



Department
of Energy &
Climate Change



2013 UK Greenhouse Gas Emissions, Final Figures

Statistical release

3rd February 2015

© Crown copyright 2015

URN [15D/031]

You may re-use this information (not including logos) free of charge in any format or medium, under the terms of the Open Government Licence.

To view this licence, visit www.nationalarchives.gov.uk/doc/open-government-licence/ or write to the Information Policy Team, The National Archives, Kew, London TW9 4DU, or email: psi@nationalarchives.gsi.gov.uk.

Any enquiries regarding this publication should be sent to us at: ClimateChange.Statistics@decc.gsi.gov.uk.

The responsible statistician for this publication is Laura Bates.

Contact telephone: 0300 068 2948.

This document is also available from our website at: <https://www.gov.uk/government/publications/final-uk-emissions-estimates>

Contents

Executive summary	4
Introduction.....	6
Coverage of emissions reporting.....	7
2013 Emissions	8
Emissions by sector.....	12
Energy supply	12
Transport	15
Business	16
Residential	18
Agriculture.....	19
Waste management.....	20
Industrial process.....	22
Public sector	23
Land Use, Land Use Change and Forestry (LULUCF)	24
Emissions from UK-based international aviation and shipping bunkers	25
Revisions from provisional estimates of greenhouse gas emissions	27
Revisions to the UK's Greenhouse Gas Inventory	29
UK emissions reduction targets.....	32
Kyoto Protocol target	32
The Climate Change Act 2008.....	33
EU Effort Sharing Decision	34
Emissions Trading.....	35
UK performance against emissions reduction targets	37
Kyoto Protocol target	37
The Climate Change Act 2008.....	37
EU Effort Sharing Decision	37
Estimating emissions on a temperature adjusted basis.....	40
Future updates to emissions estimates	41
Further information and feedback.....	41
Notes for Editors.....	42

Executive summary

- This publication provides the latest estimates of UK greenhouse gas emissions by source only from 1990 to 2013.
- In 2013, UK emissions of the basket of seven greenhouse gases covered by the Kyoto Protocol were estimated to be 568.3 million tonnes carbon dioxide equivalent (MtCO₂e). This was 2.4 percent lower than the 2012 figure of 582.2 million tonnes.
- Between 2012 and 2013, the largest decreases were experienced in the energy supply sector, down 6.8 percent (13.8 MtCO₂e) due to a decrease in the use of coal and gas for electricity generation, and the waste management sector, down by 14.1 percent (3.7 MtCO₂e) due to a reduction in emissions from landfill waste.
- Carbon dioxide (CO₂) is the main greenhouse gas, accounting for 82 percent of total UK greenhouse gas emissions in 2013. In 2013, UK net emissions of carbon dioxide were estimated to be 467.5 million tonnes (Mt). This was around 1.8 percent lower than the 2012 figure of 476.3 Mt.
- For the purposes of carbon budgets reporting, UK greenhouse gas emissions in 2013 were 566.6 MtCO₂e. However, this does not take account of the net EU ETS trading position as net UK ETS emissions for 2013 are not yet available.
- There are a number of details about the UK's emissions reduction targets for 2013 which have yet to be finalised, and so cannot be reported on in these statistics. A separate statistical note on the UK's progress against emissions reduction targets will be published once these data become available.
- 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 1990-2012 emissions figures have been revised since the previous publication in February 2014, to incorporate methodological improvements (most of which have been internationally agreed), and new data. Details of these revisions can be found later in this statistical release in the Revisions to the Inventory section.

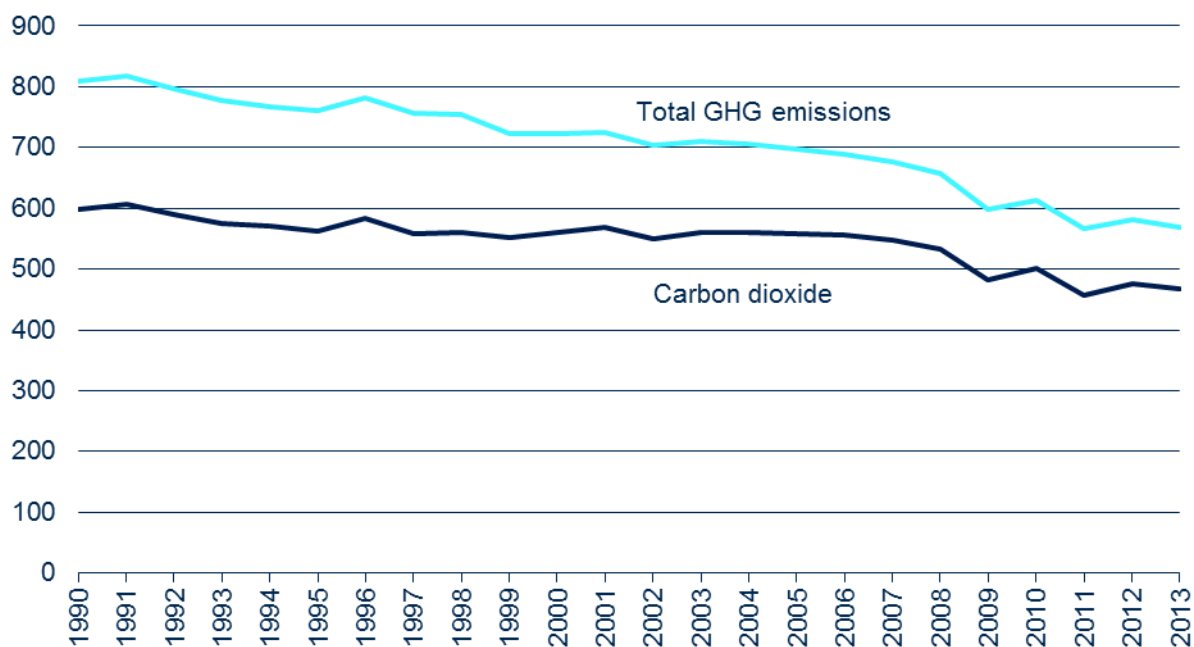
Table 1: Emissions of greenhouse gases
UK and Crown Dependencies 2012-2013

