



Department
of Energy &
Climate Change



2012 UK Greenhouse Gas Emissions, Final Figures

Statistical release

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Executive summary

- This publication provides the latest estimates of UK greenhouse gas emissions by source only from 1990-2012.
- In 2012, UK emissions of the basket of six greenhouse gases covered by the Kyoto Protocol were estimated to be 581.1[†] million tonnes carbon dioxide equivalent (MtCO₂e). This was 3.2 per cent higher than the 2011 figure of 563.2 million tonnes.
- Between 2011 and 2012, the largest increases were experienced in the residential sector, up 12.3 per cent (8.5 MtCO₂e) due to increase in residential gas use, and the energy supply sector, up by 5.9 per cent (11.2 MtCO₂e) due to greater use of coal in electricity generation.
- Carbon dioxide (CO₂) is the main greenhouse gas, accounting for 82 per cent of total UK greenhouse gas emissions in 2012. In 2012, UK net emissions of carbon dioxide were estimated to be 474.1 million tonnes (Mt). This was around 4.4 per cent higher than the 2011 figure of 454.0 Mt.
- UK emissions of the basket of six greenhouse gases covered by the Kyoto Protocol were an average 604.4[†] MtCO₂e per year over the period 2008-12, when taking into account the net EU Emissions Trading System position, 22.5 per cent lower than base year emissions.
- For the purposes of carbon budgets reporting, UK greenhouse gas emissions over the first carbon budget period 2008-12 were 2,981.7 MtCO₂e when taking into account the net EU Emissions Trading System position, 36.3 MtCO₂e below the first carbon budget period cap of 3,018 MtCO₂e.
- 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.
- Note that as part of this release the 1990-2011 figures have been revised since the previous publication in February 2013, to incorporate methodological improvements and new data. Details of these revisions can be found later in this statistical release in the Revisions to the Inventory section.

[†] Kyoto greenhouse gas basket figures for 1990-2012 were revised on 27th March 2014 to correct a minor error. The largest revision made was 0.1Mt for 2012 emissions. Figures for UK & Crown Dependency emissions, and for UK carbon budget coverage, were not affected.

Table 1: Emissions of greenhouse gases (MtCO₂e)

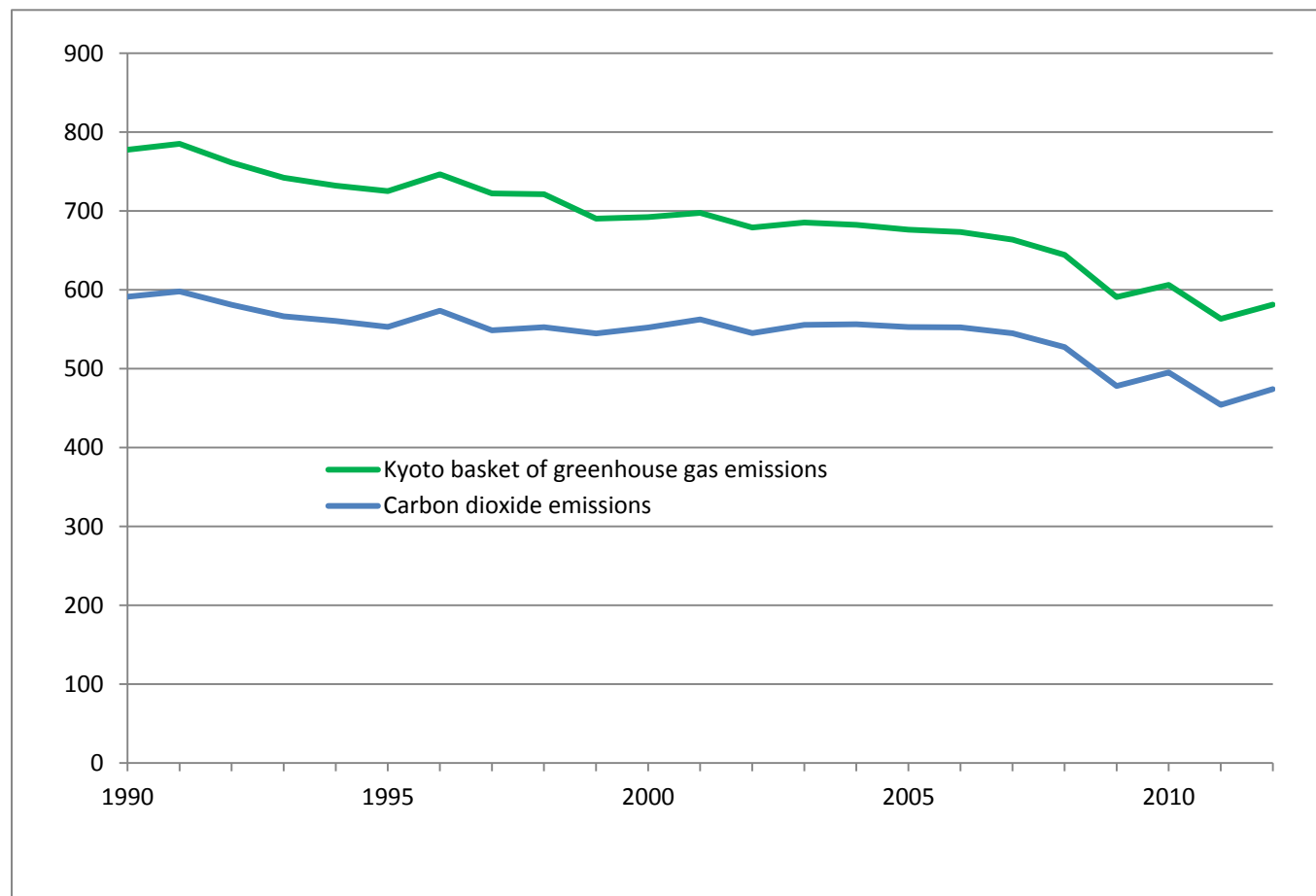
	2011	2012	Change
Total greenhouse gas emissions	563.2	581.1 ^r	3.2%
Carbon dioxide emissions	454.0	474.1	4.4%

Note:

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

^r The Kyoto greenhouse gas basket figures were revised on the 27th March 2014 to correct a minor error. The largest revision is 0.1Mt for 2012.

Figure 1: Emissions of greenhouse gases, 1990-2012 (MtCO₂e)



Introduction

This publication provides the latest estimates of UK greenhouse gas emissions by source only from 1990-2012. For the purposes of reporting, greenhouse gas emissions are allocated into sectors as follows:

- Energy supply
 - Emissions from fuel combustion for electricity and other energy production sources.
- Business
 - Emissions from combustion in industrial/commercial sectors, industrial off-road machinery and refrigeration and air conditioning.
- Transport
 - Emissions from aviation, road transport, railways, shipping, fishing and aircraft support vehicles.
- Public
 - Emissions from combustion of fuel in public sector buildings.
- Residential
 - Emissions from fuel combustion for heating/cooking, garden machinery and fluorinated gases released from aerosols/metered dose inhalers.
- Agriculture
 - Emissions from livestock, agricultural soils, stationary combustion sources and off-road machinery.
- Industrial processes
 - Emissions from industry except for those associated with fuel combustion.
- Land use land use change and forestry (LULUCF)
 - Emissions from forestland, cropland, grassland, settlements and harvested wood products.
- Waste management.
 - Emissions from waste disposed of to landfill sites, waste incineration, and the treatment of waste water.

When emissions are reported by source, emissions are attributed to the sector that emits them directly. 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), and which are used in international reporting tables which are submitted to the United Nations Framework Convention on Climate Change (UNFCCC) every year.

The UK's domestic and international targets are monitored against the figures in this release, a summary of which is presented in this release.

Emissions by fuel type and end user for 1990-2012 will be published in March 2014.

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. The last three 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 (CO₂) 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 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 from within the UK and its Crown Dependencies (Jersey, Guernsey, and the Isle of Man) and are expressed in millions of tonnes of carbon dioxide equivalent (MtCO₂e).

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 carbon dioxide 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.

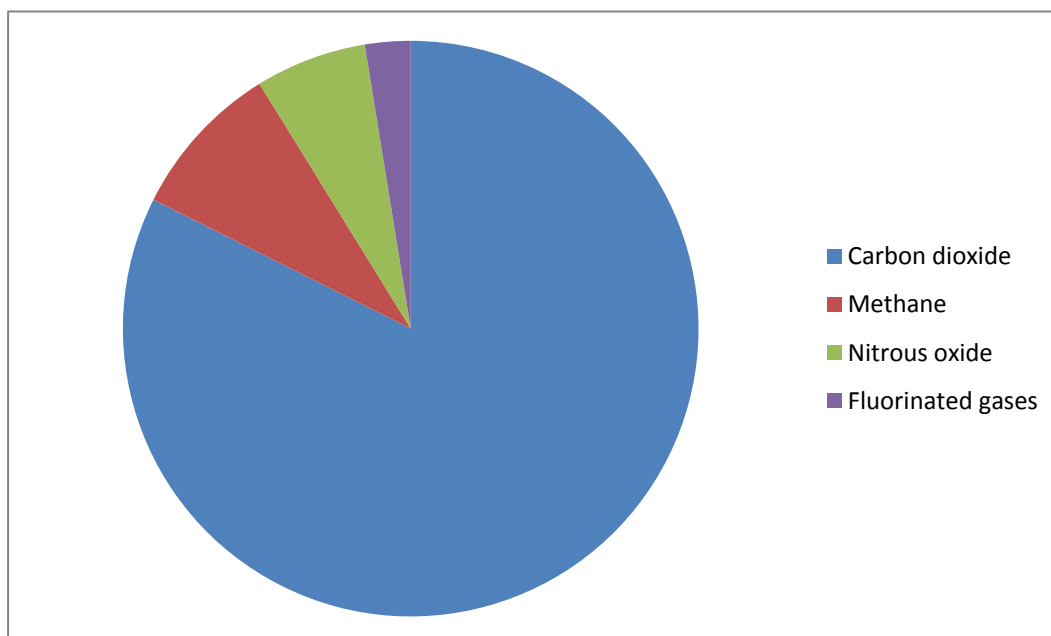
2012 Emissions

Greenhouse gas emissions are reported here in two ways: either by gas (Figure 2), or by the source sector (Figure 3) of the emissions.

When broken down by **gas**, UK emissions are dominated by carbon dioxide, which accounted for about 82 per cent of the UK's greenhouse gas emissions in 2012. Weighted by global warming potential, methane accounted for about 9 per cent of UK emissions and nitrous oxide for about 6 per cent of emissions in 2012. Fluorinated gases accounted for the remainder, around 3 per cent.

