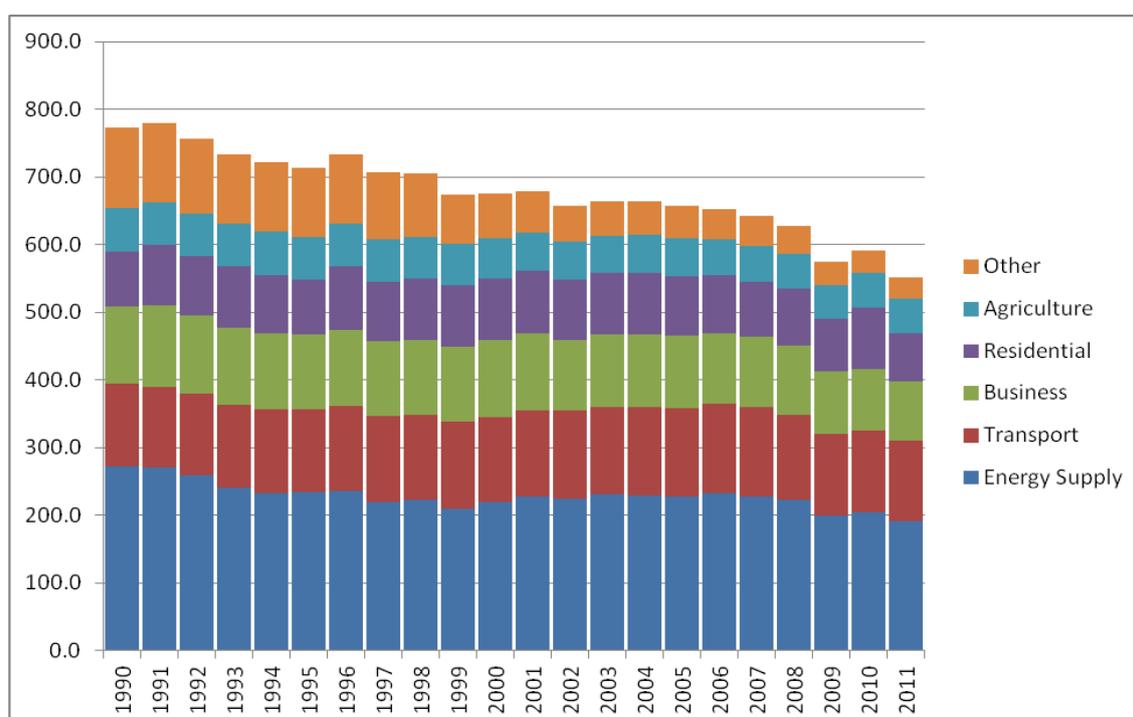
Table 4 and Figure 4 below show the breakdown of greenhouse gas emissions into the main source sectors for selected years between 1990 and 2011.

**Table 4: Sources of greenhouse gas emissions, 1990-2011 (MtCO<sub>2</sub>e)**

	1990	1995	2000	2005	2009	2010	2011
Energy Supply	272.4	234.0	218.5	227.5	198.7	204.3	190.9
Transport	121.5	122.1	126.7	130.3	121.7	120.1	118.5
Business	115.3	110.3	114.0	108.2	91.4	91.9	89.1
Residential	80.8	82.3	90.2	87.8	78.1	89.9	69.7
Agriculture	63.7	62.6	59.2	55.5	50.6	51.2	51.2
Waste Management	47.4	41.4	30.8	20.4	18.5	17.9	17.3
Industrial Process	54.7	45.1	24.7	18.8	10.8	11.7	10.2
Public	13.1	12.8	11.5	11.1	8.3	8.4	7.1
LULUCF	4.0	3.3	0.4	-2.6	-3.8	-3.7	-3.3
<b>Total</b>	<b>772.9</b>	<b>713.8</b>	<b>675.9</b>	<b>657.0</b>	<b>574.3</b>	<b>591.7</b>	<b>550.7</b>

All figures are for the UK and Crown Dependencies only, and exclude Overseas Territories.

**Figure 4: Greenhouse gas emissions by source, 1990-2011 (MtCO<sub>2</sub>e)**



Details of changes over time for each sector are set out in the following sections of this statistical release. In each case, information about the trend between 1990 and 2010 provides some context, followed by details of the changes since 2010 now seen in the 2011 estimates.

## Energy supply

The energy supply sector was responsible for 35 per cent of UK greenhouse gas emissions in 2011, with carbon dioxide being by far the most prominent gas for this sector.

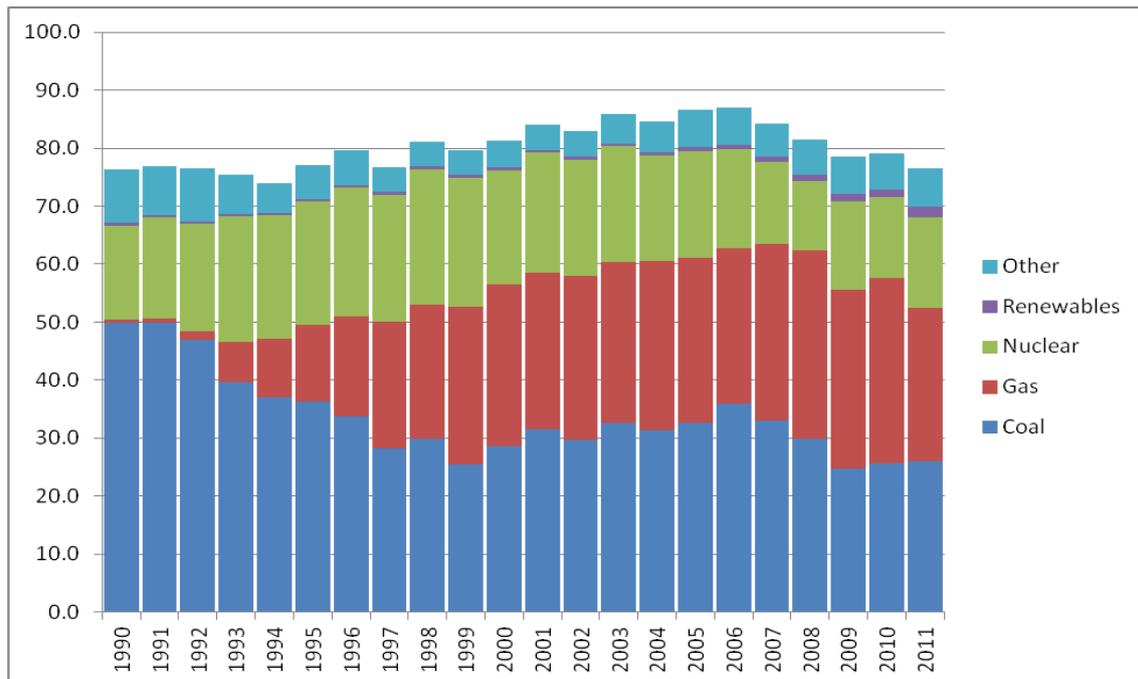
### Context – 1990 to 2010

Between 1990 and 2010, there was a general downward trend in greenhouse gas emissions from the energy supply sector, resulting in a reduction of around 25 per cent.

The downward trend over the period has primarily been driven by reductions in emissions related to electricity generation at power stations. This decrease has resulted from a combination of changes in mix of fuel being used for generation together with greater efficiency due to improvements in technology. It is difficult to assess the relative impacts of the two, but it is likely that the majority of the saving since 1990 will have been due to fuel switching from coal to gas for generation; there has been an overall decline in the use of coal at power stations over the period, accompanied by an overall increase in the use of gas, which has a lower carbon content. Coal use in generation has roughly halved since 1990.

Changes in the fuel mix for UK electricity generation since 1990 are shown in Figure 5 below.

**Figure 5: Fuel mix for UK electricity generation, 1990-2011 (MtOe)**



The other main factor which has noticeably contributed to the decline in emissions has been in relation to coal mining; the production of deep-mined

coal in particular has declined steadily over the period, with emissions from this source having fallen by 16 MtCO<sub>2</sub>e since 1990.

### 2011 results

Between 2010 and 2011 emissions from the energy supply sector fell by 6.5 per cent (13.3 MtCO<sub>2</sub>e). This decrease can almost entirely be attributed to power stations. Demand for electricity was around 3 per cent lower in 2011 than in 2010, and there was also a change in the fuel mix used at power stations for electricity generation. The technical problems which had been experienced at some nuclear power stations in 2010 were resolved, and there was therefore more nuclear power available for electricity generation in 2011. Consequently, there was an 18 per cent decrease in gas use for generation, alongside a 12 per cent increase in the use of nuclear power. The sharp decrease observed in 2011 put gas usage at power stations at its lowest level since 1998. Together, these changes resulted in a decrease of around 8 per cent in emissions from electricity generation. In 2011, total greenhouse gas emissions from power stations, at 145.3 Mt, accounted for just under a quarter of all UK greenhouse gas emissions.

It should also be mentioned that between 1990 and 2011, final consumption of electricity increased by around 15 per cent; domestic electricity consumption in particular was just over 20 per cent higher in 2011 than in 1990.