	2012	2013	Change
Total greenhouse gas emissions	582.2	568.3	-2.4%
Carbon dioxide emissions	476.3	467.5	-1.8%

Source: Table 1, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Note: Emissions are reported as net emissions, to include removals from the atmosphere by carbon sinks.

Figure 1: Emissions of greenhouse gases, UK and Crown Dependencies 1990-2013 (MtCO₂e)



Source: Table 1, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Introduction

This publication provides the latest estimates of UK greenhouse gas emissions by source sector from 1990-2013. 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 (IPCC¹), 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 1990-2013 will be published in March 2015.

¹ IPCC, <http://www.ipcc-nggip.iges.or.jp/public/index.html>

Coverage of emissions reporting

The basket of greenhouse gases covered by the Kyoto Protocol consists of seven gases: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride and nitrogen trifluoride. The last four gases are collectively referred to as fluorinated gases or F-gases. As part of the update to the IPCC 2006 Reporting Guidelines for Inventories, nitrogen trifluoride (NF₃) is included for the first time in the UK GHG inventory. Its only source in the UK is in the semiconductor manufacture industry, where it is used to clean chemical vapour chambers and in order to etch circuit boards. It is emitted in extremely small quantities in the UK. 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 for the first commitment period and have signalled a wish to join the UK’s ratification of the second commitment period 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.

In previous years, headline figures have shown total UK emissions under Kyoto Protocol coverage. However, changes to the way the LULUCF sector is accounted in the second commitment period of the Kyoto Protocol mean that under Kyoto Protocol coverage 2013 emissions are not directly comparable with 2012 emissions. As such the headline statistics given here instead show total emissions for the UK and Crown Dependencies which are consistent with figures presented in sectoral breakdowns and provide a consistent time series.

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.

References to the ‘UK Greenhouse Gas inventory’ refer to the consistent time series of emissions from 1990 to the most recent year which is updated annually and reported to the UN and the EU. The figures in these statistics are consistent with the UK’s greenhouse gas inventory for 2013, although the inventory reported to the UN includes emissions from certain overseas territories which are excluded from these statistics except where specifically stated.

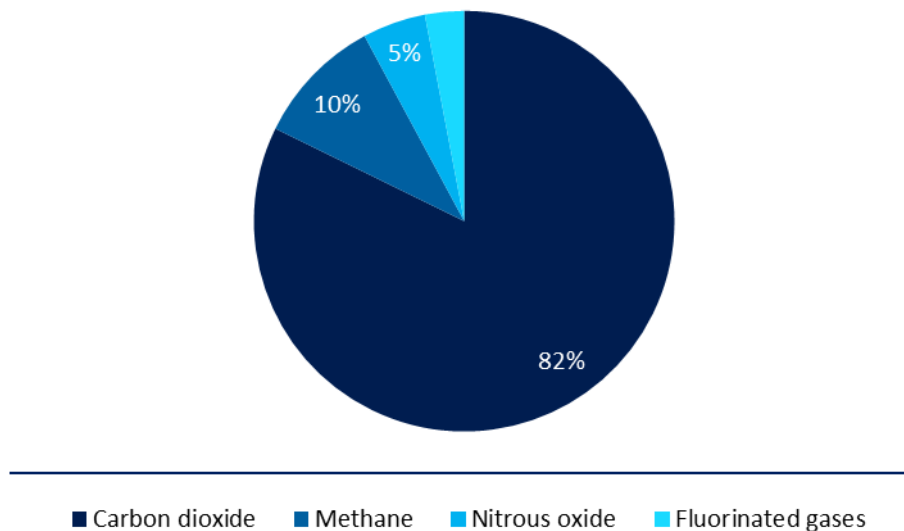
2013 Emissions

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 percent of the UK's greenhouse gas emissions in 2013 up from 74 percent in 1990. Weighted by global warming potential, methane accounted for about 10 percent of UK emissions and nitrous oxide for about 5 percent of emissions in 2013. Fluorinated gases accounted for the remainder, around 3 percent. A new gas, nitrogen trifluoride (NF₃), has been included for the first time year in accordance with new IPCC guidelines, but emissions from this are extremely small (0.00036 MtCO₂e).