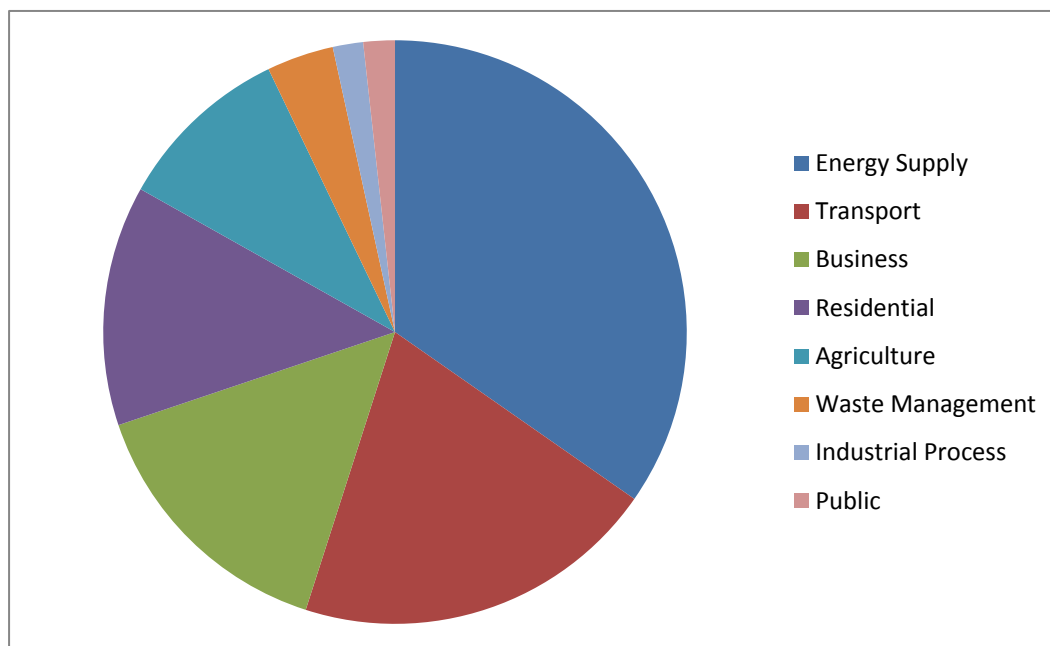
Looking at the breakdown by **sector**, in 2012, 35 per cent of greenhouse gas emissions were from the energy supply sector, 21 per cent from transport, 15 per cent from business, 13 per cent from the residential sector and 10 per cent from agriculture. The other 7 per cent were attributable to the remaining sectors; waste management, industrial process, and the public sector. The LULUCF sector acted as a net sink in 2012 so emissions were effectively negative.¹

Figure 2: Greenhouse gas emissions by gas, 2012 (%)



¹ Figures may not sum to 100 % and may be different to the data presented in the table due to rounding.

Figure 3: Greenhouse gas emissions by source sector (excluding LULUCF), 2012 (%)



Note: This Figure does not include emissions from the LULUCF sector, since in 2012 this sector acted as a net sink, and emissions were therefore effectively negative.

Table 2: Breakdown of 2012 UK greenhouse gas emissions by gas and sector (MtCO₂e)

	Carbon dioxide	Methane	Nitrous oxide	Fluorinated gases	Total
Energy Supply	192.9	7.4	1.7	0.0	202.0
Transport	116.9	0.1	1.0	0.0	118.0
Business	73.3	0.1	0.9	12.4	86.7
Residential	74.9	0.5	0.1	2.0	77.5
Agriculture	4.1	22.2	30.3	0.0	56.6
Waste Management	0.3	20.1	1.2	0.0	21.6
Industrial Process	9.3	0.1	0.1	0.3	9.8
Public	10.1	0.0	0.0	0.0	10.1
LULUCF	-7.7	0.1	0.7	0.0	-7.0
Total	474.1	50.6	36.0	14.7	575.4

Table 3: Breakdown of 2012 UK greenhouse gas emissions by gas and sector (% of total UK emissions, excluding LULUCF)

	Carbon dioxide	Methane	Nitrous oxide	Fluorinated gases	Total
Energy Supply	34%	1%	0%	0%	35%
Transport	20%	0%	0%	0%	21%
Business	13%	0%	0%	2%	15%
Residential	13%	0%	0%	0%	13%
Agriculture	1%	4%	5%	0%	10%
Waste Management	0%	4%	0%	0%	4%
Industrial Process	2%	0%	0%	0%	2%
Public	2%	0%	0%	0%	2%
Total	82%	9%	6%	3%	100%

Note: This Table does not include emissions from the LULUCF sector, since in 2012 this sector acted as a net sink, and emissions were therefore effectively negative. Sector values may sum to more than gas totals due to exclusion of LULUCF emissions.

Table 4: UK Greenhouse Gas Emissions 1990-2012, 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	2012
Net CO ₂ emissions (emissions minus removals)	Million	591.1	552.9	552.2	562.3	545.1	555.6	556.2	552.8	552.3	544.9	527.3	477.9	495.2	454.0	474.1
Methane (CH ₄)	Million	5.0	4.6	3.7	3.6	3.5	3.3	3.1	3.0	2.9	2.8	2.8	2.7	2.5	2.5	2.4
Nitrous Oxide (N ₂ O)	Million	0.2	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	1.0	2.2	4.5	5.1	5.5	6.2	6.5	7.0	7.4	7.6	7.9	8.1	8.2	8.4	8.4
Perfluorocarbons (PFC)	Thousand	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sulphur hexafluoride (SF ₆)	Thousand	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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	2012
Net CO ₂ emissions (emissions minus removals)	591.1	552.9	552.2	562.3	545.1	555.6	556.2	552.8	552.3	544.9	527.3	477.9	495.2	454.0	474.1
Methane (CH ₄)	104.3	97.1	78.2	74.8	74.0	69.3	65.1	62.3	61.2	59.2	58.0	55.7	52.5	51.7	50.6
Nitrous Oxide (N ₂ O)	69.8	59.6	48.3	45.6	43.8	43.3	43.8	42.9	40.8	40.0	39.0	36.8	37.7	36.3	36.0
Hydrofluorocarbons (HFC)	11.4	15.3	8.8	9.7	10.1	11.2	10.4	11.2	11.9	12.2	12.7	13.1	13.5	13.8	13.9
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	0.2
Sulphur hexafluoride (SF ₆)	1.0	1.2	1.8	1.4	1.4	1.3	1.0	1.0	0.7	0.7	0.6	0.6	0.6	0.6	0.5
Kyoto Greenhouse gas basket	777.6	725.2	692.2	697.6	678.9	685.3	682.3	676.3	673.2	663.7	644.2	590.7	606.2	563.2	581.1^r

Note:

- Figures for each individual gas include the Land Use, Land-Use Change and Forestry sector (LULUCF), but exclude emissions from UK Overseas Territories.
- 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.
- The entire time series is revised each year to take account of methodological improvements in the UK emissions inventory.
- 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.
- Figures shown do not include any adjustment for the effect of the EU Emissions Trading System (EUETS), which was introduced in 2005.
- 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.
- ^r The Kyoto greenhouse gas basket figures were revised on the 27th March 2014 to correct a minor error. The largest revision is 0.1Mt for 2012.

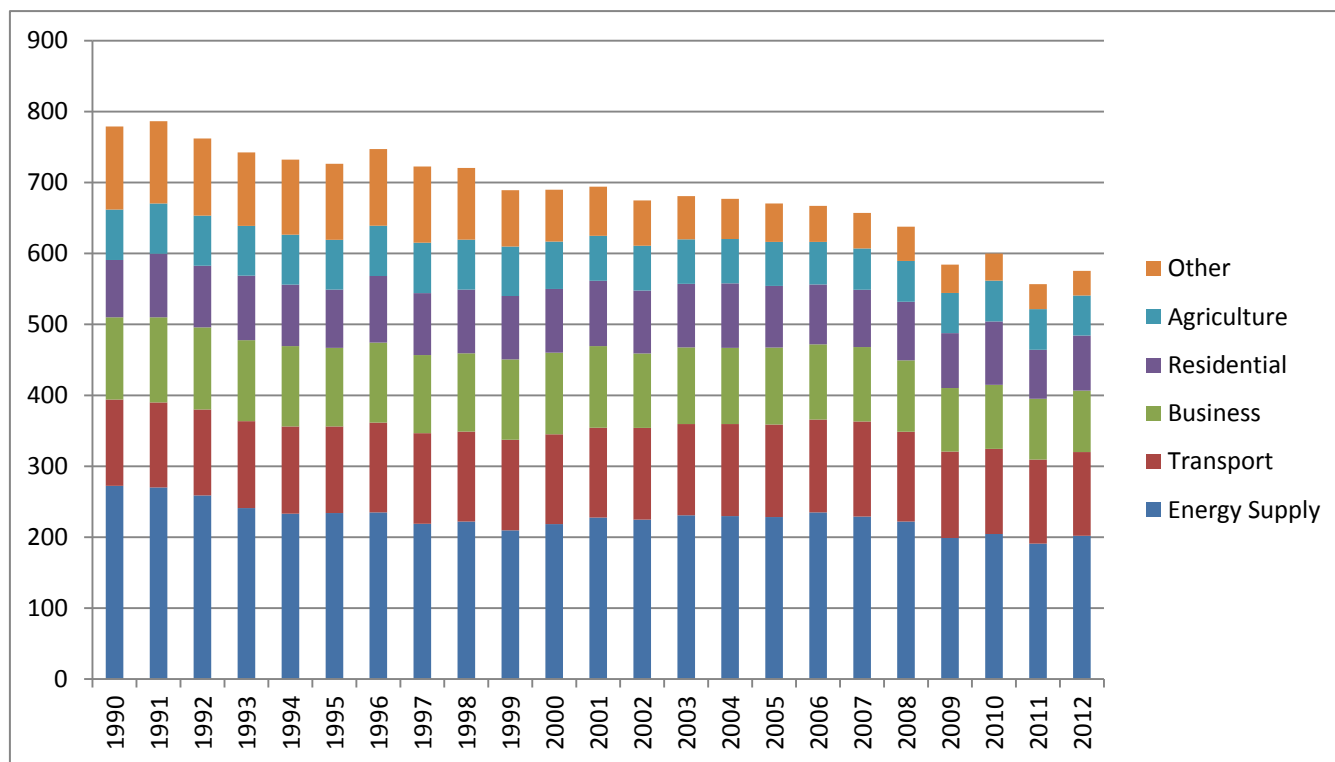
Emissions by sector

Table 5: Sources of greenhouse gas emissions, 1990-2012 (MtCO₂e)

	1990	1995	2000	2005	2010	2011	2012
Energy Supply	272.4	234.0	218.4	228.3	204.4	190.8	202.0
Transport	121.6	122.1	126.7	130.6	120.2	118.5	118.0
Business	116.0	110.7	115.0	108.4	90.3	85.9	86.7
Residential	80.8	82.3	89.7	87.0	89.2	69.0	77.5
Agriculture	71.1	70.1	66.8	61.9	57.5	57.2	56.6
Waste Management	47.3	47.9	38.8	29.8	23.2	22.7	21.6
Industrial Process	54.8	45.2	24.9	19.1	11.8	10.3	9.8
Public	13.1	12.8	11.5	11.1	10.5	9.7	10.1
LULUCF	1.9	1.5	-2.1	-5.7	-7.3	-7.5	-7.0
Total	778.9	726.6	689.8	670.5	599.8	556.7	575.4

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

Figure 4: Greenhouse gas emissions by source, 1990-2012 (MtCO₂e)



Details of changes over time for each sector are set out in the following sections of this statistical release. In each case, contextual information looking at the long-term trend is provided for the period 1990-2011, followed by details of the changes since 2011 now seen in the 2012 estimates.

Energy supply

The energy supply sector was responsible for 35 per cent of UK greenhouse gas emissions in 2012, with carbon dioxide being by far the most prominent gas for this sector.