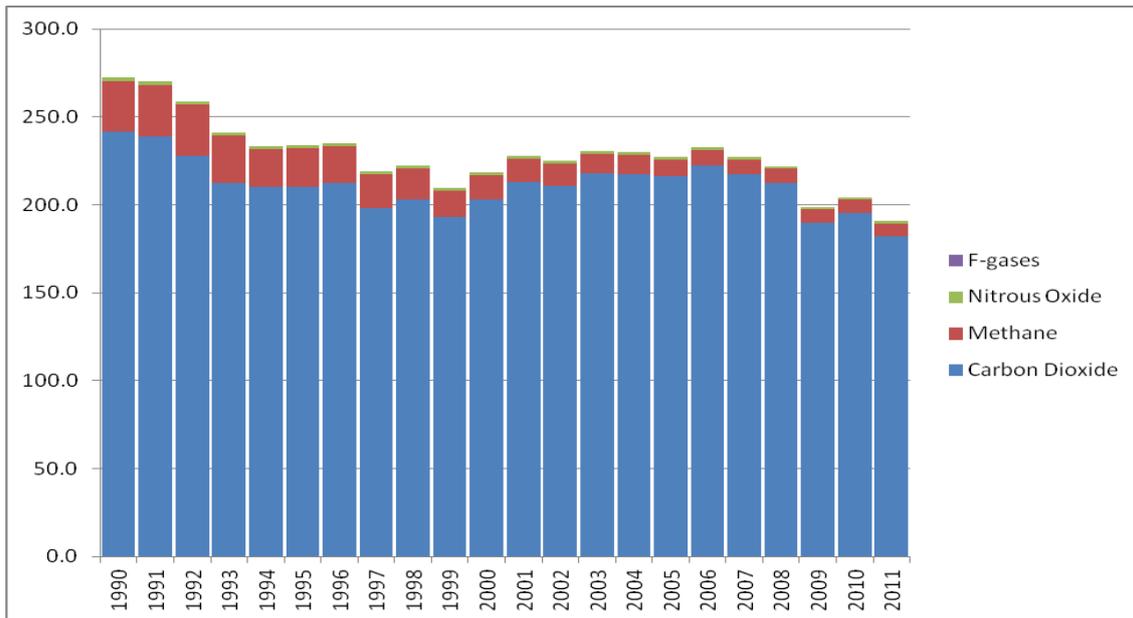
The breakdown of emissions by gas for selected years since 1990 is shown in Table 5 below. The trend in emissions over the period is shown in Figure 6.

**Table 5: Energy supply sector emissions by gas, 1990-2011 (MtCO<sub>2</sub>e)**

	1990	1995	2000	2005	2008	2009	2010	2011
Carbon dioxide	241.5	210.0	203.0	216.5	212.5	189.5	195.3	182.2
Methane	28.9	22.2	13.8	9.4	7.9	7.8	7.6	7.3
Nitrous oxide	2.1	1.8	1.6	1.7	1.5	1.4	1.4	1.5
F-gases	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Total</b>	<b>272.4</b>	<b>234.0</b>	<b>218.5</b>	<b>227.5</b>	<b>221.9</b>	<b>198.7</b>	<b>204.3</b>	<b>190.9</b>

All figures are for the UK and Crown Dependencies only, and exclude Overseas Territories.

**Figure 6: Greenhouse gas emissions from energy supply, 1990-2011 (MtCO<sub>2</sub>e)**



## **Transport**

The transport sector was responsible for around 21 per cent of UK greenhouse gas emissions in 2011, with carbon dioxide being by far the most prominent gas. Emissions of CO<sub>2</sub> are closely related to the amount of fuel used, whilst nitrous oxide and methane emissions are influenced more by the vehicle type and age.

### Context – 1990 to 2010

Between 1990 and 2010, there was very little overall change in the level of greenhouse gas emissions from the transport sector (emissions were around 1 per cent lower in 2010 than in 1990), although emissions did in fact increase up to 2007 and then fall again from 2008 onwards.

Road transport is the most significant source of emissions in this sector, passenger cars in particular, and the changes which have been seen over the period were heavily influenced by this category. Whilst there has been a decrease in emissions from passenger cars over the period, this was partially offset by an increase in emissions from light duty vehicles. Although there has been an increase in both the number of passenger vehicles and the vehicle kilometres travelled, the decrease in emissions from passenger cars has been due to lower petrol consumption outweighing an increase in diesel consumption.

### 2011 results

Between 2010 and 2011 emissions from transport fell by 1.4 per cent (1.7 MtCO<sub>2</sub>e). This decrease was primarily due, again, to a decrease in petrol consumption alongside a relatively smaller increase in diesel consumption.

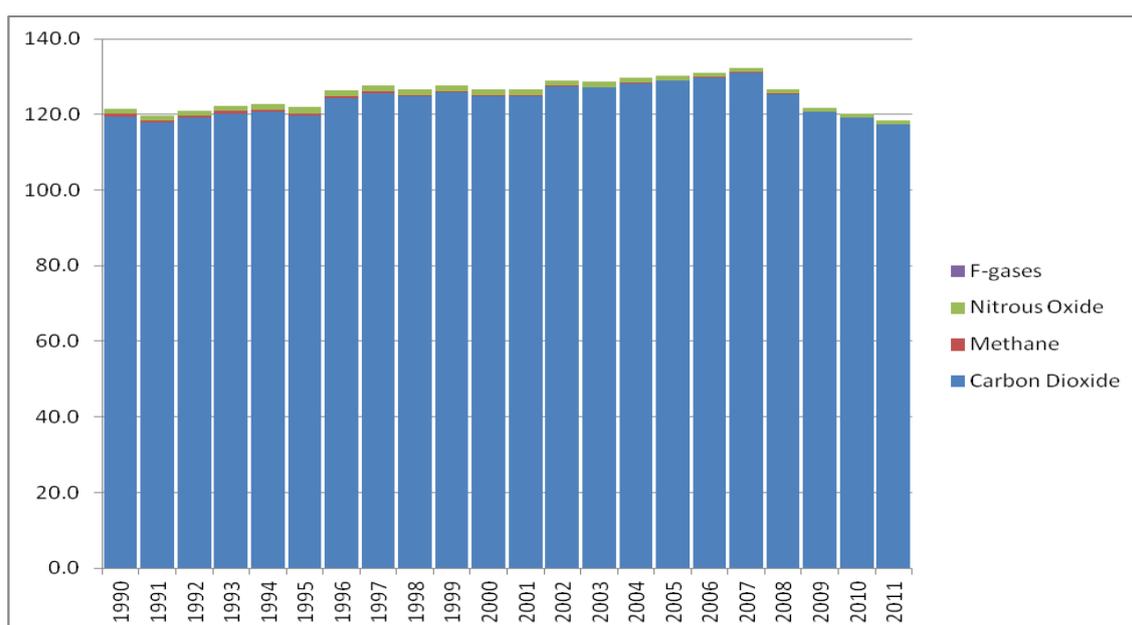
The breakdown of emissions by gas for selected years since 1990 is shown in Table 6 below. The trend in emissions over the period is shown in Figure 7.

**Table 6: Transport sector emissions by gas, 1990-2011 (MtCO<sub>2</sub>e)**

	1990	1995	2000	2005	2008	2009	2010	2011
Carbon dioxide	119.5	119.8	124.8	128.9	125.5	120.7	119.1	117.4
Methane	0.6	0.5	0.3	0.2	0.1	0.1	0.1	0.1
Nitrous oxide	1.3	1.8	1.5	1.2	1.0	0.9	0.9	1.0
F-gases	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Total</b>	<b>121.5</b>	<b>122.1</b>	<b>126.7</b>	<b>130.3</b>	<b>126.6</b>	<b>121.7</b>	<b>120.1</b>	<b>118.5</b>

All figures are for the UK and Crown Dependencies only, and exclude Overseas Territories.

**Figure 7: Greenhouse gas emissions from transport, 1990-2011(MtCO<sub>2</sub>e)**



## **Business**

The business sector was responsible for 16 per cent of UK greenhouse gas emissions in 2011, with carbon dioxide again 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 not insignificant.

### Context – 1990 to 2010

Between 1990 and 2010, there was a general downward trend in greenhouse gas emissions from the business sector, resulting in an overall decrease of around 20 per cent. This has been largely due to a reduction in emissions from industrial combustion (including iron and steel) over the period. Although emissions of carbon dioxide have reduced over the period (by 30 per cent),

emissions from F-gases have increased significantly. This has mainly been due to an increase in emissions from refrigeration and air-conditioning; between 1993 and 2002, hydrofluorocarbons (HFCs) were used to replace other, ozone depleting, substances which were previously used as refrigerants. This increasing trend has since slowed, as tighter controls on emissions leakages have been introduced.

2011 results

Between 2010 and 2011 emissions from business fell by 3.0 per cent (2.8 MtCO<sub>2</sub>e). This decrease was mainly driven by a fall in carbon dioxide emissions across industry and commerce as a whole.

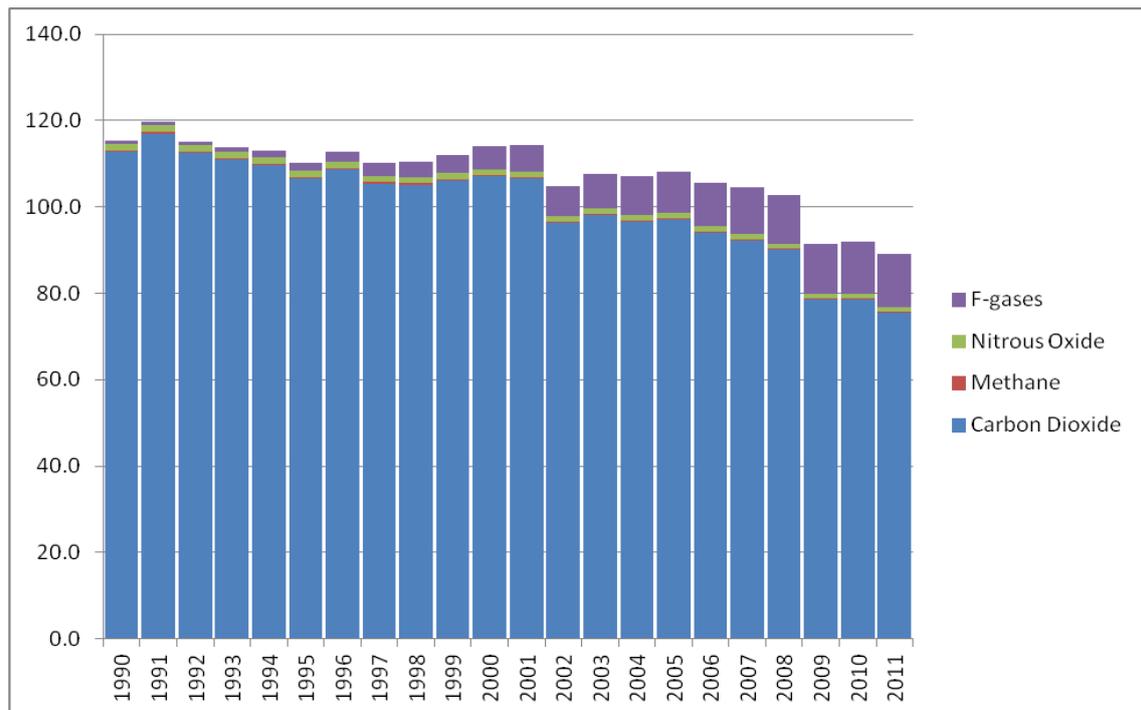
The breakdown of emissions by gas for selected years since 1990 is shown in Table 7 below. The trend in emissions over the period is shown in Figure 8.