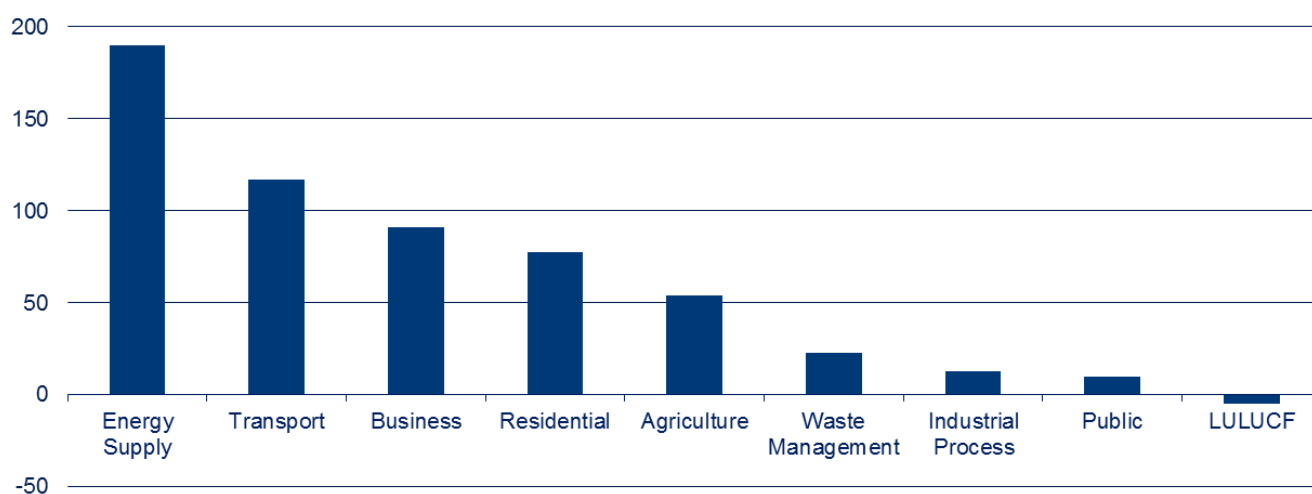
Looking at the breakdown by **sector**, in 2013, 33 percent of greenhouse gas emissions were from the energy supply sector, 21 percent from transport, 16 percent from business, 14 percent from the residential sector and 9 percent from agriculture. The rest was attributable to the remaining sectors; waste management, industrial process, and the public sector. The LULUCF sector acted as a net sink in 2013 so emissions were effectively negative.

Figure 2: Greenhouse gas emissions by gas, UK and Crown Dependencies 2013 (%)



Source: Table 1, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Figure 3: Greenhouse gas emissions by source sector (excluding LULUCF), UK and Crown Dependencies 2013 (MtCO₂e)



Source: Table 3, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Table 2: UK greenhouse gas emissions by gas and sector
UK and Crown Dependencies, 2013

	Carbon dioxide	Methane	Nitrous oxide	Fluorinated gases	Total
Energy Supply	180.8	7.6	1.4	0.0	189.7
Transport	115.7	0.1	1.0	0.0	116.8
Business	75.5	0.1	0.8	14.6	90.9
Residential	74.7	0.6	0.1	2.2	77.6
Agriculture	4.9	27.0	21.8	0.0	53.7
Waste Management	0.3	20.6	1.7	0.0	22.6
Industrial Process	12.2	0.1	0.1	0.3	12.8
Public	9.5	0.0	0.0	0.0	9.5
LULUCF	-6.0	0.0	0.7	0.0	-5.3
Total	467.5	56.2	27.6	17.1	568.3

Source: Tables 3 to 7, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Table 3: UK greenhouse gas emissions by gas and sector
UK and Crown Dependencies, 2013

% of total UK emissions, excluding LULUCF

	Carbon dioxide	Methane	Nitrous oxide	Fluorinated gases	Total
Energy Supply	32%	1%	0%	0%	33%
Transport	20%	0%	0%	0%	21%
Business	13%	0%	0%	3%	16%
Residential	13%	0%	0%	0%	14%
Agriculture	1%	5%	4%	0%	9%
Waste Management	0%	4%	0%	0%	4%
Industrial Process	2%	0%	0%	0%	2%
Public	2%	0%	0%	0%	2%
Total	82%	10%	5%	3%	100%

Source: Tables 3 to 7, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Note: This table does not include emissions from the LULUCF sector, since in 2013 this sector acted as a net sink, and emissions were therefore effectively negative. Sector values may sum to more than 100 percent due to exclusion of LULUCF emissions.