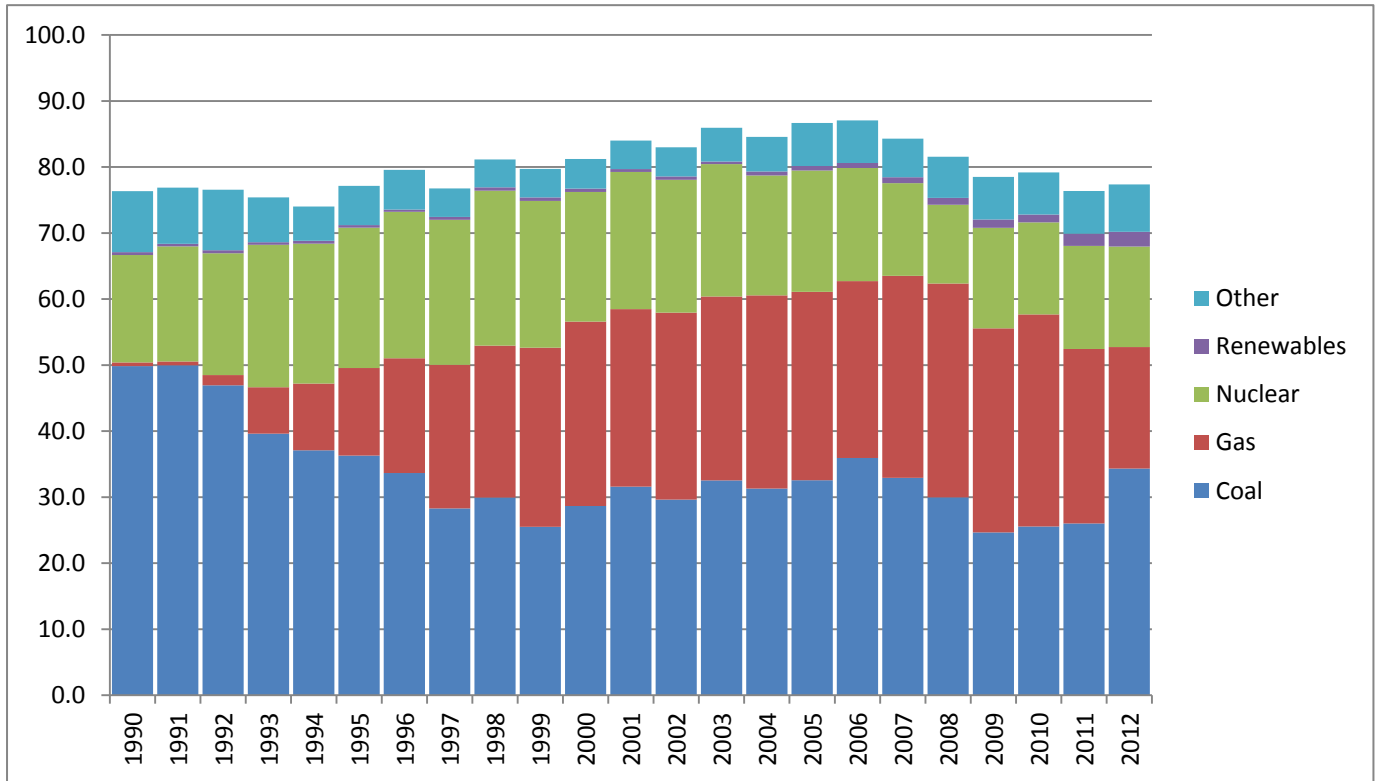
Context – 1990 to 2011

Between 1990 and 2011, there was a 30 per cent reduction in greenhouse gas emissions from the energy supply sector, driven by reductions in emissions related to electricity generation at power stations. This decrease has resulted from a combination of changes in the mix of fuel being used for electricity generation, together with greater efficiency resulting from 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 (particularly during the 1990s), accompanied by an overall increase in the use of gas, which has a lower carbon content.

Coal use in generation roughly halved between 1990 and 2011. 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 peaking in 2005.

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 MtCO₂e (89 per cent) since 1990.

Figure 5: Fuel mix for UK electricity generation, 1990-2012 (Mtoe)



Source: Digest of United Kingdom Energy Statistics, Table 5.1.1 Fuel input for electricity generation, 1970 to 2012

2012 results

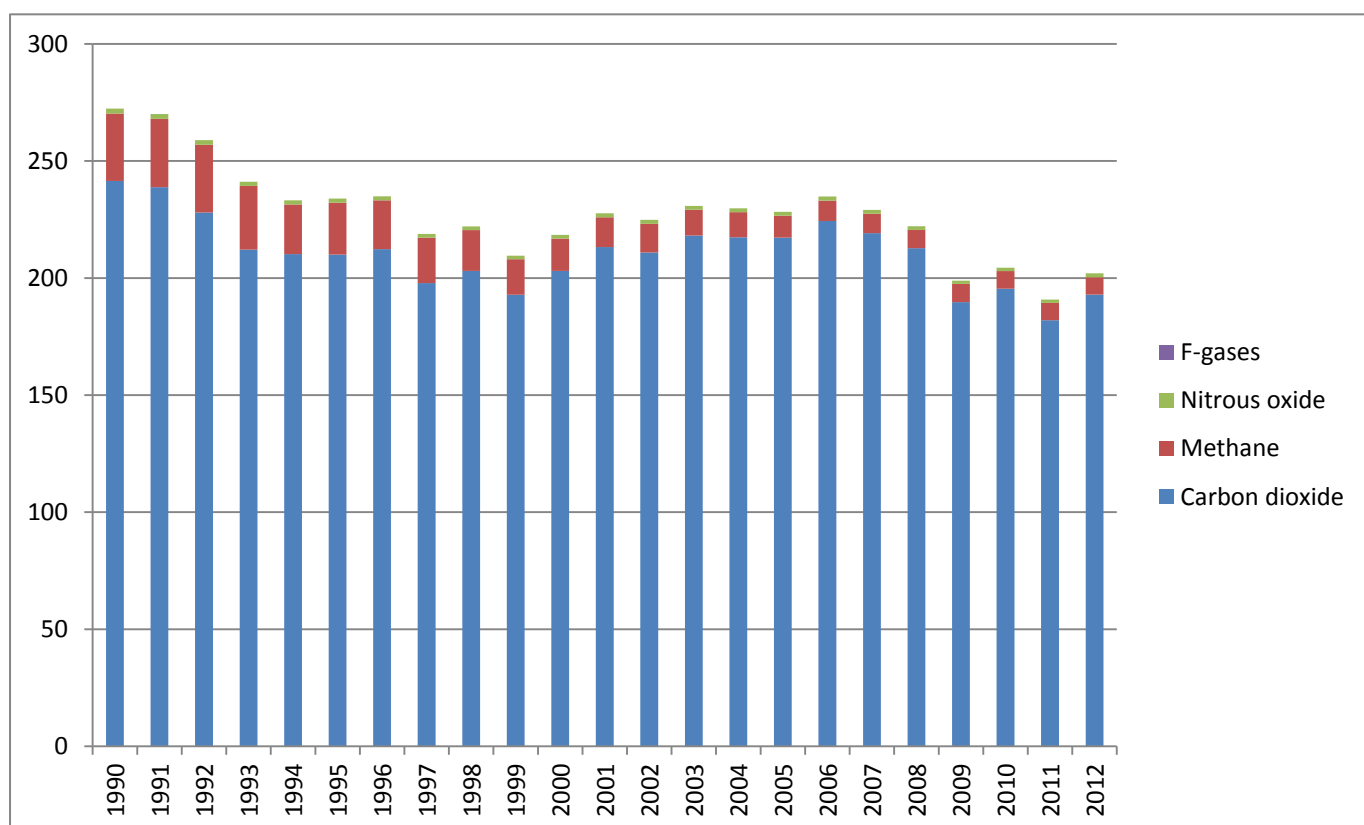
Between 2011 and 2012 emissions from the energy supply sector increased by 5.9 per cent (11.2 MtCO₂e). This increase has been driven by a change in the fuel mix used at power stations for electricity generation. There was a large increase (32 per cent) in coal consumption in power stations with a corresponding decrease (30 per cent) in gas consumption, driven by relatively high wholesale gas prices. The sharp decrease in gas consumption observed in 2012 put gas usage at power stations at its lowest level since 1996. These changes resulted in an increase of around 10 per cent in emissions from electricity generation. In 2012, total greenhouse gas emissions from power stations, at 159.5 MtCO₂e, accounted for just over a quarter of all UK greenhouse gas emissions.

Table 6: Energy supply sector emissions by gas, 1990-2012 (MtCO₂e)

	1990	1995	2000	2005	2010	2011	2012
Carbon dioxide	241.5	210.0	203.1	217.3	195.5	182.0	192.9
Methane	28.8	22.2	13.8	9.3	7.6	7.4	7.4
Nitrous oxide	2.1	1.8	1.6	1.7	1.4	1.4	1.7
F-gases	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	272.4	234.0	218.4	228.3	204.4	190.8	202.0

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

Figure 6: Greenhouse gas emissions from energy supply, 1990-2012 (MtCO₂e)



Transport

The transport sector was responsible for around 21 per cent of UK greenhouse gas emissions in 2012, almost entirely through carbon dioxide emissions. 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.

Context – 1990 to 2011

Between 1990 and 2011, there was relatively little overall change in the level of greenhouse gas emissions from the transport sector (emissions were around 3 per cent lower in 2011 than in 1990), although emissions actually increased slightly up to 2007 and then fell again from 2008 onwards.

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

2012 results

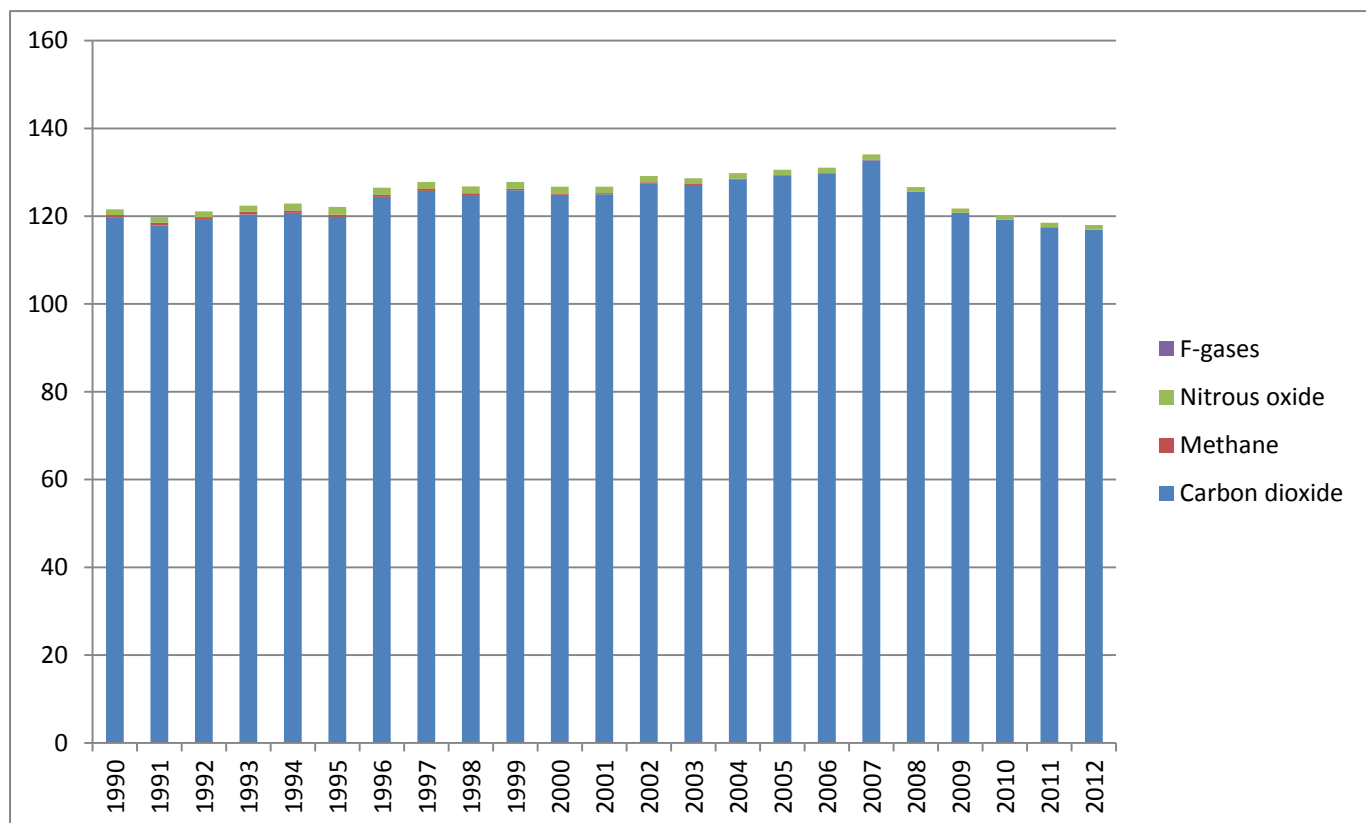
Between 2011 and 2012 there was very little change in emissions from the transport sector.