**Table 7: Business sector emissions by gas, 1990-2011 (MtCO<sub>2</sub>e)**

	1990	1995	2000	2005	2008	2009	2010	2011
Carbon dioxide	112.8	106.6	107.0	97.1	90.1	78.5	78.5	75.6
Methane	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2
Nitrous oxide	1.6	1.5	1.3	1.3	1.2	1.0	1.0	0.9
F-gases	0.7	1.9	5.3	9.5	11.3	11.7	12.1	12.4
Total	115.3	110.3	114.0	108.2	102.8	91.4	91.9	89.1

All figures are for the UK and Crown Dependencies only, and exclude Overseas Territories.

**Figure 8: Greenhouse gas emissions from business, 1990-2011 (MtCO<sub>2</sub>e)**



## ***Residential***

The residential sector was responsible for around 13 per cent of UK greenhouse gas emissions in 2011, with carbon dioxide being the most prominent gas for this sector.

It should be noted that since these figures are estimates of emissions by source, for carbon dioxide they only include emissions related to residential fossil fuel use. These emissions are therefore primarily related to activities such as heating and cooking. Emissions related to residential electricity use, including for heating, are attributable to power stations, which are the source of these emissions, and are therefore included in the energy supply sector.

### *Context – 1990 to 2010*

Between 1990 and 2010, there was considerable variation in greenhouse gas emissions from year to year in the residential sector, although since 2004 there has been a general downward trend, although 2010 was an exception to this trend due to the particularly cold weather experienced in that year. Emissions of F-gases in this sector, which have increased slightly since 1990, are related to the use of aerosols and metered dose inhalers.

### *2011 results*

Between 2010 and 2011 there was a decrease of around 23 per cent (20.2 MtCO<sub>2</sub>e) in emissions from this sector, the highest decrease for any single sector in both absolute and percentage terms. This was due to a decrease in the use of all fossil fuels, gas in particular. Compared with the long term average, 2011 was a warm year; in particular, it was significantly warmer than 2010. In the first and last quarters, 2011 was warmer than 2010 by 2.2 and 4.1 degrees Celsius respectively. This heavily contributed to a significant reduction in the use of natural gas for space heating, which was reflected by a similar fall in emissions.

Emissions from this sector are now at their lowest level since 1990.

In general, carbon dioxide emissions from this sector in particular are heavily influenced by external temperatures. Since April 2012, DECC have published quarterly emissions estimates which incorporate an assessment of the impact of temperatures on emissions. Further details of these estimates can be found later in this statistical release.

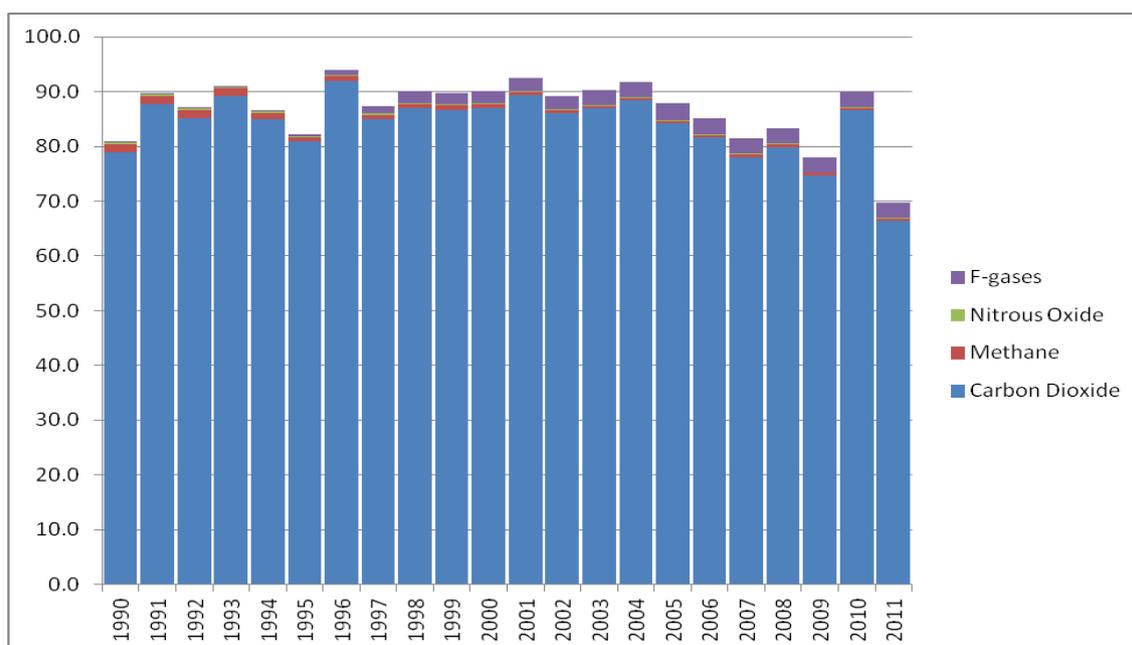
The breakdown of emissions by gas for selected years since 1990 is shown in Table 8 below. The trend in emissions over the period is shown in Figure 9.

**Table 8: Residential sector emissions by gas, 1990-2011 (MtCO<sub>2</sub>e)**

	1990	1995	2000	2005	2008	2009	2010	2011
Carbon dioxide	79.0	80.8	87.1	84.3	79.9	74.7	86.5	66.4
Methane	1.5	0.8	0.7	0.4	0.5	0.5	0.5	0.5
Nitrous oxide	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1
F-gases	0.0	0.4	2.2	3.0	2.9	2.8	2.7	2.7
<b>Total</b>	<b>80.8</b>	<b>82.3</b>	<b>90.2</b>	<b>87.8</b>	<b>83.4</b>	<b>78.1</b>	<b>89.9</b>	<b>69.7</b>

All figures are for the UK and Crown Dependencies only, and exclude Overseas Territories.

**Figure 9: Greenhouse gas emissions from the residential sector, 1990-2011 (MtCO<sub>2</sub>e)**



## Agriculture

The agriculture sector was responsible for 9 per cent of UK greenhouse gas emissions in 2011. Emissions of methane and nitrous oxide dominate this sector. The most significant sources here 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.

### Context – 1990 to 2010

Between 1990 and 2010, there was a general downward trend in greenhouse gas emissions from this sector, resulting in an overall decrease of around 20 per cent. This reduction has been driven by a fall in animal numbers over the period, together with a decrease in synthetic fertiliser use.

## 2011 results

Between 2010 and 2011 there was virtually no change in emissions from the agriculture sector.

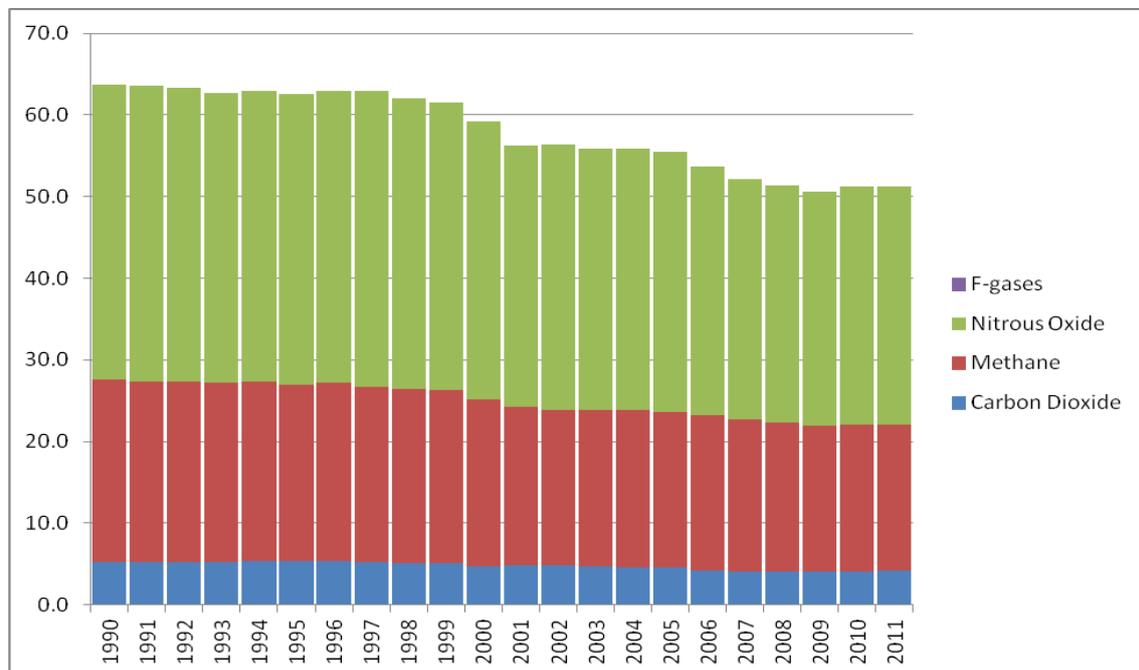
The breakdown of emissions by gas for selected years since 1990 is shown in Table 9 below. The trend in emissions over the period shown in Figure 10.

**Table 9: Agriculture sector emissions by gas, 1990-2011 (MtCO<sub>2</sub>e)**

	1990	1995	2000	2005	2008	2009	2010	2011
Carbon dioxide	5.2	5.3	4.8	4.6	4.1	4.1	4.1	4.2
Methane	22.4	21.6	20.4	19.1	18.2	17.9	18.0	17.9
Nitrous oxide	36.1	35.6	34.0	31.8	29.1	28.7	29.1	29.2
F-gases	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Total</b>	<b>63.7</b>	<b>62.6</b>	<b>59.2</b>	<b>55.5</b>	<b>51.4</b>	<b>50.6</b>	<b>51.2</b>	<b>51.2</b>

All figures are for the UK and Crown Dependencies only, and exclude Overseas Territories.

**Figure 10: Greenhouse gas emissions from agriculture, 1990-2011 (MtCO<sub>2</sub>e)**



## **Waste management**

The waste management sector was responsible for around 3 per cent of UK greenhouse gas emissions in 2011, with methane being by far the most prominent gas. The vast majority of these emissions are from landfill sites.