Table 4: UK Greenhouse Gas Emissions 1990-2013, headline results
UK and Crown Dependencies, 1990-2013

	MtCO ₂ e						
	1990	1995	2000	2005	2010	2012	2013
Net CO ₂ emissions (emissions minus removals)	597.9	562.0	559.5	557.8	500.8	476.3	467.5
Methane (CH ₄)	136.9	129.9	113.9	92.1	67.0	61.2	56.2
Nitrous Oxide (N ₂ O)	57.1	47.2	36.6	32.2	28.9	27.7	27.6
Hydrofluorocarbons (HFC)	14.6	19.6	10.5	13.1	15.7	16.2	16.2
Perfluorocarbons (PFC)	1.7	0.6	0.6	0.4	0.3	0.3	0.3
Sulphur hexafluoride (SF ₆)	1.3	1.3	1.8	1.1	0.7	0.6	0.6
Nitrogen Trifluoride (NF ₃)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total greenhouse gases	809.4	760.6	722.8	696.6	613.3	582.2	568.3

Source: Table 1, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Note:

1. Figures for each individual gas include the Land Use, Land-Use Change and Forestry sector (LULUCF).
2. The entire time series is revised each year to take account of methodological improvements.
3. 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.
4. Figures shown do not include any adjustment for the effect of the EU Emissions Trading System (EUETS), which was introduced in 2005.
5. 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.

Emissions by sector

Table 5: Sources of greenhouse gas emissions
UK and Crown Dependencies, 1990-2013

	1990	1995	2000	2005	2010	2012	2013
Energy Supply	278.8	238.8	221.5	231.4	206.7	203.5	189.7
Transport	121.7	122.2	126.8	130.7	120.3	118.0	116.8
Business	115.4	113.7	117.2	109.5	94.4	88.4	90.9
Residential	80.6	81.9	89.0	86.0	87.8	77.3	77.6
Agriculture	66.0	65.1	61.4	57.3	54.6	54.0	53.7
Waste Management	69.3	71.5	66.8	53.0	31.5	26.3	22.6
Industrial Process	60.0	50.9	27.2	20.4	12.5	10.5	12.8
Public	13.5	13.3	12.1	11.2	9.8	9.3	9.5
LULUCF	4.0	3.3	0.8	-2.9	-4.3	-5.0	-5.3
Total	809.4	760.6	722.8	696.6	613.3	582.2	568.3

Source: Table 3, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Energy supply

The energy supply sector was responsible for 33 percent of UK greenhouse gas emissions in 2013, with carbon dioxide being by far the most prominent gas for this sector. The main source of emissions from this sector is the use of coal and natural gas in electricity generation from power stations.

Between 1990 and 2013, there was a 32 percent reduction in greenhouse gas emissions from the energy supply sector. This decrease has resulted mainly from changes in the mix of fuels being used for electricity generation, including the growth of renewables, together with greater efficiency resulting from improvements in technology.

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 reduced by 37 percent between 1990 and 2013². Final consumption of electricity was 14 percent higher in 2013 than it was in 1990, although it peaked in 2005 and has decreased since then. Electricity generation in 2013 was 9 percent higher in 2013 than in 1990, although again it peaked in 2003 and has decreased since.³

² Digest of United Kingdom Energy Statistics, Table 5.1.1 Fuel input for electricity generation, 1970 to 2013

³ Digest of United Kingdom Energy Statistics, Table 5.1.3 Electricity generated and supplied, 1970 to 2013

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 17 MtCO₂e since 1990 to only 1 MtCO₂e in 2013 between 1990 and 2013.

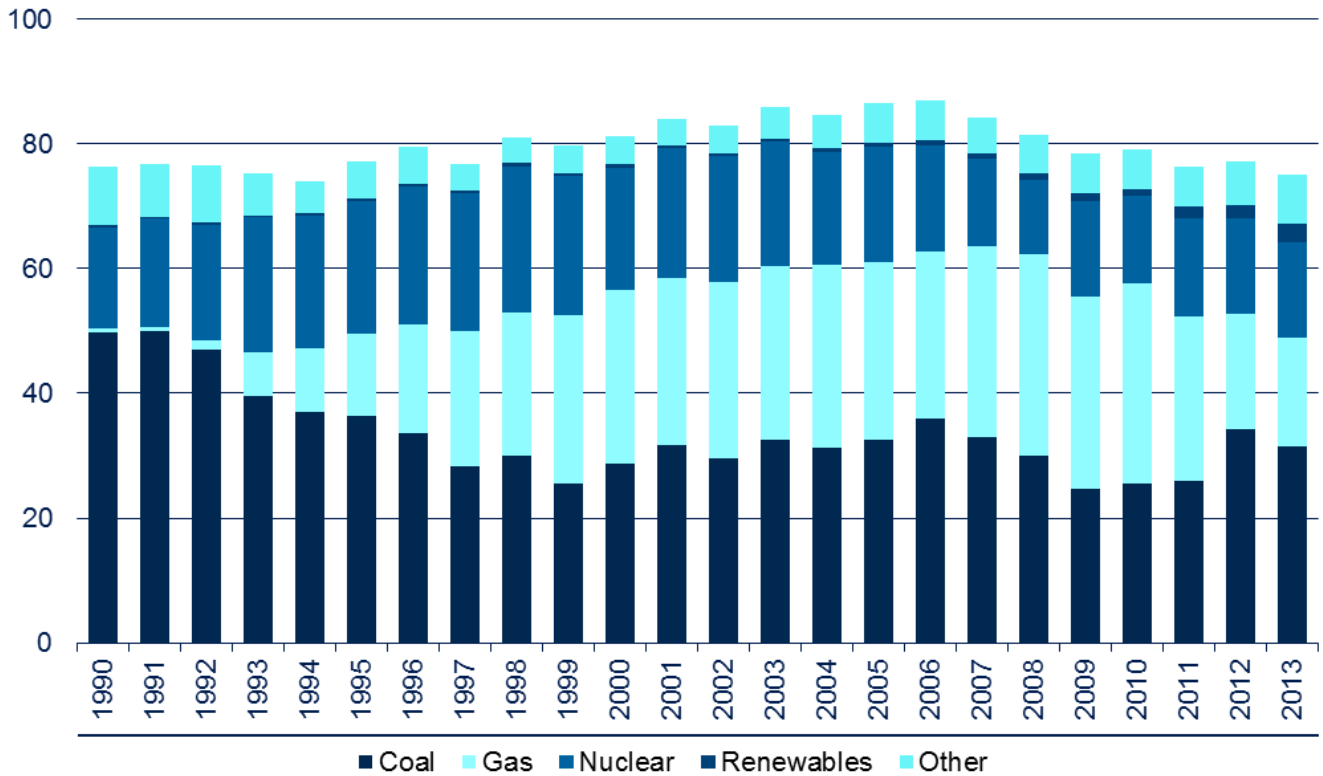
Between 2012 and 2013 emissions from the energy supply sector decreased by 6.8 percent (13.8 MtCO₂e). This decrease has been driven by a change in the fuel mix used at power stations for electricity generation and a decrease (2 percent) in total fuel used for electricity generation. There was a decrease in coal (8 percent) and gas (6 percent) consumption in power stations, which resulted in a decrease of around 7 percent in emissions from electricity generation. In 2013, total greenhouse gas emissions from power stations, at 147.9 MtCO₂e, accounted for just over a quarter of all UK greenhouse gas emissions.