Table 7: Transport sector emissions by gas, 1990-2012 (MtCO₂e)

	1990	1995	2000	2005	2010	2011	2012
Carbon dioxide	119.6	119.9	124.9	129.2	119.1	117.4	116.9
Methane	0.6	0.5	0.3	0.2	0.1	0.1	0.1
Nitrous oxide	1.3	1.8	1.5	1.2	1.0	1.0	1.0
F-gases	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	121.6	122.1	126.7	130.6	120.2	118.5	118.0

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

Figure 7: Greenhouse gas emissions from transport, 1990-2012 (MtCO₂e)



Business

The business sector was responsible for 15 per cent of UK greenhouse gas emissions in 2012, 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.

Context – 1990 to 2011

Between 1990 and 2011, there was a general downward trend in greenhouse gas emissions from the business sector, resulting in an overall decrease of around 26 per cent. This has been largely due to a reduction in emissions from industrial combustion (including iron and steel) meaning emissions of carbon dioxide have reduced over the period by 36 per cent. However, emissions from F-gases have increased significantly, mainly due to an increase in emissions from refrigeration and air-conditioning as between 1993 and 2002, hydrofluorocarbons (HFCs) were used to replace other, ozone depleting (not shown in emissions data below), substances which were previously used as refrigerants. This increasing trend has since slowed, as tighter controls on emissions leakages have been introduced.

2012 results

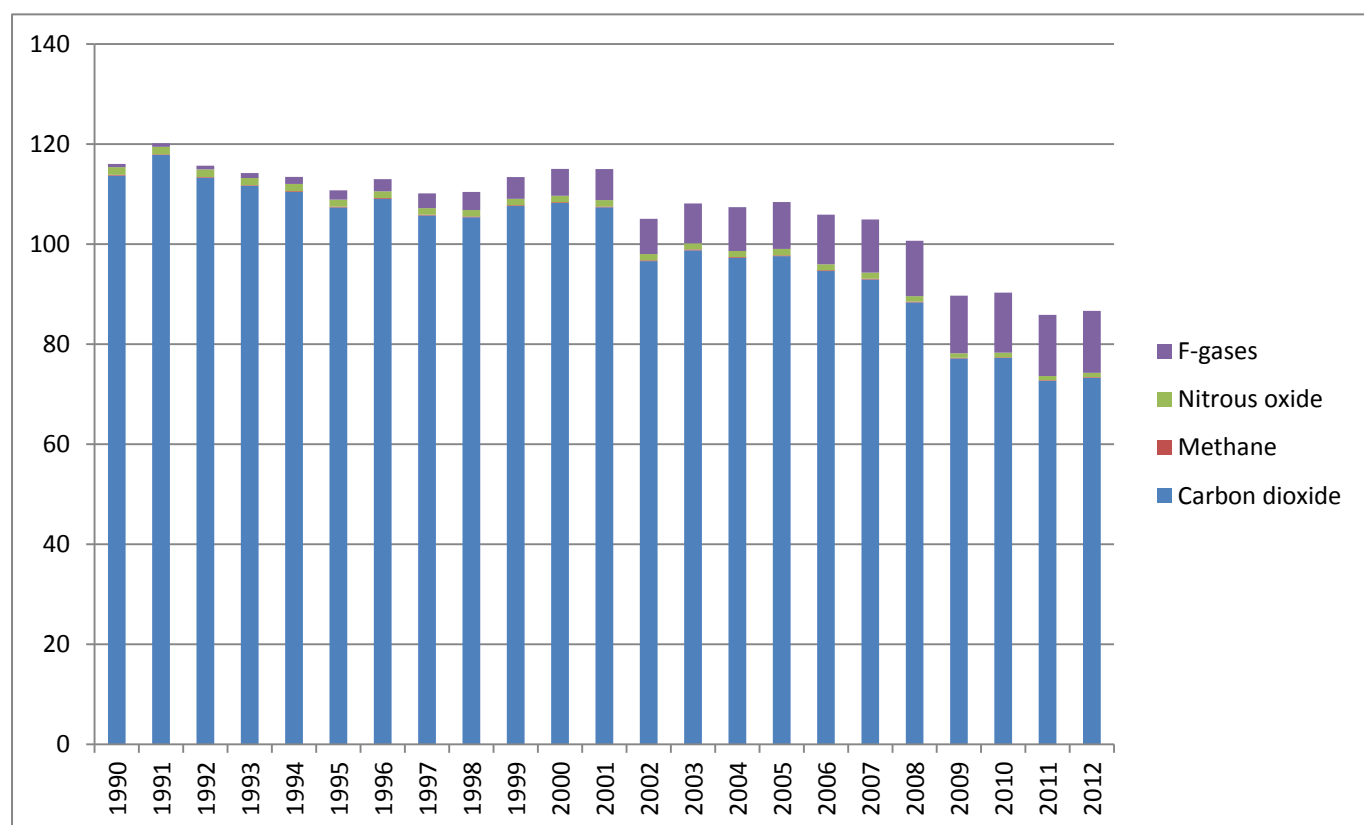
Between 2011 and 2012 there was very little change in emissions from the business sector.

Table 8: Business sector emissions by gas, 1990-2012 (MtCO₂e)

	1990	1995	2000	2005	2010	2011	2012
Carbon dioxide	113.7	107.3	108.2	97.6	77.2	72.7	73.3
Methane	0.1	0.2	0.2	0.2	0.1	0.1	0.1
Nitrous oxide	1.5	1.4	1.3	1.3	0.9	0.8	0.9
F-gases	0.6	1.8	5.4	9.4	12.0	12.2	12.4
Total	116.0	110.7	115.0	108.4	90.3	85.9	86.7

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

Figure 8: Greenhouse gas emissions from business, 1990-2012 (MtCO₂e)



Residential

The residential sector was responsible for around 13 per cent of UK greenhouse gas emissions in 2012, 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.

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.

Context – 1990 to 2011

Between 1990 and 2011, there was considerable variation in greenhouse gas emissions from year to year in the residential sector. Since 2004 there has been a general downward trend, although 2010 was an exception to this, 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.

2012 results

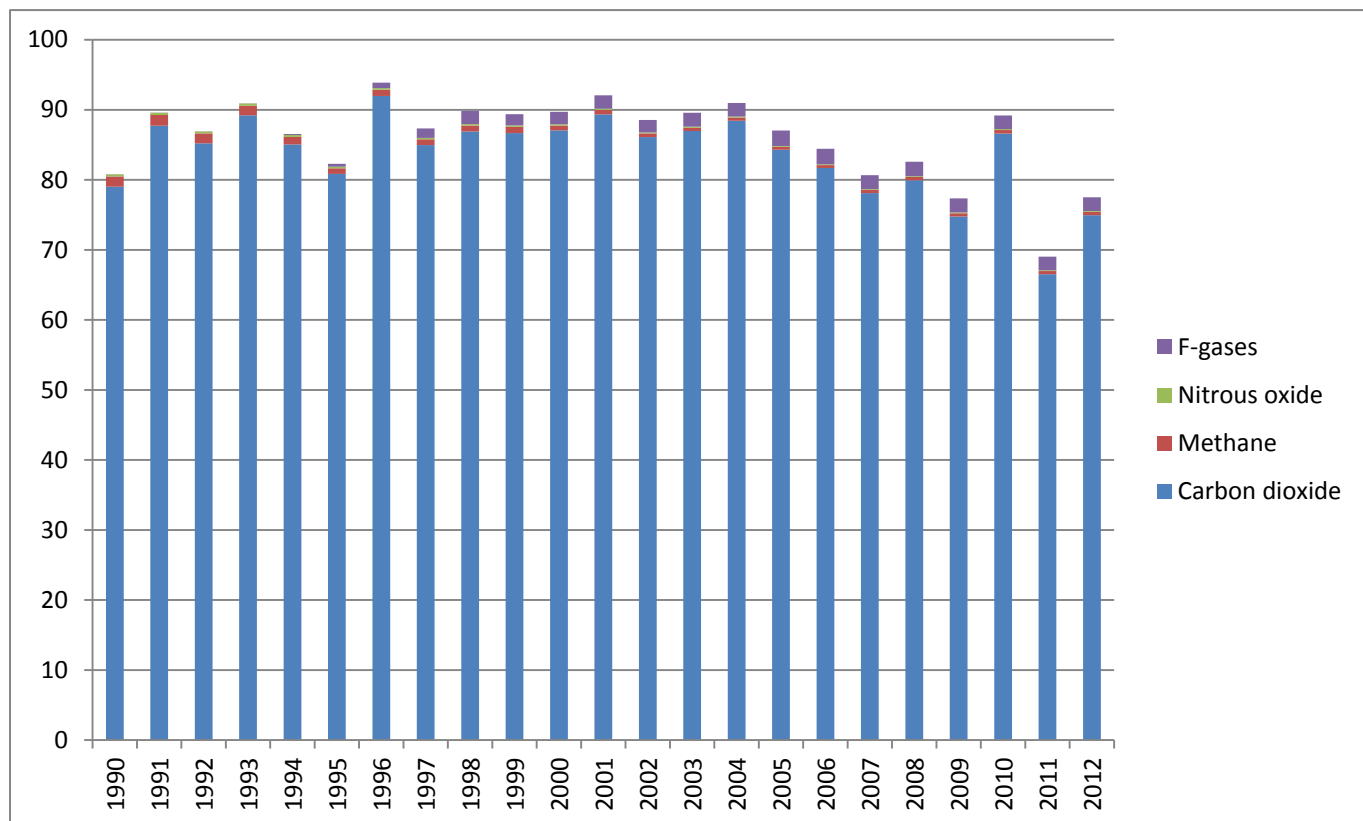
Between 2011 and 2012 there was an increase of around 12.3 per cent (8.5 MtCO₂e) in emissions from this sector, due to an increase in the consumption of gas used for space heating. This was due to 2012 being a colder year on average than 2011 (the average mean air temperature over the year 2012 was 1 degree Celsius lower than 2011).

Table 9: Residential sector emissions by gas, 1990-2012 (MtCO₂e)

	1990	1995	2000	2005	2010	2011	2012
Carbon dioxide	79.0	80.8	87.1	84.3	86.6	66.5	74.9
Methane	1.5	0.8	0.7	0.4	0.5	0.5	0.5
Nitrous oxide	0.3	0.2	0.2	0.1	0.1	0.1	0.1
F-gases	0.0	0.4	1.8	2.2	1.9	1.9	2.0
Total	80.8	82.3	89.7	87.0	89.2	69.0	77.5

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

Figure 9: Greenhouse gas emissions from the residential sector, 1990-2012 (MtCO₂e)



Agriculture

The agriculture sector was responsible for 10 per cent of UK greenhouse gas emissions in 2012. Emissions of nitrous oxide (53 per cent) and methane (39 per cent) 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 2011

Between 1990 and 2011, greenhouse gas emissions from agriculture decreased by around 19 per cent, due to a general downward trend since the late 1990s. This reduction was driven by a fall in animal numbers over the period, together with a decrease in synthetic fertiliser use.