### Context – 1990 to 2010

Between 1990 and 2010, there was a significant reduction in greenhouse gas emissions from the waste management sector, resulting in an overall decrease of around 62 per cent. This has been due to a combination of factors, including improvements in the standards of landfilling, changes to the types of waste going to landfill (such as reducing the amount of biodegradable waste), and an increase in the amount of landfill gas being used for energy. Emissions of methane alone have reduced by 64 per cent over the period.

### 2011 results

Between 2010 and 2011 emissions from waste management fell by just over 3 per cent (0.6 MtCO<sub>2</sub>e), reflecting a continuation of the same trend seen in recent years, due to the same reasons.

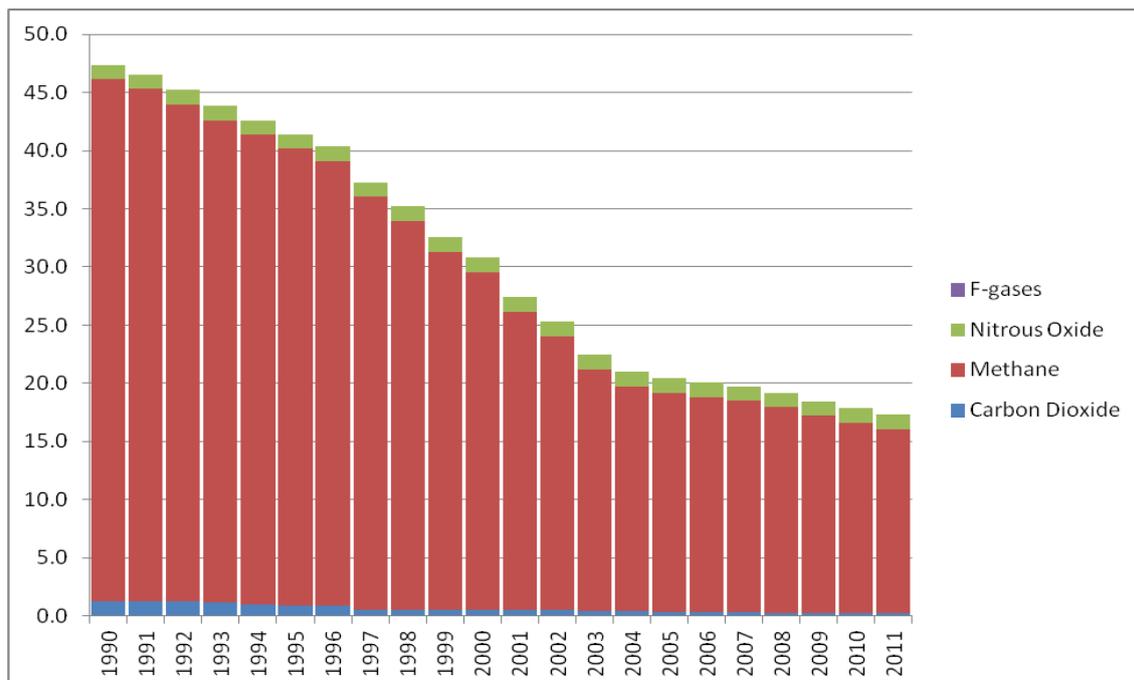
The breakdown of emissions by gas for selected years since 1990 is shown in Table 10 below. The trend over the period is shown in Figure 11.

**Table 10: Waste management sector emissions by gas, 1990-2011 (MtCO<sub>2</sub>e)**

	1990	1995	2000	2005	2008	2009	2010	2011
Carbon dioxide	1.3	0.9	0.5	0.4	0.3	0.3	0.3	0.3
Methane	44.9	39.3	29.0	18.8	17.7	17.0	16.3	15.8
Nitrous oxide	1.2	1.2	1.3	1.2	1.2	1.2	1.3	1.3
F-gases	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	47.4	41.4	30.8	20.4	19.2	18.5	17.9	17.3

All figures are for the UK and Crown Dependencies only, and exclude Overseas Territories.

**Figure 11: Greenhouse gas emissions from waste management, 1990-2011 (MtCO<sub>2</sub>e)**



### **Industrial process**

The industrial process sector was responsible for 2 per cent of UK greenhouse gas emissions in 2011, with carbon dioxide being the most prominent gas. The main source of emissions is cement production, with other processes such as sinter and lime production also worth mentioning.

#### Context – 1990 to 2010

Between 1990 and 2010, there was a significant reduction in greenhouse gas emissions from the industrial process sector, with an overall decrease of around 79 per cent. This was most notably due to a large reduction in emissions from adipic acid production and halocarbon production between 1998 and 1999 (combined emissions of which are now almost zero), although there has been a general downward trend in emissions over the period.

#### 2011 results

Between 2010 and 2011 emissions from the industrial process sector fell by around 13 per cent (1.5 MtCO<sub>2</sub>e). This was largely driven by a reduction in nitrous oxide emissions from nitric acid production, with abatement technology being installed at all three UK nitric acid production plants during the year.

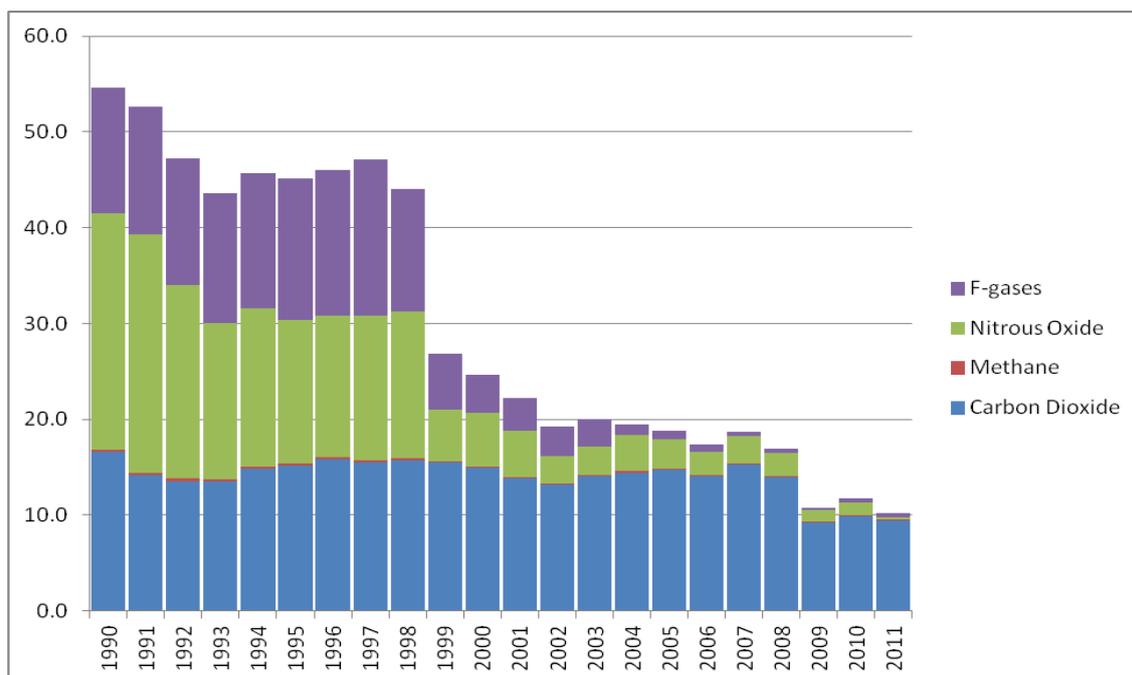
The breakdown of emissions by gas for selected years since 1990 is shown in Table 11 below. The trend over the period is shown in Figure 12.

**Table 11: Industrial process sector emissions by gas, 1990-2011 (MtCO<sub>2</sub>e)**

	1990	1995	2000	2005	2008	2009	2010	2011
Carbon dioxide	16.6	15.2	15.0	14.8	14.0	9.2	9.9	9.5
Methane	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Nitrous oxide	24.7	14.9	5.6	3.0	2.5	1.2	1.4	0.2
F-gases	13.1	14.8	4.0	0.9	0.4	0.3	0.4	0.4
<b>Total</b>	<b>54.7</b>	<b>45.1</b>	<b>24.7</b>	<b>18.8</b>	<b>16.9</b>	<b>10.8</b>	<b>11.7</b>	<b>10.2</b>

All figures are for the UK and Crown Dependencies only, and exclude Overseas Territories.

**Figure 12: Greenhouse gas emissions from industrial processes, 1990-2011 (MtCO<sub>2</sub>e)**



### **Public sector**

The public sector was responsible for just over 1 per cent of UK greenhouse gas emissions in 2011, with carbon dioxide representing almost the entirety of these emissions.

#### Context – 1990 to 2010

Between 1990 and 2010, there was a general downward trend in greenhouse gas emissions from the public sector, with an overall decrease of around 36 per cent. This has been largely driven by a reduction in the use of oil in this sector.

#### 2011 results

Between 2010 and 2011 emissions from the public sector fell by just over 15 per cent (1.3 MtCO<sub>2</sub>e), largely due to a reduction in natural gas use.