Table 6: Energy supply sector emissions by gas
UK and Crown Dependencies, 1990-2013

	MtCO ₂ e						
	1990	1995	2000	2005	2010	2012	2013
Carbon dioxide	242.6	210.8	203.6	218.7	196.4	193.3	180.8
Methane	34.3	26.4	16.4	11.1	9.0	8.7	7.6
Nitrous oxide	2.0	1.6	1.4	1.5	1.2	1.5	1.4
F-gases	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	278.8	238.8	221.5	231.4	206.7	203.5	189.7

Source: Tables 3 to 7, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

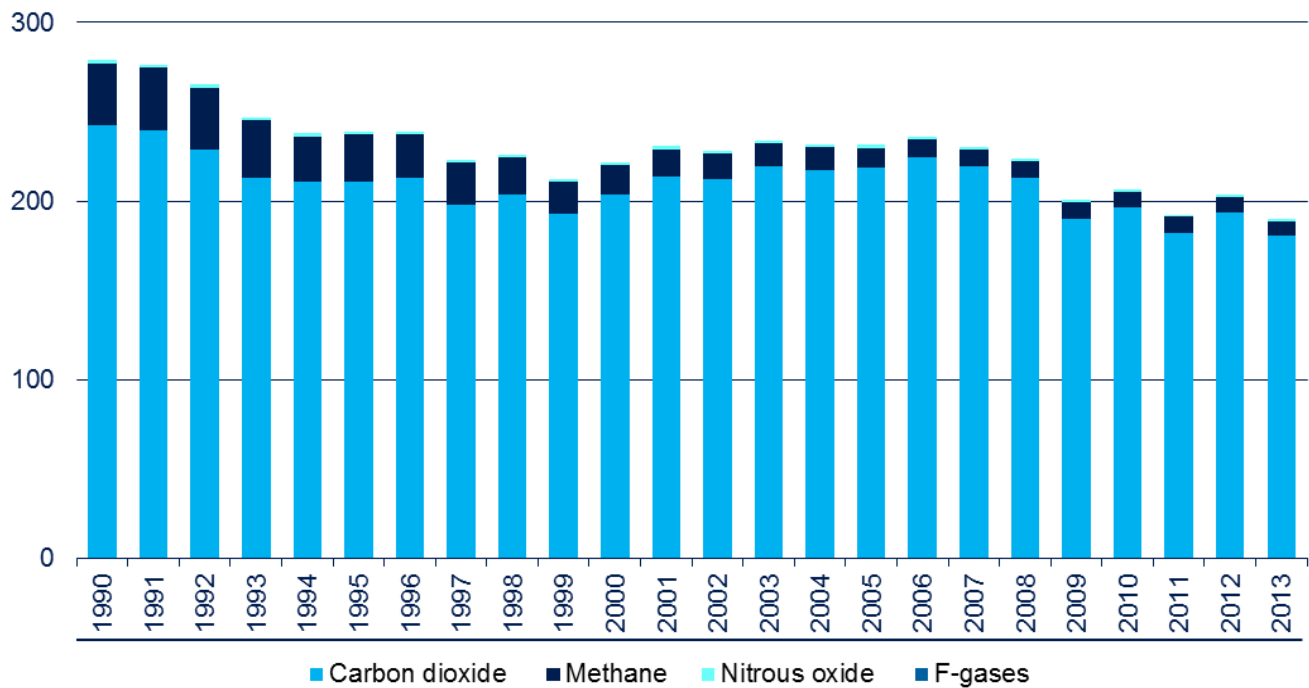
Figure 4: Fuel used for UK electricity generation, UK and Crown Dependencies 1990-2013 (Mtoe)