2012 results

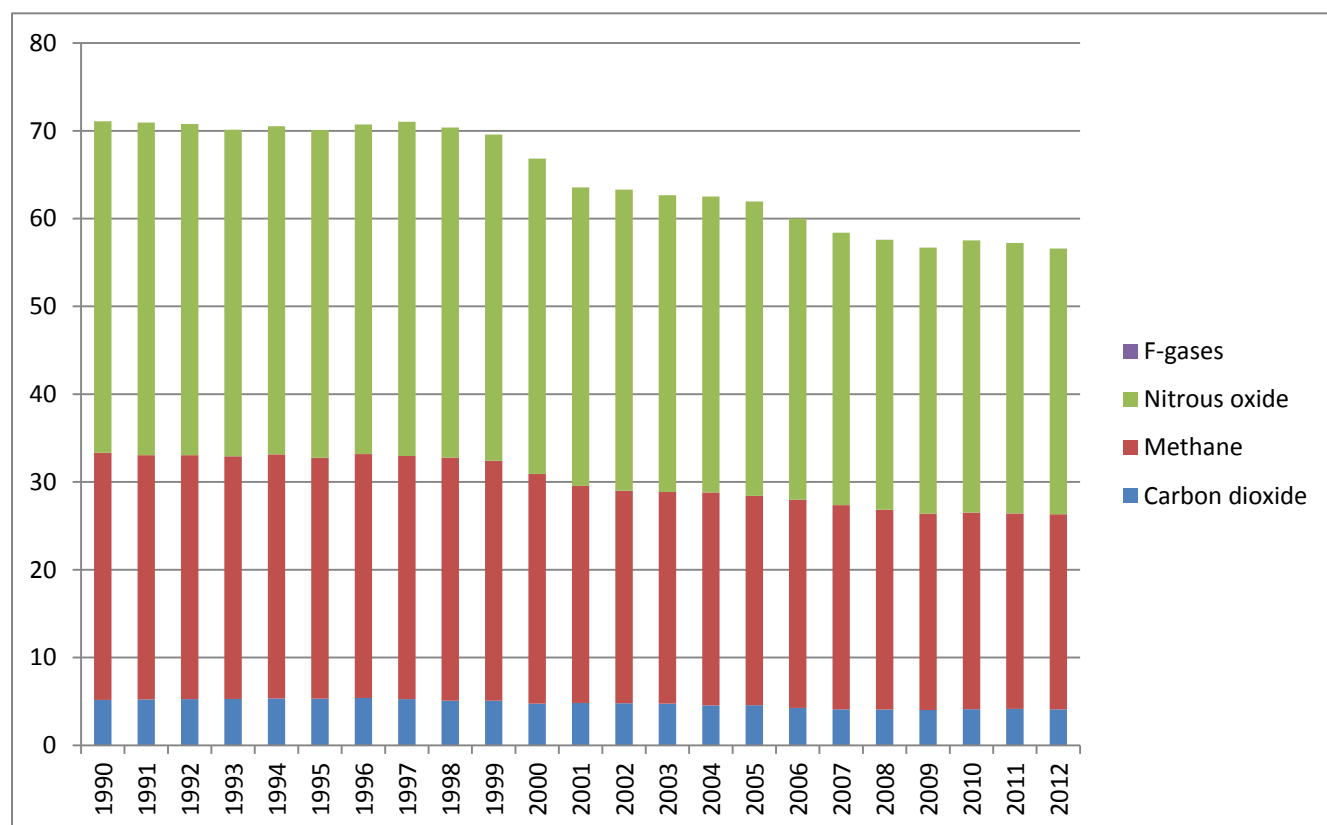
Between 2011 and 2012 there was very little change in emissions from the agriculture sector.

Table 10: Agriculture sector emissions by gas, 1990-2012 (MtCO₂e)

	1990	1995	2000	2005	2010	2011	2012
Carbon dioxide	5.2	5.3	4.8	4.6	4.1	4.2	4.1
Methane	28.1	27.5	26.2	23.8	22.4	22.3	22.2
Nitrous oxide	37.8	37.3	35.9	33.5	31.0	30.8	30.3
F-gases	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	71.1	70.1	66.8	61.9	57.5	57.2	56.6

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

Figure 10: Greenhouse gas emissions from agriculture, 1990-2012 (MtCO₂e)



Waste management

The waste management sector was responsible for around 4 per cent of UK greenhouse gas emissions in 2012, with methane being by far the most prominent gas (93 per cent). The vast majority of these emissions are from landfill sites.

Context – 1990 to 2011

Between 1990 and 2011, greenhouse gas emissions from the waste management sector decreased by 52 per cent. This was 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 53 per cent over the period.

2012 results

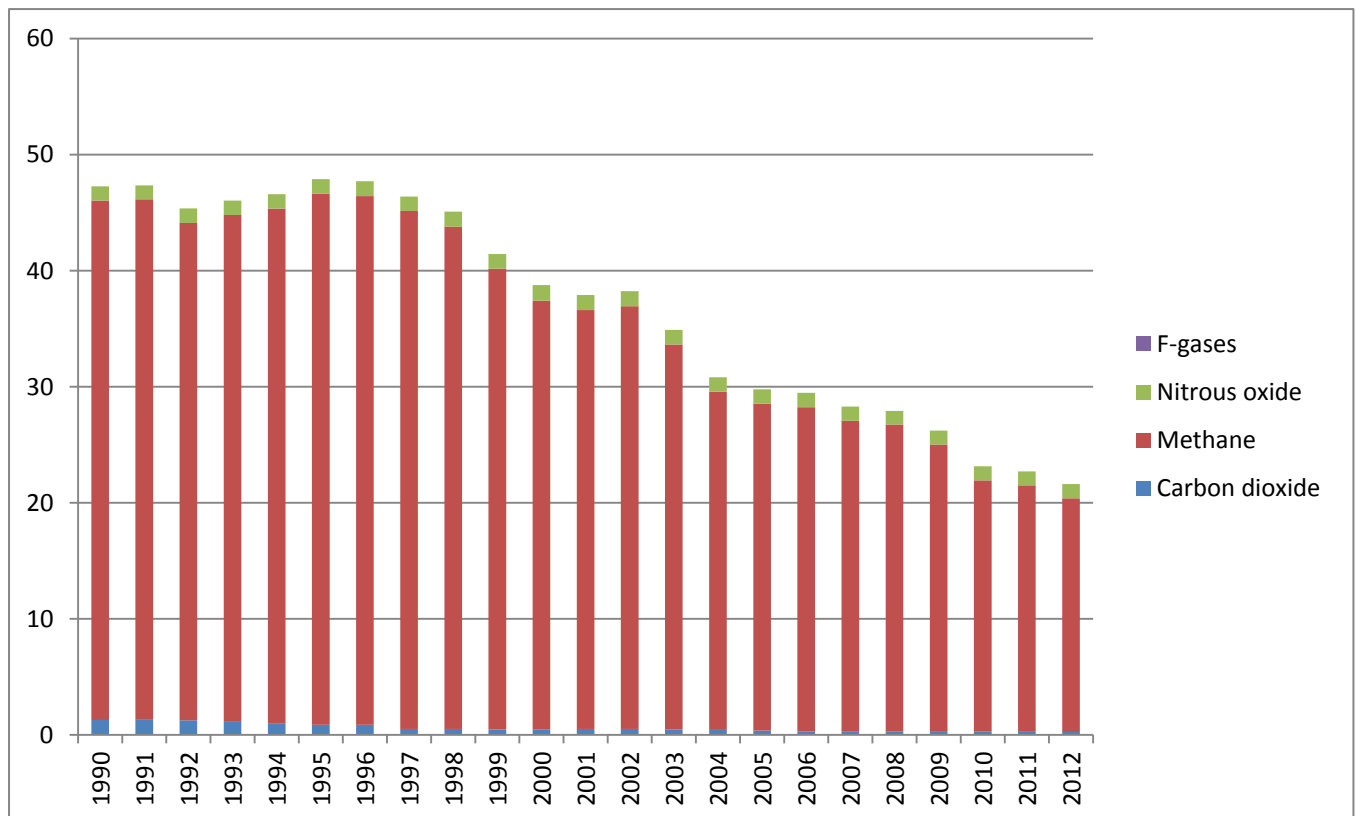
Between 2011 and 2012, emissions from waste management fell by just under 5 per cent (1.1 MtCO₂e), reflecting a continuation of the trend seen in recent years of a decrease in emissions from landfill waste.

Table 11: Waste management sector emissions by gas, 1990-2012 (MtCO₂e)

	1990	1995	2000	2005	2010	2011	2012
Carbon dioxide	1.3	0.9	0.5	0.4	0.3	0.3	0.3
Methane	44.8	45.8	36.9	28.2	21.7	21.2	20.1
Nitrous oxide	1.2	1.2	1.3	1.2	1.2	1.2	1.2
F-gases	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	47.3	47.9	38.8	29.8	23.2	22.7	21.6

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

Figure 11: Greenhouse gas emissions from waste management, 1990-2012 (MtCO₂e)



Industrial process

The industrial process sector was responsible for 2 per cent of UK greenhouse gas emissions in 2012, 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 2011

Between 1990 and 2011, there was a large reduction in greenhouse gas emissions from the industrial process sector, with an overall decrease of around 81 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.

2012 results

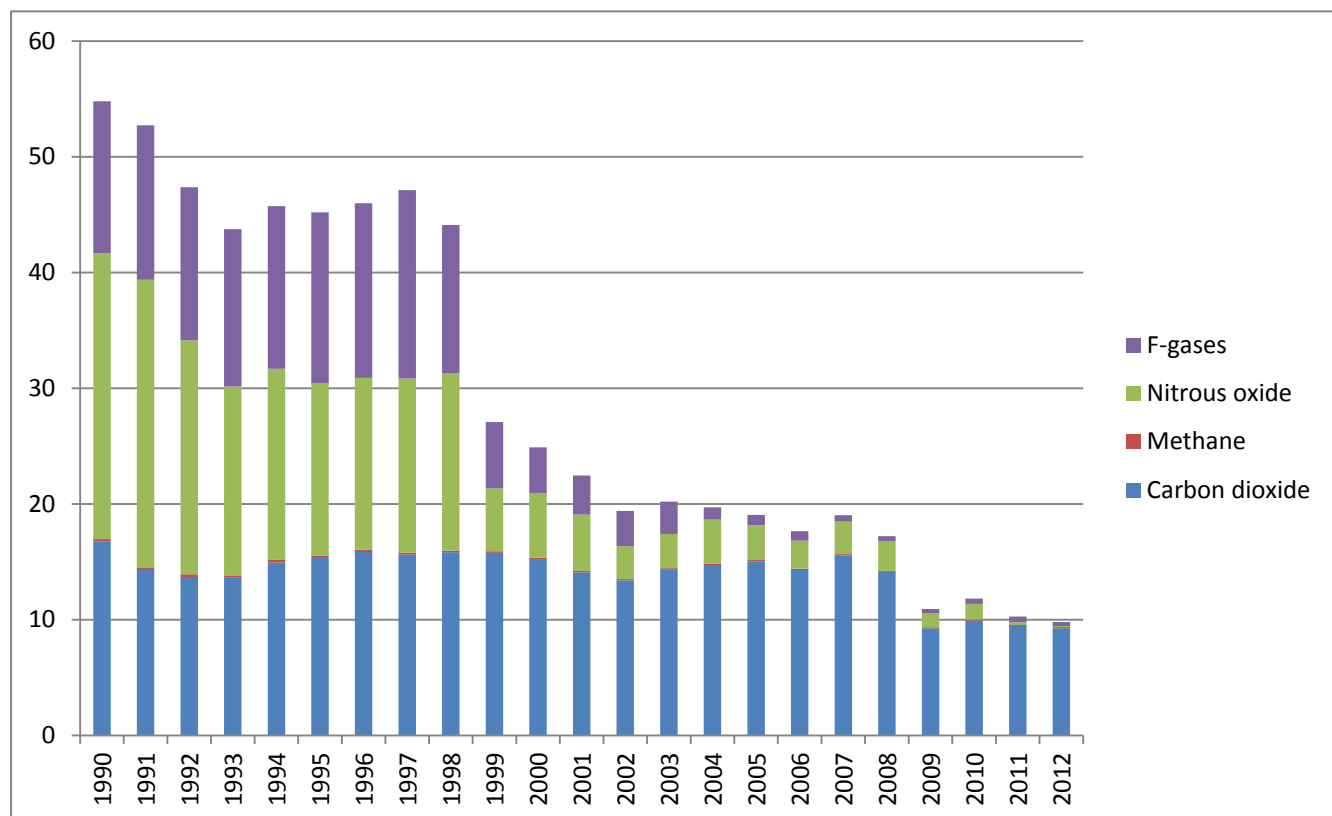
Between 2011 and 2012, emissions from the industrial process sector fell by around 4.5 per cent (0.5 MtCO₂e).