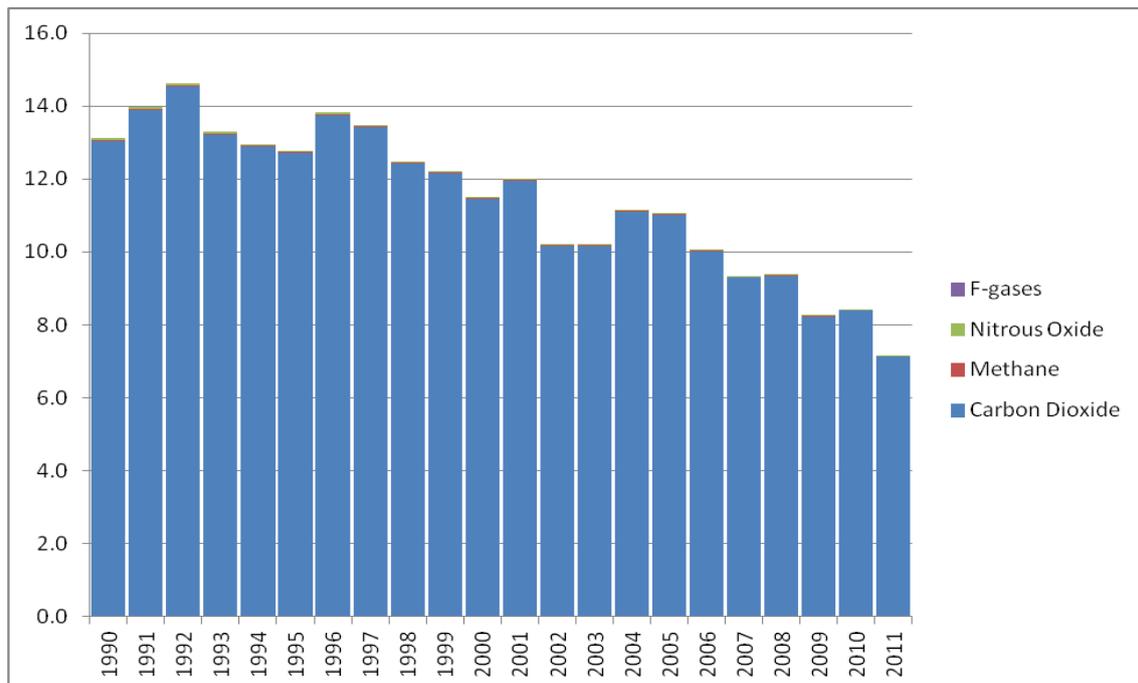
The breakdown of emissions by gas for selected years since 1990 is shown in Table 12 below. The trend over the period is shown in Figure 13.

**Table 12: Public sector emissions by gas, 1990-2011 (MtCO<sub>2</sub>e)**

	1990	1995	2000	2005	2008	2009	2010	2011
Carbon dioxide	13.0	12.7	11.5	11.0	9.3	8.2	8.4	7.1
Methane	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.01
Nitrous oxide	0.06	0.03	0.02	0.01	0.01	0.01	0.01	0.01
F-gases	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Total</b>	<b>13.1</b>	<b>12.8</b>	<b>11.5</b>	<b>11.1</b>	<b>9.4</b>	<b>8.3</b>	<b>8.4</b>	<b>7.1</b>

All figures are for the UK and Crown Dependencies only, and exclude Overseas Territories.

**Figure 13: Greenhouse gas emissions from the public sector, 1990-2011 (MtCO<sub>2</sub>e)**



### **Land Use, Land Use Change and Forestry (LULUCF)**

The LULUCF sector acted as a net sink of UK greenhouse gas emissions in 2011, dominated by carbon dioxide.

#### Context – 1990 to 2010

Between 1990 and 2010, the UK went from being a net source of LULUCF emissions to a net sink. This was largely due to changes in land use over the period. In general, land being converted to cropland is the dominant source of CO<sub>2</sub> emissions, and forest land which remains as forest land is the dominant sink. The downward trend in net emissions over the period has largely been

driven by forest land, with an increasing uptake of CO<sub>2</sub> by trees as they reach maturity, in line with the historical planting pattern. There has also been some reduction in emissions since 1990 due to less intensive agricultural practices.

2011 results

Between 2010 and 2011, net emissions from the LULUCF sector increased slightly, by around 0.4 MtCO<sub>2</sub>e, largely due to the fact that forest land which has until now acted as a sink has now passed maturity, resulting in a lower uptake of CO<sub>2</sub> by trees.

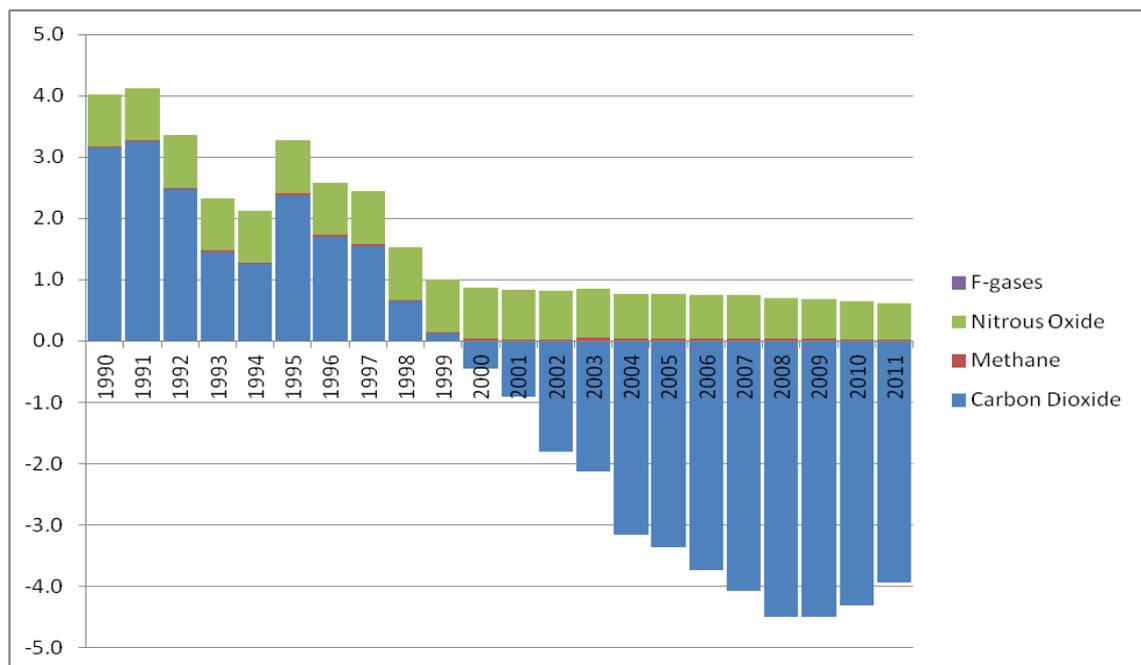
The breakdown of emissions and removals by gas for selected years since 1990 is shown in Table 13 below. The trend over the period is shown in Figure 14.

**Table 13: LULUCF sector emissions by gas, 1990-2011 (MtCO<sub>2</sub>e)**

	1990	1995	2000	2005	2008	2009	2010	2011
Carbon dioxide	3.1	2.4	-0.4	-3.4	-4.5	-4.5	-4.3	-3.9
Methane	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nitrous oxide	0.8	0.9	0.8	0.7	0.7	0.7	0.6	0.6
F-gases	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	4.0	3.3	0.4	-2.6	-3.8	-3.8	-3.7	-3.3

All figures are for the UK and Crown Dependencies only, and exclude Overseas Territories.

**Figure 14: Greenhouse gas emissions from the LULUCF sector, 1990-2011 (MtCO<sub>2</sub>e)**



## Emissions from UK-based international aviation and shipping bunkers

Emissions from international aviation and shipping can be estimated from refuelling from bunkers at UK airports and ports, whether by UK or non-UK operators. Under the reporting guidelines agreed by the UNFCCC, these emissions are not included in the UK's emissions total, but are reported as memo items in national greenhouse gas inventories. Parties to the UNFCCC are required to act to limit or reduce emissions from international services working through the International Civil Aviation Organisation (ICAO) and International Maritime Organisation (IMO).

In 2011, emissions from international aviation fuel use were estimated to be 33.2 million tonnes carbon dioxide equivalent. This was 4.3 per cent higher than the 2010 figure of 31.8 million tonnes. Between 1990 and 2006, these emissions increased by around 130 per cent, although since 2006 they have been steadily falling until 2011. In 2011 these emissions are still more than double the 1990 level. High altitude aviation also has a greenhouse effect over and above that of carbon dioxide alone, but this is not reflected in these estimates.

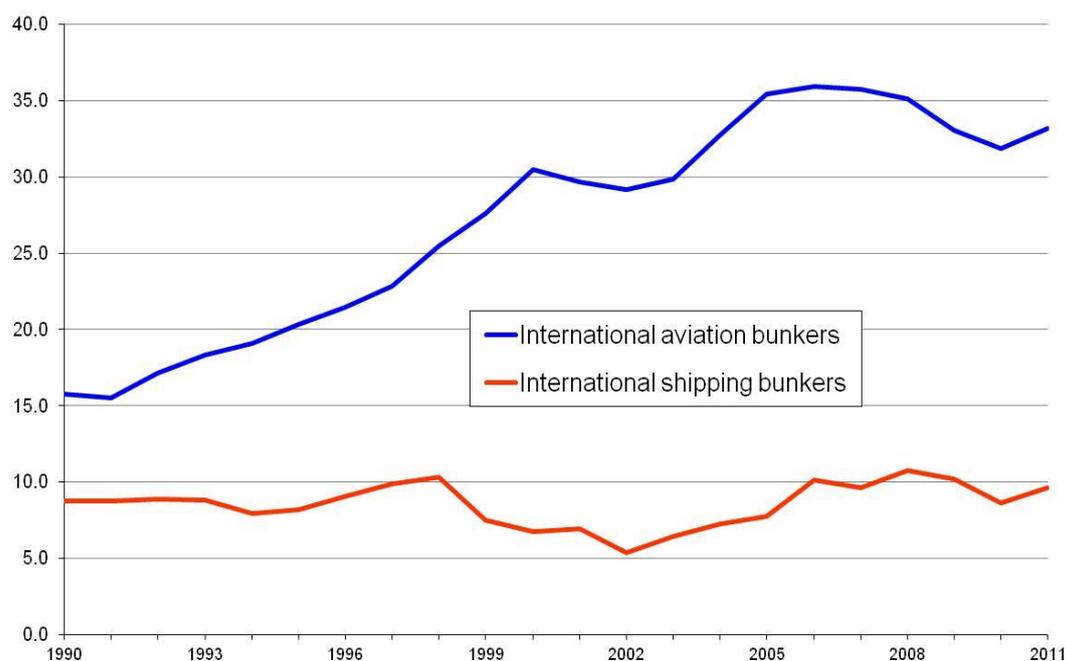
In 2011, emissions from UK international shipping bunkers were estimated to be 9.7 million tonnes carbon dioxide equivalent. This was 12.2 per cent higher than the 2010 figure of 8.6 million tonnes. Since 1990, emissions from UK shipping bunkers have been highly variable. There was an increase of around 18 per cent between 1990 and 1998, followed by a fall of 48 per cent between 1998 and 2002. Emissions then almost doubled between 2002 and 2006, but have since been very variable year on year, and there is no clear trend. The level of these emissions is now around 10 per cent higher than it was in 1990. It should be noted that UK operators purchase most of their fuel outside the UK.