Source: Digest of United Kingdom Energy Statistics, Table 5.1.1 Fuel input for electricity generation, 1970 to 2013

<https://www.gov.uk/government/statistics/electricity-chapter-5-digest-of-united-kingdom-energy-statistics-dukes>

Figure 5: Greenhouse gas emissions from energy supply, 1990-2013 (MtCO₂e)



Source: Tables 3 to 7, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Transport

The transport sector was responsible for around 21 percent of UK greenhouse gas emissions in 2013, almost entirely through carbon dioxide emissions. The main source of emissions from this sector is the use of petrol and diesel in road transport.

Between 1990 and 2013, there was relatively little overall change in the level of greenhouse gas emissions from the transport sector (emissions were around 3 percent lower in 2013 than in 1990). Emissions increased slightly up to 2007 and then have fallen again from 2008 onwards. Between 2012 and 2013 there was very little change (emissions were around 1 percent lower in 2013 than in 2012).

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 vehicles⁴ and the vehicle kilometres travelled⁵, emissions from passenger cars have decreased since the early 2000s due to lower petrol consumption outweighing an increase in diesel consumption⁶ and more recently, improvements in fuel efficiency of both petrol and diesel cars⁷. However, this decrease has been partially offset by an increase in emissions from light duty vehicles. 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.

Table 7: Transport sector emissions by gas
UK and Crown Dependencies, 1990-2013

	1990	1995	2000	2005	2010	2012	MtCO _{2e} 2013
Carbon dioxide	119.7	119.9	124.9	129.3	119.3	116.9	115.7
Methane	0.8	0.6	0.4	0.2	0.1	0.1	0.1
Nitrous oxide	1.3	1.7	1.5	1.2	0.9	1.0	1.0
F-gases	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	121.7	122.2	126.8	130.7	120.3	118.0	116.8

Source: Tables 3 to 7, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

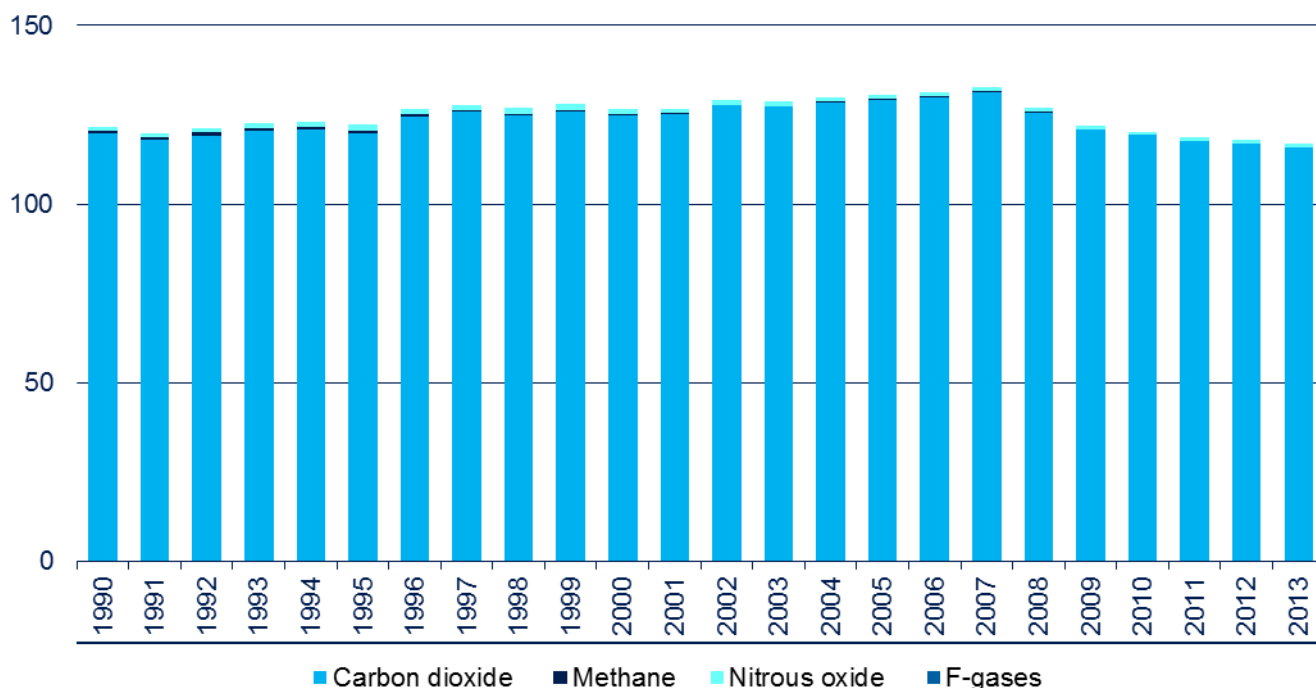
⁴ Transport Statistics Great Britain, Vehicles (TSGB09), Table TSGB0901 (VEH0103) Licensed vehicles by tax class, Great Britain, annually from 1909
<https://www.gov.uk/government/statistical-data-sets/tsgb09-vehicles>