Table 12: Industrial process sector emissions by gas, 1990-2012 (MtCO₂e)

	1990	1995	2000	2005	2010	2011	2012
Carbon dioxide	16.7	15.3	15.2	15.0	9.9	9.5	9.3
Methane	0.2	0.2	0.1	0.1	0.1	0.1	0.1
Nitrous oxide	24.7	14.9	5.6	3.0	1.4	0.2	0.1
F-gases	13.1	14.7	3.9	0.9	0.5	0.5	0.3
Total	54.8	45.2	24.9	19.1	11.8	10.3	9.8

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

Figure 12: Greenhouse gas emissions from industrial processes, 1990-2012 (MtCO₂e)



Public sector

The public sector was responsible for 2 per cent of UK greenhouse gas emissions in 2012, with carbon dioxide making up almost all of these emissions.

Context – 1990 to 2011

Between 1990 and 2011, there was a general downward trend in greenhouse gas emissions from the public sector, with an overall decrease of around 26 per cent. This has been largely driven by a reduction in the use of oil and coal in this sector.

2012 results

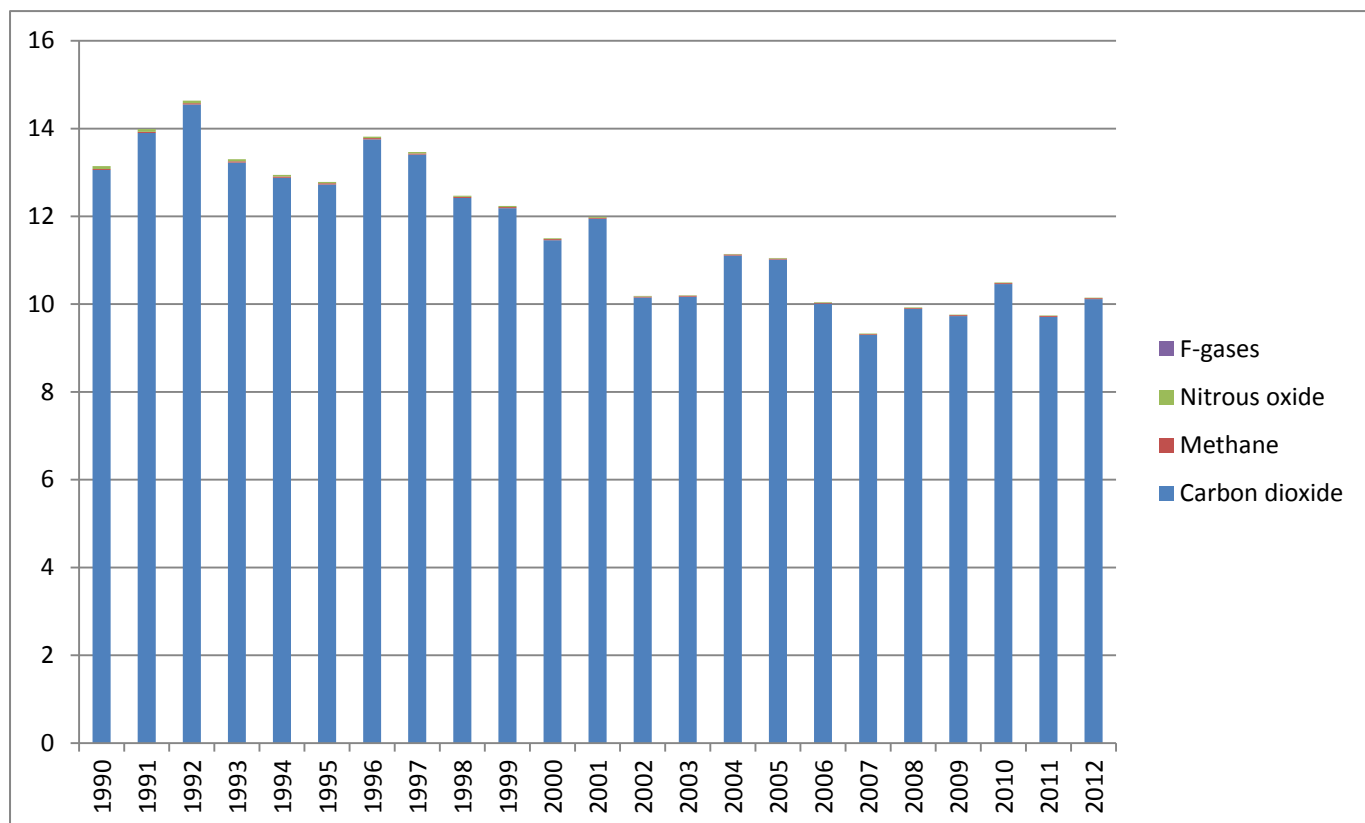
Between 2011 and 2012 emissions from the public sector increased by just over 4.2 per cent (0.4 MtCO₂e).

Table 13: Public sector emissions by gas, 1990-2012 (MtCO₂e)

	1990	1995	2000	2005	2010	2011	2012
Carbon dioxide	13.1	12.7	11.5	11.0	10.5	9.7	10.1
Methane	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nitrous oxide	0.1	0.0	0.0	0.0	0.0	0.0	0.0
F-gases	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	13.1	12.8	11.5	11.1	10.5	9.7	10.1

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

Figure 13: Greenhouse gas emissions from the public sector, 1990-2012 (MtCO₂e)



Land Use, Land Use Change and Forestry (LULUCF)

The LULUCF sector acted as a net sink of UK greenhouse gas emissions in 2012, dominated by carbon dioxide. In general, land being converted to cropland is the dominant source of carbon dioxide emissions, and forest land which remains as forest land is the dominant sink.

Context – 1990 to 2011

Between 1990 and 2011, 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. The downward trend in net emissions over the period has largely been driven by land converted to cropland and forest land, with an increasing uptake of carbon dioxide 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.

2012 results

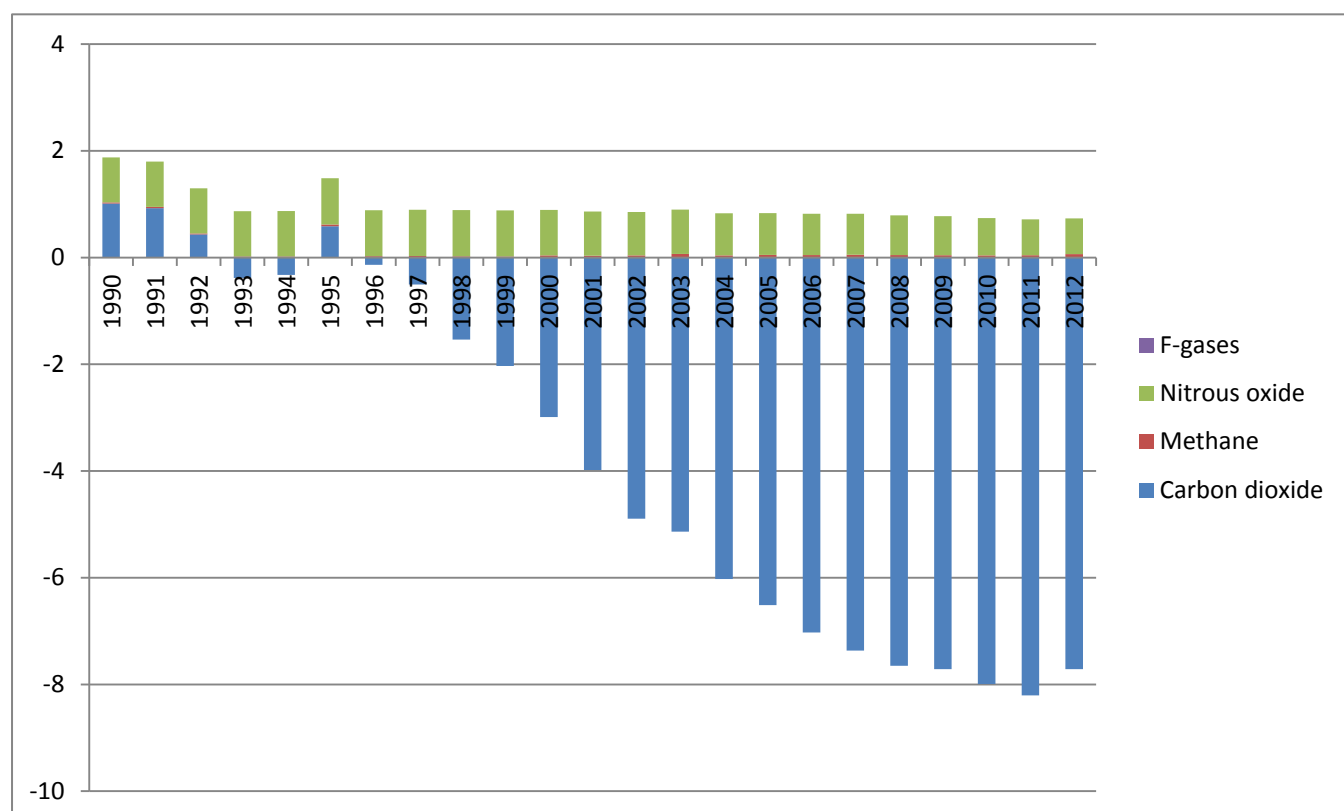
Between 2011 and 2012, net emissions from the LULUCF sector increased slightly, by around 0.5 MtCO₂e, largely due to increases in emissions from biomass burning.

Table 14: LULUCF sector emissions by gas, 1990-2012 (MtCO₂e)

	1990	1995	2000	2005	2010	2011	2012
Carbon dioxide	1.0	0.6	-3.0	-6.5	-8.0	-8.2	-7.7
Methane	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Nitrous oxide	0.8	0.9	0.9	0.8	0.7	0.7	0.7
F-gases	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	1.9	1.5	-2.1	-5.7	-7.3	-7.5	-7.0

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

Figure 14: Greenhouse gas emissions from the LULUCF sector, 1990-2012 (MtCO₂e)



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).