Table 14 and Figure 15 below show the international aviation and shipping emissions series from 1990 to 2011.

**Table 14: Greenhouse gas emissions from UK-based international aviation and shipping bunkers, 1990-2011 (MtCO<sub>2</sub>e)**

	1990	1995	2000	2005	2008	2009	2010	2011
International aviation	15.8	20.3	30.5	35.4	35.1	33.1	31.8	33.2
International shipping	8.8	8.2	6.7	7.8	10.8	10.2	8.6	9.7
Total	24.5	28.5	37.2	43.2	45.9	43.3	40.5	42.9

**Figure 15: Greenhouse gas emissions from UK-based international aviation and shipping bunkers, 1990-2011 (MtCO<sub>2</sub>e)**



### Revisions from provisional estimates

Provisional estimates of 2011 UK greenhouse gas and carbon dioxide emissions were published in March 2012, based on early estimates of energy consumption for the year. Differences between the provisional and final estimates arise primarily due to revisions to other statistics on which these estimates were based, and methodological changes arising from developments to the inventory. Together these factors combine to give an uncertainty range in the provisional estimates of around +/-1½ per cent.

At that time, it was provisionally estimated that total UK greenhouse gas emissions in 2011 would be 549.3 million tonnes carbon dioxide equivalent, which represented a decrease of 7 per cent from the 2010 figure. Although the final 2011 figure of 552.6 million tonnes is around half a per cent higher than the provisional estimate, this still represents a decrease from 2010 to 2011 of around 7 per cent. This difference is due to revisions in the historical data series. Importantly, the same year-on-year trend as anticipated by the provisional estimates has now been seen in the final figures.

Similarly, it was provisionally estimated that net UK carbon dioxide emissions would be 456.3 million tonnes, representing a decrease of around 8 per cent from the 2010 figure. The final 2011 figure of 458.6 million tonnes is also around half a per cent higher than the provisional estimate; however, this does actually represent a decrease from 2010 to 2011 of around 8 per cent.

Table 15 below shows the difference between the provisional estimates and the final estimates for 2011, alongside the equivalent figures for 2010. The breakdown by sector shown in the table is for carbon dioxide emissions only.

**Table 15: Comparison of 2011 provisional and final estimates**

	Provisional estimates (MtCO <sub>2</sub> e)				Final estimates (MtCO <sub>2</sub> e)			
	2010	2011	Change	% change	2010	2011	Change	% change
Energy Supply	195.7	183.8	-11.9	-6.1%	195.3	182.2	-13.2	-6.7%
Transport	120.6	118.9	-1.7	-1.4%	119.1	117.4	-1.7	-1.4%
Business	75.6	69.6	-6.0	-7.9%	78.5	75.6	-2.9	-3.7%
Residential	86.5	67.5	-19.0	-22.0%	86.5	66.4	-20.2	-23.3%
Agriculture	4.1	4.1	0.0	0.0%	4.1	4.2	0.1	1.3%
Waste Management	0.3	0.3	0.0	0.0%	0.3	0.3	0.0	-2.5%
Industrial Process	9.0	8.7	-0.3	-3.3%	9.9	9.5	-0.4	-4.1%
Public	8.4	7.9	-0.5	-6.0%	8.4	7.1	-1.3	-15.2%
LULUCF	-4.5	-4.5	0.0	0.0%	-4.3	-3.9	0.4	-8.8%
Total CO <sub>2</sub>	495.8	456.3	-39.5	-8.0%	497.8	458.6	-39.2	-7.9%
Other greenhouse gases	92.0	90.4	-1.6	-1.7%	93.9	92.1	-1.8	-1.9%
Kyoto greenhouse gas basket	590.4	549.3	-41.1	-7.0%	594.0	552.6	-41.4	-7.0%

All figures for CO<sub>2</sub> are for the UK and Crown Dependencies only, and exclude Overseas Territories.

Most of the difference between the provisional and final estimates is due to developments which have been made to the UK greenhouse gas inventory since the previous estimates were published. These developments are needed to address both UNFCCC requirements and UK Government policy needs. Further details are provided in the following section.

### Revisions to the Inventory

The UK Greenhouse Gas Inventory is reviewed every year, and the whole historical data series is revised to incorporate methodological improvements and new data. This takes into account revisions to the datasets which have been used in its compilation, most notably the UK energy statistics published in the Digest of UK Energy Statistics (DUKES). It is therefore not appropriate to compare the Inventory from one year with that from another. However, the latest Inventory represents a single consistent data series going back to 1990, and this therefore allows year-on-year comparisons to be made.

In preparing the 2011 Inventory, the most notable changes to the historical series since the 2010 Inventory was published are linked to new data and

research which have become available in relation to a number of specific sectors. The impact of these, by sector, is shown in Table 16 below

**Table 16: Revisions in the 2011 inventory, by sector (MtCO<sub>2</sub>e)**

	1990 emissions			2010 emissions		
	2010 inventory	2011 inventory	Change	2010 inventory	2011 inventory	Change
Energy Supply	273.4	272.4	-1.0	204.3	204.3	-0.1
Transport	121.5	121.5	0.0	121.9	120.1	-1.8
Business	113.2	115.3	2.1	89.0	91.9	2.9
Residential	80.8	80.8	0.0	89.9	89.9	0.0
Agriculture	63.1	63.7	0.6	50.7	51.2	0.5
Waste Management	45.9	47.4	1.5	16.5	17.9	1.3
Industrial Process	54.4	54.7	0.2	10.9	11.7	0.9
Public	13.1	13.1	0.0	8.5	8.4	0.0
LULUCF	3.9	4.0	0.1	-3.8	-3.7	0.2
<b>Total</b>	<b>769.4</b>	<b>772.9</b>	<b>3.6</b>	<b>587.8</b>	<b>591.7</b>	<b>3.9</b>

All figures are for the UK and Crown Dependencies only, and exclude Overseas Territories.

Details of the most notable revisions are as follows.

Estimates of carbon dioxide emissions from industrial combustion, within the business sector, were revised in respect of the use other petroleum gas at UK petrochemical plants. The 2012 UNFCCC review of the UK inventory concluded that our emissions estimates in the chemical category were underestimated across the whole time series from 1990 onwards, due to emissions estimates having only been included for some, but not all, UK petrochemical plants. These emissions estimates are now higher than previously estimated across the entire time series.

Estimates of carbon dioxide emissions from road transport have been revised to reflect new data now available for vehicle kilometres travelled on minor roads, together with other changes to the underlying petrol and diesel consumption data from the Digest of UK Energy Statistics (DUKES). These emissions are now lower than previously estimated for all years from 2000 onwards.

Finally, there were revisions to the estimates of methane emissions from industrial waste-water handling, within the waste management sector. The 2012 UNFCCC review of the UK inventory concluded that our emissions estimates in this category were underestimated across the whole time series from 1990 onwards, due to a lack of transparency around whether emissions had been adequately reported. Our emissions estimates for this source have now been revised upwards across the entire time series.

All the revisions to the UK inventory have resulted in revisions to the figures, for all years up to and including 2010. The total of all UK greenhouse gas emissions reported for the Kyoto Protocol in 2010 has been revised upwards from 590.4 to 594.0 million tonnes carbon dioxide equivalent. Comparing the 2011 figures with the 2010 figures published a year ago will therefore give a different year-on-year percentage change, but one which is incorrect and which should not be used.

## **UK emissions reduction targets**

The UK has both international and domestic targets for reducing greenhouse gas emissions.

These can be summarised as follows:

**Kyoto Protocol target**      The Kyoto Protocol uses a base year which is comprised of 1990 for carbon dioxide, methane and nitrous oxide, and 1995 for fluorinated compounds. To meet its commitment under the Protocol, the UK has agreed a legally binding target to reduce its greenhouse gas emissions to 12.5 per cent below the base year level over the period 2008-2012.

In July 2007, on completion of the review of the UK Inventory, the UK's Kyoto base year figure was set at 779.9 million tonnes CO<sub>2</sub> equivalent, based on the 2006 UK Inventory submission. This means that to meet the UK's Kyoto commitment, greenhouse gas emissions must be below 682.4 million tonnes CO<sub>2</sub> equivalent on average per year over the first five year commitment period of the Protocol (2008-2012).

In accordance with this average yearly target, the Kyoto Protocol target for the UK was then set at 3,412 million tonnes carbon dioxide equivalent over the full five year period - this is now the UK's *Assigned Amount*.

For more details of the UK's Kyoto commitment, see the [UK Initial Report under the Kyoto Protocol](#).

**UK Climate Change Act**      This Act includes a legally binding target for the UK to reduce its greenhouse gas emissions by at least 80 per cent below base year levels by 2050. It also establishes a system of binding five-year carbon budgets to set the trajectory towards these targets.

Like the Kyoto Protocol, the Act uses a base year which is comprised of 1990 for carbon dioxide, methane and nitrous oxide, and 1995 for fluorinated

compounds. However, this base year figure differs from that used for reporting against the Kyoto Protocol in that the baseline is revised each year to incorporate revisions made subsequent to the UK's Kyoto Protocol assigned amount having been fixed.

The Government set the first three carbon budgets in May 2009, covering the periods 2008-12, 2013-17 and 2018-2022. The fourth carbon budget, covering the period 2023-27, was set in June 2011. The first of these budgets requires that total UK greenhouse gas emissions do not exceed 3,018 million tonnes CO<sub>2</sub> equivalent over the five-year period 2008-12, which is about 22 per cent below the base year level on average over the period. The fourth carbon budget was set so as to require a reduction in emissions of 50 per cent below base year levels over the period 2023-2027.

Table 17 below shows details of the first four carbon budgets.

**Table 17: Summary of UK Carbon Budgets, 2008-2027**

	Base year (actual emissions)	Budget 1 2008-12	Budget 2 2013-17	Budget 3 2018-22	Budget 4 2023-27
Budget level (MtCO <sub>2</sub> e)		3018	2782	2544	1950
Equivalent average annual emissions (MtCO <sub>2</sub> e)	774.3	603.6	556.4	508.8	390.0
Percentage reduction below base year levels		22%	28%	34%	50%

The levels of all four carbon budgets expressed as a percentage reduction have changed from the values which have been referred to previously. This is because the base year figure is not fixed, but is revised each year to incorporate revisions to the inventory.