⁵ Transport Statistics Great Britain, Modal comparisons (TSGB01), Table TSGB0101 Passenger Transport by mode, since 1952
<https://www.gov.uk/government/statistical-data-sets/tsgb01-modal-comparisons>

⁶ Transport Statistics Great Britain, Energy and environment (TSGB03), Table TSGB0301 (ENV0101) Petroleum consumption by transport mode and fuel type: United Kingdom, 2000-2013
<https://www.gov.uk/government/statistical-data-sets/tsgb03>

⁷ Transport Statistics Great Britain, Energy and environment (TSGB03), Table TSGB0301 (ENV0103) Average new car fuel consumption: Great Britain 1997-2013
<https://www.gov.uk/government/statistical-data-sets/tsgb03>

Figure 6: Greenhouse gas emissions from transport, UK and Crown Dependencies 1990-2013 (MtCO₂e)



Source: Tables 3 to 7, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Business

The business sector was responsible for 16 percent of UK greenhouse gas emissions in 2013, 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 also significant. The business sector is responsible for the majority of emissions from F-gases.

2013 emissions from the business sector were 21 percent lower than 1990 emissions. Most of this decrease came between 2001 and 2009, with a significant drop in 2009 likely driven by economic factors. There has been little change in emissions since 2009. The main driver of the decrease in emissions since 1990 is a reduction in emissions from industrial combustion (including iron and steel) which has led to a reduction in carbon dioxide emissions of 33 percent since 1990. However, emissions from F-gases have increased significantly, mainly due to an increase in emissions from refrigeration and air-conditioning due to an increase in hydrofluorocarbon (HFC) emissions as HFCs replaced replacing 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.

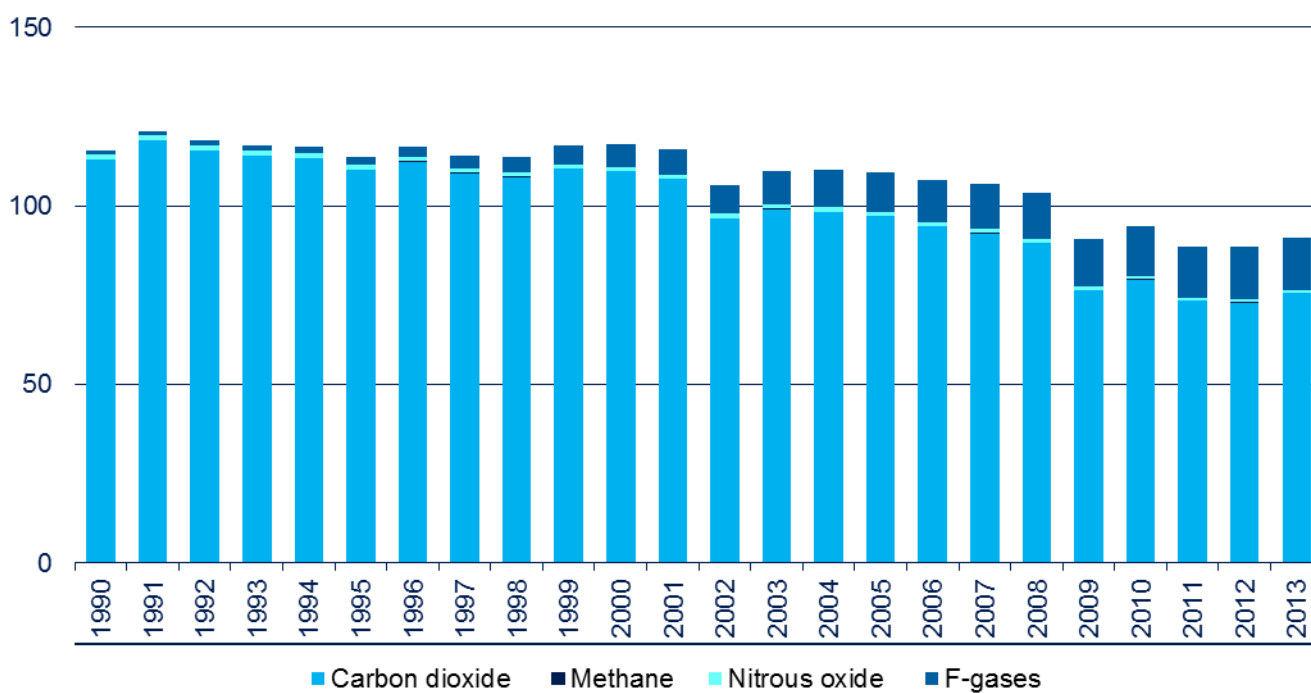
Between 2012 and 2013 there was a 3 percent increase in emissions from the business sector, which is largely due to increased use of manufactured fuels in the iron and steel industry caused by the re-opening of Teesside Steelworks in April 2012 since when it has gradually increased operations, and the opening of a furnace at Port Talbot in February 2013.