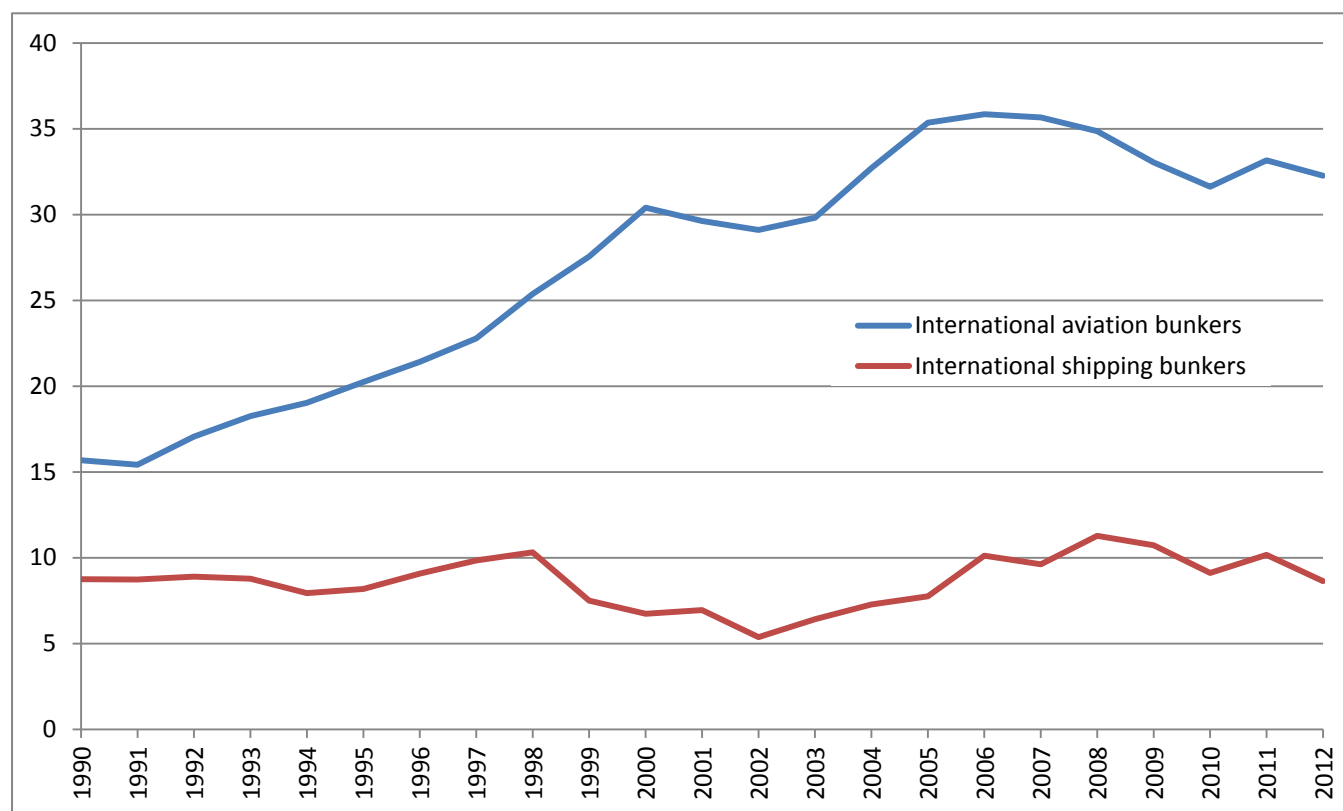
In 2012, emissions from international aviation fuel use were estimated to be 32.3 million tonnes carbon dioxide equivalent. This was 3 per cent lower than the 2011 figure of 33.2 million tonnes of carbon dioxide equivalent. Between 1990 and 2006, these emissions increased by around 130 per cent from 15.7 million tonnes of carbon dioxide equivalent to 35.9 million tonnes of carbon dioxide equivalent. They then declined until 2010 but increased again in 2011. Emissions in 2012, though lower than in 2011, are still more than double the 1990 level. High altitude aviation has a greenhouse effect over and above that of carbon dioxide alone, but this is not reflected in these estimates.

In 2012, emissions from UK international shipping bunkers were estimated to be 8.6 million tonnes carbon dioxide equivalent. This was 15 per cent higher than the 2011 figure of 10.2 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 comparable to 1990 emissions. It should be noted that UK operators purchase most of their fuel outside the UK.

Table 15: Greenhouse gas emissions from UK-based international aviation and shipping bunkers, 1990-2012 (MtCO₂e)

	1990	1995	2000	2005	2010	2011	2012
International aviation	15.7	20.2	30.4	35.4	31.6	33.2	32.3
International shipping	8.8	8.2	6.7	7.8	9.1	10.2	8.6
Total	24.4	28.4	37.1	43.1	40.8	43.3	40.9

Figure 15: Greenhouse gas emissions from UK-based international aviation and shipping bunkers, 1990-2012 (MtCO₂e)



Revisions from provisional estimates of greenhouse gas emissions

Provisional estimates of 2012 UK greenhouse gas and carbon dioxide emissions were published in March 2013, 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 +/-2 per cent for total emissions.

In March 2013, it was provisionally estimated that total UK greenhouse gas emissions in 2012 would be 571.6 million tonnes carbon dioxide equivalent. The final 2012 figure of 581.1[†] million tonnes is around 2 per cent higher than the provisional estimate. The difference between 2011 and 2012 emissions is much the same as expected in the provisional estimates, (an increase of around 3 per cent), as 2011 figures have also been revised in the final estimates.

It was provisionally estimated that net UK carbon dioxide emissions in 2012 would be 479.1 million tonnes. The final 2012 figure of 474.1 million tonnes is around 1 per cent lower than the provisional estimate. Again, the difference between 2011 and 2012 emissions is similar to the difference in the provisional estimates (an increase of around 4 per cent) as 2011 emissions have been revised in the final figures.

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 both for total UK greenhouse gas emissions and net UK carbon dioxide emissions. The provisional estimates show less uncertainty in estimating net UK carbon dioxide emissions. This is what would be expected since provisional estimates use DECC energy data as the basis to calculate net UK carbon estimates.

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.

[†] Kyoto greenhouse gas basket figures for 1990-2012 were revised on 27th March 2014 to correct a minor error. The largest revision made was 0.1Mt for 2012 emissions. Figures for UK & Crown Dependency emissions, and for UK carbon budget coverage, were not affected.

Table 16: Comparison of 2012 provisional and final estimates

	Provisional estimates (MtCO ₂ e)				Final estimates (MtCO ₂ e)			
	2011	2012	Change	% change	2011	2012	Change	% change
Energy Supply	182.2	192.1	9.9	5.4%	182.0	192.9	10.9	6.0%
Transport	117.4	116	-1.4	-1.2%	117.4	116.9	-0.6	-0.5%
Business	75.6	79.2	3.6	4.8%	72.7	73.3	0.6	0.8%
Residential	66.4	74.2	7.8	11.7%	66.5	74.9	8.4	12.7%
Agriculture	4.2	4.2	0.0	0.0%	4.2	4.1	0.0	-1.2%
Waste Management	0.3	0.3	0.0	0.0%	0.3	0.3	0.0	-6.3%
Industrial Process	9.5	9.8	0.3	3.2%	9.5	9.3	-0.2	-2.0%
Public	7.1	7.4	0.3	4.2%	9.7	10.1	0.4	4.2%
LULUCF	-3.9	-3.9	0.0	0.0%	-8.2	-7.7	0.5	-6.0%
Total CO ₂	458.6	479.1	20.5	4.5%	454.0	474.1	20.0	4.4%
Other greenhouse gases	92.1	90.7	-1.4	-1.5%	102.7	101.3	-1.3	-1.3%
Kyoto greenhouse gas basket	552.6	571.6	19.0	3.4%	563.2	581.1 ^r	17.9 ^r	3.2%

Note:

1. All figures for CO₂ are for the UK and Crown Dependencies only, and exclude Overseas Territories.
2. The breakdown by sector shown in the table is for carbon dioxide emissions only.
- r The Kyoto greenhouse gas basket figures were revised on the 27th March 2014 to correct a minor error. The largest revision is 0.1Mt for 2012.

Revisions to the Inventory

The UK Greenhouse Gas Inventory is reviewed every year, and the whole historical data series is revised where necessary 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 submission 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 2012 Inventory, the most notable changes to the historical series since the 2011 Inventory was published are linked to new data and research which have become available in relation to a number of specific sectors.

Table 17: Revisions in the 2012 inventory, by sector (MtCO₂e)

	1990 emissions			2011 emissions		
	2011 inventory	2012 inventory	Change	2011 inventory	2012 inventory	Change
Energy Supply	272.4	272.4	-0.1	190.9	190.8	-0.2
Transport	121.5	121.6	0.1	118.5	118.5	0.0
Business	115.3	116.0	0.7	89.1	85.9	-3.3
Residential	80.8	80.8	0.0	69.7	69.0	-0.6
Agriculture	63.7	71.1	7.4	51.2	57.2	6.0
Waste Management	47.4	47.3	-0.1	17.3	22.7	5.4
Industrial Process	54.7	54.8	0.1	10.2	10.3	0.0
Public	13.1	13.1	0.0	7.1	9.7	2.6
LULUCF	4.0	1.9	-2.1	-3.3	-7.5	-4.2
Total	772.9	778.9	6.0	550.7	556.7	5.9

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

Details of the most notable revisions are as follows:

The carbon balance model used to estimate emissions from the production and combustion of fuels derived from coal in coke ovens and steelworks has been improved. The country-specific carbon factors used in the model have been reviewed and in some cases replaced with data

from the EU Emissions Trading System (EU ETS). This has provided a much larger dataset to review and assess the time series consistency of data from individual sites and from the sector as a whole.

A new dataset from the Environment Agency has been used to improve estimates of methane emissions arising from landfill waste. Since 2009 operators of landfills have been required to report the quantity of landfill gas flared at regulated sites as part of the conditions of their operating permit. This has provided a better estimate on the quantities of gas recorded as being collected and burnt in landfill gas engines and flares. Previously emissions were estimated using energy statistics on landfill gas utilisation in energy generation, landfill gas capture rate assumptions and derived gas flaring volumes. The new method provides a more accurate estimate of emissions for this source and emissions have now been revised upwards across the entire time series as a result of this change.

The allocation of manure to various management systems has been revised. The volume of manure allocated to daily spread management has reduced and manure allocated to solid storage has been reallocated to deep litter. These changes have had the effect of increasing emissions across the time series.

Emissions of methane arising from enteric fermentation in dairy cows have been revised to include a more accurate figure of the feed digestibility value currently used. The value itself has not changed, however it was rounded to the nearest integer when used to estimate emissions previously and now the full value is used.

There have been significant changes to the methodology for modelling Forest Land, in the LULUCF sector. The changes to modelling methodology include a better UK representation of forest areas in existence before 1920, and the distribution of tree species, growth rates and forest management practices. The improved representation of Forest Land in the LULUCF Sector has increased the estimates of the size of the removals from Forest Land and therefore the LULUCF Sector as a whole. The new model also provides estimates of carbon dynamics associated with mineral and organic soils. Estimates of emissions and removals associated with Forest Land soil carbon are reasonably consistent with those produced by the older model.

Changes to methodology in the Industrial Process sector have affected emissions in the LULUCF sector. Estimates of emissions resulting from by-products of sugar production for soil liming are now included and this has increased emissions across the time series. Land use and land use change have been recalculated for the Overseas Territories and Crown Dependencies, which has resulted in an increase in emissions. There has been new activity data for wildfires which has changed the time series. For 2011, in the current inventory, the LULUCF Sector ~~is~~ now a larger sink than it was in the previous inventory. This has also resulted in this sector becoming a net sink in 1998 instead of in 2001 as indicated by last year's data set.

There have been revisions to some of the other underlying data used to compile the emissions estimates, including increases in public sector emissions since 2008 to take into account a revision in the natural gas consumption data and an increase in transport sector emissions in 2007 to take into account revisions in diesel fuel consumption.

Overall, revisions and improvements to the UK greenhouse gas inventory have resulted in revisions to emissions in all years from 1990 to 2011. The total of all UK greenhouse gas emissions reported for the Kyoto Protocol in 2011 has been revised upwards from 550.7 to 556.7 million tonnes carbon dioxide equivalent. Comparing the 2012 figures from this year's publication with the 2011 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. Further details of each are summarised below.

Kyoto Protocol target

The UK has a target for the first commitment period of the Kyoto Protocol to reduce its emissions by an average 12.5 per cent below base year levels over the five-year period 2008-12.

In July 2007, on completion of the review of the UK Inventory, the UK's Kyoto base year figure was set at 779.9 MtCO_{2e}, 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 MtCO_{2e} on average per year over the first five year commitment period of the Protocol (2008-2012).

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 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](#).

The Climate Change Act 2008

The Climate Change Act 2008 established a long-term legally-binding framework to reduce GHG emissions, committing the UK to reducing emissions by at least 80 per cent below 1990 baselines by 2050, with an interim target to reduce GHG emissions by at least 34 per cent compared to the 1990 baseline by 2020.

To help set this trajectory, the Climate Change Act also introduced carbon budgets, which set legally-binding limits on the total amount of GHG can emit for a given five-year period.

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 MtCO₂e over the five-year period 2008-12. 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.

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 to 1990 and 1995 emissions data, whereas the Kyoto Protocol base year emissions are fixed. Table 17 below shows details of the first four carbon budgets.

Table 18: Summary of UK Carbon Budgets, 2008-2027

	Budget 1 2008-12	Budget 2 2013-17	Budget 3 2018-22	Budget 4 2023-27
Budget level (MtCO ₂ e)	3,018	2,782	2,544	1,950
Equivalent average annual emissions (MtCO ₂ e)	603.6	556.4	508.8	390.0

Note: The levels of carbon budgets are not shown here as a percentage reduction from the base year. This is because the base year figure is not fixed, but is revised each year to incorporate revisions to the inventory so the percentage reduction required to meet targets will change over time.