Further details of how the Kyoto Protocol and Carbon Budget baseline emissions figures have been derived, can be found on the DECC website in the [Record of UK base year emissions](#) table.

## Emissions Trading

***Emissions trading results, including those from the European Union Emissions Trading System (EU ETS), are not published as National Statistics, and any results which incorporate emissions trading figures should therefore not be treated as National Statistics.***

Under the UNFCCC and Kyoto Protocol, three *flexible mechanisms* were established to provide for trading of national allowances and project-based credits by Governments and emitters. These are *International Emissions Trading*, the *Clean Development Mechanism (CDM)* and *Joint Implementation (JI)*. International Emissions Trading allows Government-to-Government trading of Assigned Amount Units (AAUs) between developed (*Annex I*) countries. The CDM allows Annex I countries with a target under the Kyoto Protocol to fund carbon reduction projects in developing (*non-Annex I*) countries and earn carbon credits for the avoided emissions. JI allows Annex I countries to implement emissions reduction projects in other Annex I countries, generating carbon credits which can be used for compliance with targets by the investor country.

In reporting emissions reductions against all of its targets, the UK needs to take account of emissions trading through these flexible mechanisms. At the present time, the scope of the UK's emissions trading does not extend beyond the European Union Emissions Trading System (EU ETS), although it should be noted that EU ETS participants may also use credits generated under CDM and JI projects, subject to certain limits, in order to comply with their obligations.

However, the Government will be able to include any units or credits generated through any of the Kyoto Protocol's flexible mechanisms in its future assessment of the UK's progress towards its emissions reduction targets.

The EU ETS operates as a *cap and trade* system, which means that, currently, any installation within the System in the EU is given an allocation of emissions allowances each year. If the installation's actual emissions are above this initial allocation for the year in question, then the installation must either purchase allowances through the System, or bring forward some allowances from the following year's allocation, so as to cover the deficit. Conversely, installations with a surplus of emissions compared with their cap are allowed to either sell allowances or carry them over into the following year's allocation, thus providing a financial incentive to reduce emissions. As there is a finite limit of allowances in the System (i.e. the cap), any allowances purchased should come from installations which have reduced emissions.

The System is now in the first year of Phase III, which will cover the eight year period 2013-2020. Phase III has seen changes to some of the parameters of the system, but there has been no change to the ultimate cap and trade basis of the EU ETS. Final results are currently available for each year of Phase I, which covered the three year period 2005-2007, and also for the first four years (2008-2011) of Phase II, which covers the period 2008-2012.

In 2011, for the third consecutive year, the UK has been a net seller of allowances. This effectively means that installations between them either sold or carried over more emissions allowances than they purchased or brought forward. Taking emissions trading into account within the context of the UK's reported emissions, this will affect the results by increasing the level of emissions by the amount of EU ETS allowances sold in the year.

It should be noted that at the end of Phase I, the UK Government sold a small number of unallocated allowances from the new entrant reserve on the open market. Since it would not have been appropriate to incorporate these sales in the 2007 results alone, they were spread equally over each of the three years in Phase I.

Table 18 below shows the UK's net trading position in each year since the System commenced in 2005. For example, in 2011 the UK sold allowances totalling 25.0 MtCO<sub>2</sub>e, which should be taken into account when reporting emissions against the Kyoto Protocol target.

**Table 18: EU ETS net trading position, 2005-2011 (MtCO<sub>2</sub>e)**

	2005	2006	2007	2008	2009	2010	2011
Net purchases/(sales) by UK installations	27.1	33.2	27.5	19.9	(13.7)	(7.7)	(25.0)
Net purchases/(sales) by UK Government	(1.9)	(1.9)	(1.9)	-	-	-	-
Net UK purchases/(sales)	25.2	31.3	25.6	19.9	(13.7)	(7.7)	(25.0)

It should be noted that, for the purposes of reporting for UK Carbon Budgets under the Climate Change Act, the figure for net UK purchases/(sales) in 2011 will be slightly lower, at 24.9 MtCO<sub>2</sub>e. This is due to differences in both the coverage of the Act and the way in which the annual cap in 2011 has been calculated.

Further details of progress towards the UK carbon budgets will be included in the annual statement of emissions, required under section 16 of the Climate Change Act. In respect of 2011, this must be laid before Parliament no later than 31<sup>st</sup> March 2013.

The statement will provide a clear and thorough explanation of how the *Net UK carbon account* – which is what we use to determine compliance with the carbon budgets – was calculated, and what it amounts to. It will contain details of UK emissions and removals on a carbon budgets (i.e. UK only) basis, and the details of where carbon units have been used, in accordance with the methodologies contained in the Carbon Accounting Regulations 2009 and Carbon Accounting (Amendment) Regulations 2009.

## UK performance against emissions reduction targets

Performance measured against targets, *incorporating the net EU ETS trading position*, can be summarised as follows:

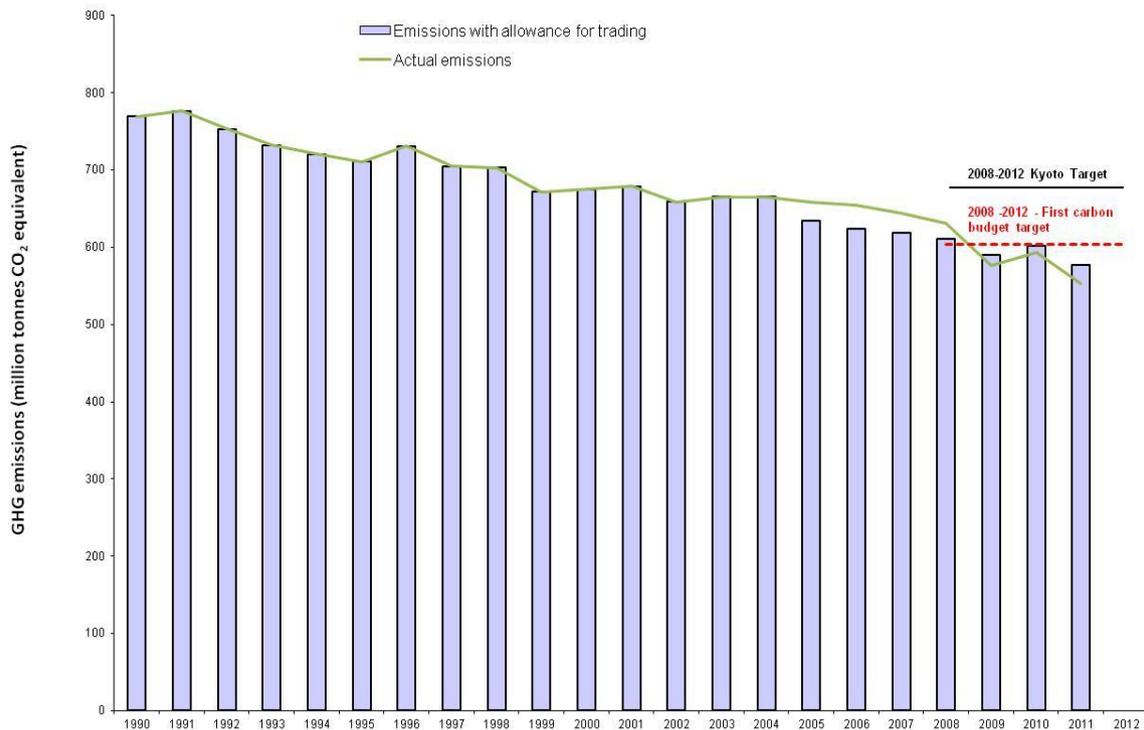
- UK emissions of the basket of six greenhouse gases covered by the Kyoto Protocol were 25.9 per cent lower in 2011 than in the base year, down from 779.9 to 577.6 million tonnes carbon dioxide equivalent.
- For the purposes of carbon budgets reporting, UK greenhouse gas emissions were also 25.9 per cent lower in 2011 than in the base year, down from 774.3 to 574.1 million tonnes carbon dioxide equivalent.

These results are shown in the context of the headline results in Table 19 and Figure 16 below. A more detailed summary of the results can also be found in Table 22 at the end of this release.

**Table 19: Performance against emissions reduction targets**

		Base year emissions (MtCO <sub>2</sub> e)	2011	
			Emissions (MtCO <sub>2</sub> e)	Change from base year
All greenhouse gases – Kyoto Protocol coverage (UK, Crown Dependencies & Overseas Territories)	Actual emissions (no allowance for trading)	779.9	552.6	-29.2%
	<i>Emissions with allowance for trading</i>	779.9	577.6	-25.9%
All greenhouse gases – UK Carbon Budgets coverage (UK only)	Actual emissions (no allowance for trading)	774.3	549.2	-29.1%
	<i>Emissions with allowance for trading</i>	774.3	574.1	-25.9%

**Figure 16: UK's progress towards meeting each of its targets**



### Estimating emissions on a temperature adjusted basis

Since April 2012, DECC have published estimates of emissions on a quarterly basis which incorporate an assessment of the impact of external temperatures on emissions of carbon dioxide. The quarterly emissions series is based on quarterly energy data published by DECC, and is not as accurate as the estimates in this statistical release, which are derived from our annual greenhouse gas inventory. However, the quarterly estimates do enable us to monitor recent trends on a more frequent basis.

The most recent quarterly estimates, published in January 2013, covered emissions up to and including the third quarter of 2012. This publication therefore included estimates of emissions for the 2011 calendar year, alongside equivalent estimates on a temperature adjusted basis, both of which we can compare with the final estimates now available.

Based on the latest quarterly estimates, net emissions of carbon dioxide were estimated at 495.8 Mt in 2010 and 457.1 Mt in 2011, representing a fall in emissions of 38.7 Mt between the two years. These figures compare with the final estimates of 497.8 Mt and 458.6 Mt respectively, suggesting that the quarterly estimates are a fairly good indicator of actual emissions.

On a temperature adjusted basis, net CO<sub>2</sub> emissions in 2010 and 2011 were estimated to be 477.9 Mt and 474.7 Mt respectively. This represents a much smaller reduction in emissions, of around 3.2 Mt. This would suggest that

external temperatures made a significant contribution to the emissions reductions seen in 2011.

These results are shown in Table 20 below.

**Table 20: Comparison of quarterly emissions estimates with final emissions estimates**

	2010 CO <sub>2</sub> emissions (Mt)	2011 CO <sub>2</sub> emissions (Mt)	Absolute change (Mt)	Percentage change
Final estimates – actual emissions	497.8	458.6	-39.2	-7.9%
Quarterly estimates – actual emissions	495.8	457.1	-38.7	-7.8%
Quarterly estimates – temperature adjusted emissions	477.9	474.7	-3.2	-0.7%

### Future updates to emissions estimates

On Thursday 28<sup>th</sup> March 2013 we will be publishing a breakdown of 2011 UK emissions by end-user sector and fuel type, to supplement the source sector breakdown published today.

On the same date we will also be publishing provisional estimates of UK greenhouse gas emissions in 2012 as National Statistics. This will coincide with the publication of *Energy Trends*, which will include the first estimates of 2012 UK energy consumption.

### Further information and feedback

Any enquiries or comments in relation to this statistical release should be sent to DECC's UK Greenhouse Gas Emissions Statistics and Inventory Team at the following address:

[ClimateChange.Statistics@decc.gsi.gov.uk](mailto:ClimateChange.Statistics@decc.gsi.gov.uk)

Contact telephone: 0300 068 6563

The lead statistician for this publication is John Mackintosh.

Further information on UK greenhouse gas emissions statistics, including Excel downloads of all the data used to compile this statistical release, can be found on the Gov.uk website at:

<https://www.gov.uk/government/organisations/department-of-energy-climate-change/series/uk-greenhouse-gas-emissions>

## Notes for Editors

1. A full set of data tables can be accessed via the UK greenhouse gas emissions pages of the Gov.uk website.
2. This Statistical Release and the related data tables are the first release of data from the National Atmospheric Emissions Inventory (NAEI) for 1970-2011, produced for DECC and the Devolved Administrations by Ricardo-AEA. Additional results will be released as they become available, including a full report to be published later in the year. For further information on the UK Greenhouse Gas Inventory, see the [NAEI web site](#).
3. Further information about the Kyoto Protocol can be found on the [UNFCCC's website](#).
4. Results from the EU ETS are not currently published as National Statistics. They have therefore not been incorporated in the headline results. Further details of the European Union Emissions Trading System can be found at the [EU ETS section of the Gov.uk website](#).
5. There are uncertainties associated with all estimates of greenhouse gas emissions. Although for any given year considerable uncertainties may surround the emissions estimates for a pollutant, it is important to note that trends over time are likely to be much more reliable. For more information on these uncertainties see the page on the [UK greenhouse gas inventory](#) on the Gov.uk website.
6. Under the Climate Change Act, the annual statement of emissions for 2011 must be laid before Parliament and published no later than 31<sup>st</sup> March 2013. This will give details of the net UK carbon account for 2011, which is used to determine compliance with the targets and budgets under the Act.
7. The latest UK energy statistics, including revisions to earlier years' data, can be found in the [2012 Digest of UK Energy Statistics](#).
8. Detailed UK temperature data can be found on both the [Met Office website](#) and the [Energy Statistics section of the Gov.uk website](#).
9. When emissions are measured on this basis, UK emissions account for around 2 per cent of the global total, based on a range of estimates produced by the UN, the IEA, the World Resources Institute and the EIA, amongst others.
10. Similar results for non-greenhouse gas atmospheric pollutants, covering the period 1970-2011, were published by Defra in December 2012.

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**Table 21: UK Greenhouse Gas Emissions 1990-2011, headline results**

**Greenhouse gas emissions: actual emissions in tonnes**

	Units (tonnes)	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Net CO <sub>2</sub> emissions (emissions minus removals)	Million	592.0	553.8	553.1	564.3	547.5	557.6	558.2	554.1	552.7	543.6	531.2	480.7	497.8	458.6
Methane (CH <sub>4</sub> )	Million	4.7	4.0	3.1	2.8	2.7	2.5	2.4	2.3	2.3	2.2	2.1	2.1	2.0	2.0
Nitrous Oxide (N <sub>2</sub> O)	Million	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Hydrofluorocarbons (HFC)	Thousand	0.98	2.23	4.71	5.35	5.83	6.55	6.84	7.37	7.77	7.98	8.35	8.49	8.61	8.73
Perfluorocarbons (PFC)	Thousand	0.20	0.06	0.06	0.05	0.04	0.04	0.05	0.04	0.04	0.03	0.03	0.02	0.03	0.05
Sulphur hexafluoride (SF <sub>6</sub> )	Thousand	0.04	0.05	0.08	0.06	0.06	0.06	0.05	0.05	0.04	0.03	0.03	0.03	0.03	0.03

**Greenhouse gas emissions: weighted by global warming potential (million tonnes carbon dioxide equivalent)**

	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Net CO <sub>2</sub> emissions (emissions minus removals)	592.0	553.8	553.1	564.3	547.5	557.6	558.2	554.1	552.7	543.6	531.2	480.7	497.8	458.6
Methane (CH <sub>4</sub> )	98.9	85.0	64.8	59.1	56.1	52.1	50.5	48.3	47.3	46.2	44.8	43.5	42.8	41.9
Nitrous Oxide (N <sub>2</sub> O)	68.2	58.0	46.4	43.7	42.0	41.5	42.1	41.2	39.0	38.3	37.3	35.3	35.9	34.7
Hydrofluorocarbons (HFC)	11.4	15.3	9.3	10.2	10.7	11.9	11.1	12.0	12.7	13.0	13.6	14.0	14.3	14.6
Perfluorocarbons (PFC)	1.4	0.5	0.5	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.1	0.2	0.3
Sulphur hexafluoride (SF <sub>6</sub> )	1.0	1.2	1.8	1.4	1.5	1.3	1.1	1.1	0.9	0.8	0.7	0.7	0.7	0.6
<b>Kyoto greenhouse gas basket</b>	<b>769.7</b>	<b>711.0</b>	<b>675.2</b>	<b>678.9</b>	<b>658.6</b>	<b>665.5</b>	<b>665.2</b>	<b>659.0</b>	<b>655.0</b>	<b>644.7</b>	<b>630.5</b>	<b>576.8</b>	<b>594.0</b>	<b>552.6</b>

**Notes**

1. Figures for each individual gas include the Land Use, Land-Use Change and Forestry sector (LULUCF), but exclude emissions from UK Overseas Territories.
2. Kyoto basket total differs slightly from sum of individual pollutants above as the basket uses a narrower definition for LULUCF, and includes emissions from UK Overseas Territories, as well as emissions from direct flights between the UK and these Territories.
3. The entire time series is revised each year to take account of methodological improvements in the UK emissions inventory.
4. Emissions are presented as carbon dioxide equivalent in line with international reporting and carbon trading. To convert carbon dioxide into carbon equivalents, divide figures by 44/12.
5. Figures shown do not include any adjustment for the effect of the EU Emissions Trading System (EUETS), which was introduced in 2005.
6. Carbon dioxide emissions are reported as net emissions, to include removals from the atmosphere by carbon sinks. This also affects some of the other greenhouse gases, but to a lesser extent.

**Table 22: UK Greenhouse Gas Emissions 1990-2011, progress towards the Kyoto Protocol and Carbon Budgets Targets**

		Baseline	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011
<b>Kyoto Protocol greenhouse gas target</b>												
<b>No allowance for emission trading</b>	All greenhouse gases ( <i>including net emissions/removals from LULUCF</i> )	779.9	769.7	711.0	675.2	659.0	655.0	644.7	630.5	576.8	594.0	552.6
	Percentage change from baseline			-8.8%	-13.4%	-15.5%	-16.0%	-17.3%	-19.2%	-26.0%	-23.8%	-29.2%
<b>EU ETS</b>	Net purchases/(sales) by UK installations					27.1	33.2	27.5	19.9	-13.7	-7.7	-25.0
	Net purchases/(sales) by UK Government					-1.9	-1.9	-1.9	-	-	-	-
	Net UK purchases/(sales)					25.2	31.3	25.6	19.9	-13.7	-7.7	-25.0
<b>With allowance for emissions trading</b>	All greenhouse gases ( <i>including net emissions/removals from LULUCF</i> )	779.9	769.7	711.0	675.2	633.8	623.7	619.1	610.6	590.5	601.7	577.6
	Percentage change from baseline			-8.8%	-13.4%	-18.7%	-20.0%	-20.6%	-21.7%	-24.3%	-22.9%	-25.9%
<b>United Kingdom Carbon Budgets</b>												
<b>No allowance for emissions trading</b>	All greenhouse gases ( <i>including net emissions/removals from LULUCF</i> )	774.3							626.2	572.7	590.2	549.2
	Percentage change from baseline								-19.1%	-26.0%	-23.8%	-29.1%
<b>EU ETS</b>	Net purchases/(sales) by UK installations								19.3	-13.5	-7.6	-24.9
	Net purchases/(sales) by UK Government								-	-	-	-
	Net UK purchases/(sales)								19.3	-13.5	-7.6	-24.9
<b>With allowance for emissions trading</b>	All greenhouse gases ( <i>including net emissions/removals from LULUCF</i> )	774.3							606.9	586.2	597.8	574.1
	Percentage change from baseline								-21.6%	-24.3%	-22.8%	-25.9%

**Notes**

1. Kyoto base year consists of emissions of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O in 1990, and of HFCs, PFCs and SF<sub>6</sub> in 1995. Includes an allowance for net emissions from LULUCF in 1990.
2. Emissions are presented as carbon dioxide equivalent in line with international reporting and carbon trading. To convert carbon dioxide into carbon equivalent, divide figures by 44/12.
3. UK Carbon Budgets were introduced in 2008. Figures include emissions solely from the UK and exclude emissions from Crown Dependencies and UK Overseas Territories. Figures include the Land Use, Land-Use Change and Forestry sector (LULUCF).
4. The Kyoto Protocol target includes emissions from the UK, Crown Dependencies and UK Overseas Territories. The target uses a narrower definition for the LULUCF sector.
5. The entire time series is revised each year to take account of methodological improvements in the UK emissions Inventory. However, the baseline used for the Kyoto Protocol is fixed and therefore does not change when methodological changes are made to the Inventory.