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 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 each year of Phase II, which covered the period 2008-2012.

In 2013, for the fourth 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.

At the end of Phase II of the EU ETS, the UK was required to cancel all allowances which have not been either issued or auctioned by that point. As a consequence, allowances totalling 4.5 MtCO₂e were cancelled in 2012. These cancelled allowances have the effect of reducing the overall cap for the whole of Phase II. For presentational purposes, this amount has been distributed evenly over the five years, effectively reducing the cap by 0.9 MtCO₂e each year.

In 2012 the UK sold allowances totalling 14.7 MtCO₂e, and after taking into account allowances cancelled the net UK figure to be used is 13.8 MtCO₂e which should be taken into account when reporting emissions against the Kyoto Protocol target.

Note that a negative net value indicates that the reported emissions from UK installations in the EU ETS were below the cap, i.e. there was a net selling or withholding of units by UK installations. Taking EU ETS into account therefore increases the UK's reported emissions, as the allowances which are sold or withheld may not be used to offset UK emissions. The opposite occurs when reported emissions from EU ETS installations exceed the cap.

Table 19: EU ETS net trading position, 2005-2012 (MtCO₂e)

	2005	2006	2007	2008	2009	2010	2011	2012
Net purchases/(sales) by UK installations	27.1	33.2	27.5	19.9	(13.7)	(7.7)	(25.0)	(14.7)
Net purchases/(sales) by UK Government	(1.9)	(1.9)	(1.9)	-	-	-	-	-
Net cancelled unallocated allowances/(sales) by UK Government	-	-	-	0.9	0.9	0.9	0.9	0.9
Net UK purchases/(sales)	25.2	31.3	25.6	20.8	(12.8)	(6.8)	(24.1)	(13.8)

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 2012 is slightly lower, at 13.6 MtCO₂e. This is due to differences in both the coverage of the Act and the way in which the annual cap in 2012 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 2012 emissions, this must be laid before Parliament no later than 31st March 2014.

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.

In 2012, aviation was included in the EU ETS for the first time, and aircraft operators were required to report their annual emissions and surrender an equivalent number of allowances. However, it should be noted that this report does not take into account any impact from the inclusion of aviation in the EU ETS. The Kyoto Protocol only covers domestic aviation, and the same approach will be taken for determining the scope of the first UK carbon budget.

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 an average 604.4^f MtCO₂e per year over the period 2008-12, 22.5 per cent lower than base year emissions. However, final figures for the UK's emissions under the Kyoto Protocol first commitment period will not be finalised until 2015, following the end of commitment period true-up period.
- For the purposes of carbon budgets reporting, UK greenhouse gas emissions over the first carbon budget period 2008-12 were 2,981.7 MtCO₂e, 36.3 MtCO₂e below the first carbon budget period cap of 3,018 MtCO₂e. 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.

Table 20: Performance against emissions reduction targets

		Base year emissions	Emissions 2008-2012	Average Annual Emissions over 2008-2012 period	Average change from base year
All greenhouse gases – Kyoto Protocol coverage (UK, Crown Dependencies & Overseas Territories)	Actual emissions (no allowance for trading)	779.9	2985.4 ^f	597.1	23.4%
	Emissions with allowance for trading	779.9	3022.2 ^f	604.4 ^f	22.5%
All greenhouse gases – UK Carbon Budgets coverage (UK only)	Actual emissions (no allowance for trading)	780.3	2944.9	589.0	24.5%
	Emissions with allowance for trading	780.3	2981.7	596.3	23.6%

^f Kyoto greenhouse gas basket figures for 1990-2012 were revised on 27th March 2014 to correct a minor error. The largest revision made was 0.1Mt for 2012 emissions. Figures for UK & Crown Dependency emissions, and for UK carbon budget coverage, were not affected.

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

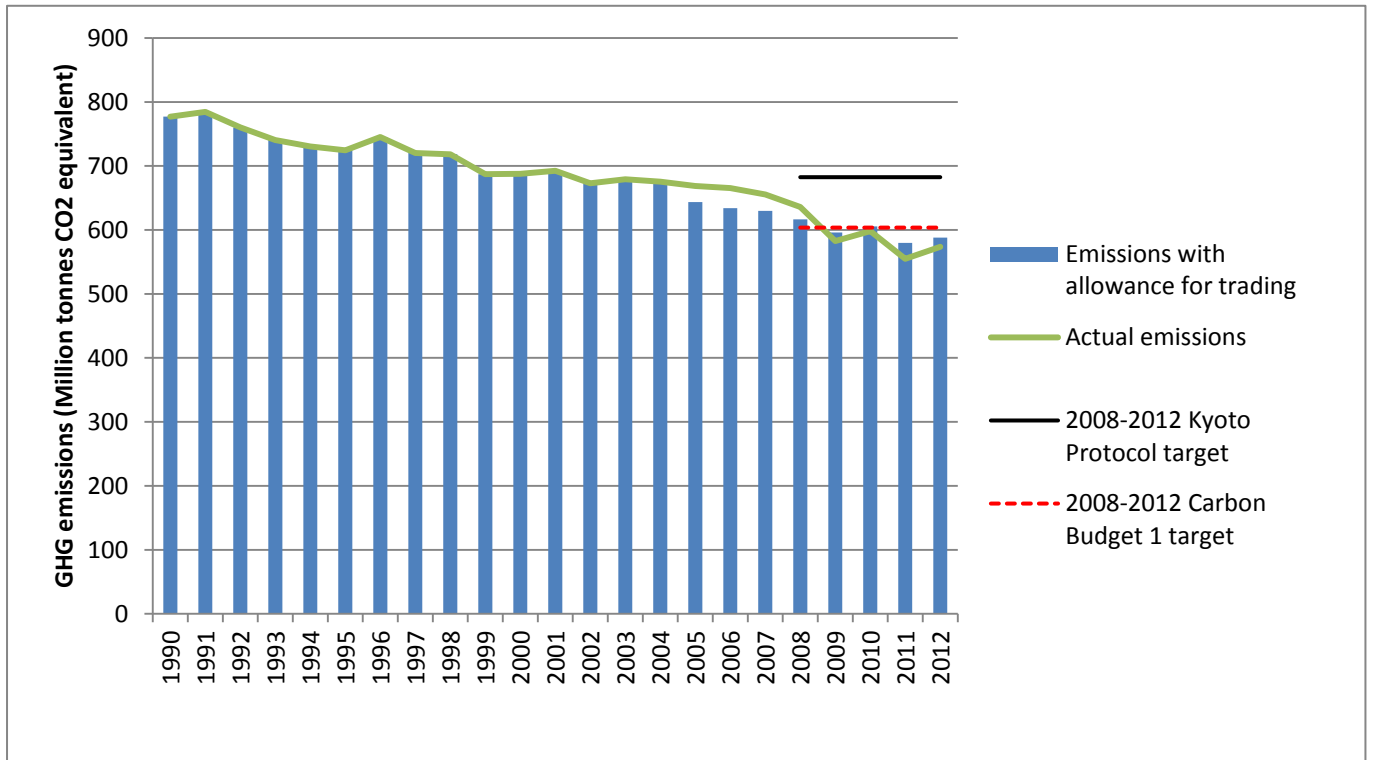


Table 21: Performance against emissions reduction targets (MtCO₂e)

		Baseline	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
Kyoto Protocol greenhouse gas target													
No allowance for emission trading	All greenhouse gases (including net emissions/removals from LULUCF)	779.9	777.6	725.2	692.2	676.3	673.2	663.7	644.2	590.7	606.2	563.2	581.1 ^r
	Percentage change from baseline			-7.0%	-11.3%	-13.3%	-13.7%	-14.9%	-17.4%	-24.3%	-22.3%	-27.8%	-25.5%
EU ETS	Net purchases/(sales) by UK installations					27.1	33.2	27.5	19.9	(13.7)	(7.7)	(25.0)	(14.7)
	Net purchases/(sales) by UK Government					(1.9)	(1.9)	(1.9)	-	-	-	-	-
	Net cancelled unallocated allowances/(sales) by UK Government								0.9	0.9	0.9	0.9	0.9
	Net UK purchases/(sales)					25.2	31.3	25.6	20.8	(12.8)	(6.8)	(24.1)	(13.8)
With allowance for emissions trading	All greenhouse gases (including net emissions/removals from LULUCF)	779.9	777.6	725.2	692.2	651.1	642.0	638.1	623.4	603.5	613.0	587.3	594.9 ^r
	Percentage change from baseline			-7.0%	-11.3%	-16.5%	-17.7%	-18.2%	-20.1%	-22.6%	-21.4%	-24.7%	-23.7%
United Kingdom Carbon Budgets													
No allowance for emission trading	All greenhouse gases (including net emissions/removals from LULUCF)	780.3							635.9	582.5	598.0	554.9	573.5
	Percentage change from baseline								-18.5%	-25.3%	-23.4%	-28.9%	-26.5%
EU ETS	Net purchases/(sales) by UK installations								19.3	(13.5)	(7.6)	(24.9)	(14.5)
	Net purchases/(sales) by UK Government								-	-	-	-	-
	Net cancelled unallocated allowances/(sales) by UK Government								0.9	0.9	0.9	0.9	0.9
	Net UK purchases/(sales)								20.2	(12.6)	(6.7)	(24.0)	(13.6)
With allowance for emissions trading	All greenhouse gases (including net emissions/removals from LULUCF)	780.3							615.7	595.2	604.7	579.0	587.1
	Percentage change from baseline								-21.1%	-23.7%	-22.5%	-25.8%	-24.8%

Note:

- Kyoto base year consists of emissions of CO₂, CH₄ and N₂O in 1990, and of HFCs, PFCs and SF₆ in 1995. Includes an allowance for net emissions from LULUCF in 1990.
 - 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.
 - 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).
 - 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.
 - 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.
- r The Kyoto greenhouse gas basket figures were revised on the 27th March 2014 to correct a minor error. The largest revision is 0.1Mt for 2012.

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 estimated 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 2014, covered emissions up to and including the third quarter of 2013. This publication therefore included estimates of emissions for the 2012 calendar year, alongside equivalent estimates on a temperature adjusted basis, both of which we can compare with the final estimates now available.

On a temperature adjusted basis, net carbon dioxide emissions in 2011 and 2012 were estimated to be 475.8 Mt and 476.9 Mt respectively. This represents a much smaller increase in emissions than in the non-temperature adjusted figures, of around 1.1 Mt. This suggests that external temperatures made a significant contribution to the emissions increase seen in 2012. These results are shown in Table 22 below.

Table 22: Comparison of quarterly emissions estimates with final emissions estimates

	2011 CO ₂ emissions (Mt)	2012 CO ₂ emissions (Mt)	Absolute change (Mt)	Percentage change
Final estimates				
➤ actual emissions	454.0	474.1	20.0	4.4%
Quarterly estimates				
➤ actual emissions	458.6	479.0	20.4	4.4%
Quarterly estimates				
➤ Temperature adjusted emissions	475.8	476.9	1.1	0.2%

Future updates to emissions estimates

On Thursday 27th March 2014 DECC will be publishing a breakdown of 2012 UK emissions by end-user sector and fuel type, to supplement the source sector breakdown published today.

On the same date DECC will also be publishing provisional estimates of UK greenhouse gas emissions for 2013 as National Statistics. This will coincide with the publication of *Energy Trends*, which will include estimates of 2013 UK energy consumption.

Further information and feedback

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/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 1970-2012, 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 2012 must be laid before Parliament and published no later than 31st March 2014. This will give details of the net UK carbon account for 2012, 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 [2013 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 were published by Defra in December 2013 [Emissions of air pollutants in the UK, 1970 to 2012](#)

A National Statistics publication

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