Table 8: Business sector emissions by gas
UK and Crown Dependencies, 1990-2013

	MtCO ₂ e						
	1990	1995	2000	2005	2010	2012	2013
Carbon dioxide	112.8	110.1	109.7	97.1	79.3	72.9	75.5
Methane	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Nitrous oxide	1.4	1.3	1.1	1.2	0.9	0.9	0.8
F-gases	1.1	2.2	6.3	11.1	14.1	14.6	14.6
Total	115.4	113.7	117.2	109.5	94.4	88.4	90.9

Source: Table 3 to 7, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Figure 7: Greenhouse gas emissions from business, UK and Crown Dependencies 1990-2013 (MtCO₂e)



Source: Tables 3 to 7, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Residential

The residential sector was responsible for around 14 percent of UK greenhouse gas emissions in 2013, with carbon dioxide being the most prominent gas for this sector. The main source of emissions from this sector is the use of natural gas for heating and cooking. Emissions of F-gases in this sector are related to the use of aerosols and metered dose inhalers.

It should be noted that since these figures are estimates of emissions by source, emissions related to residential electricity use, including for heating, are attributed to power stations, and are therefore included in the energy supply sector rather than the residential sector.

In general, carbon dioxide emissions from this sector are particularly 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.

Between 1990 and 2013, there has been 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 and 2012 were exceptions to this, due to the particularly cold weather experienced in 2010 and warm weather in 2011.

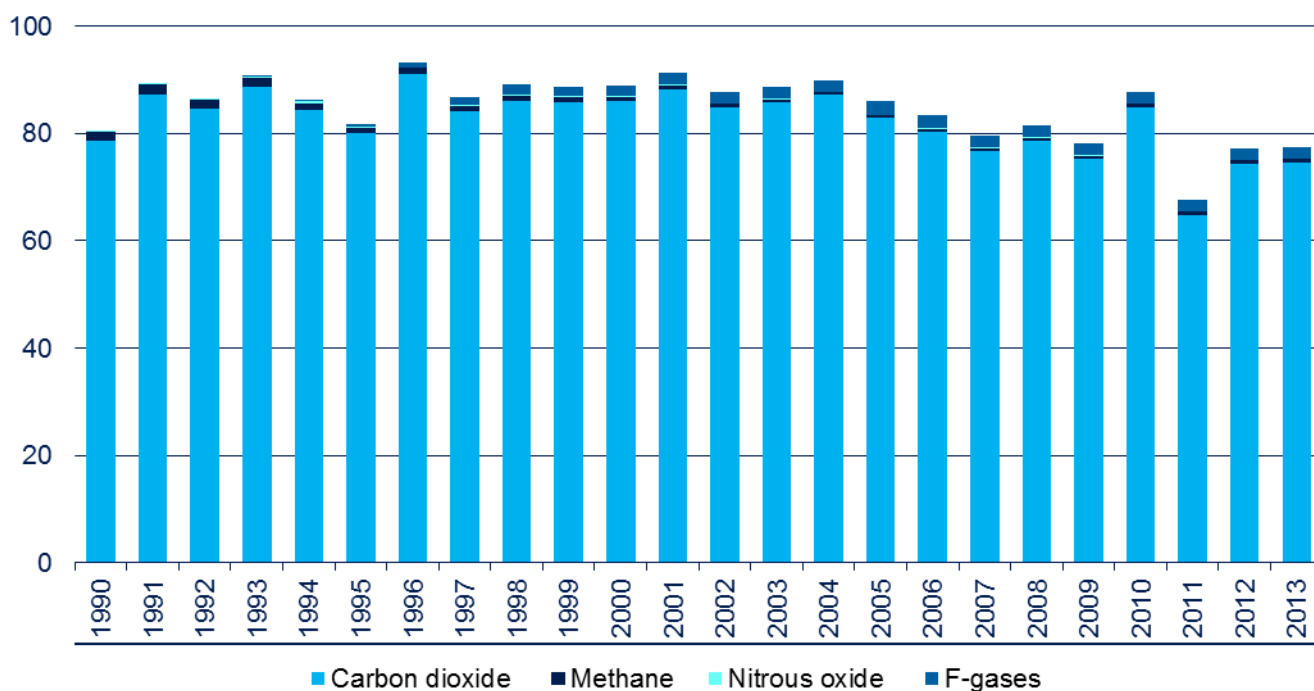
Between 2012 and 2013 there was little change in emissions from this sector.

Table 9: Residential sector emissions by gas
UK and Crown Dependencies, 1990-2013

	MtCO ₂ e						
	1990	1995	2000	2005	2010	2012	2013
Carbon dioxide	78.6	80.0	86.1	83.0	84.9	74.4	74.7
Methane	1.7	1.0	0.8	0.5	0.6	0.6	0.6
Nitrous oxide	0.3	0.2	0.2	0.1	0.1	0.1	0.1
F-gases	0.0	0.7	2.0	2.4	2.1	2.2	2.2
Total	80.6	81.9	89.0	86.0	87.8	77.3	77.6

Source: Tables 3 to 7, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Figure 8: Greenhouse gas emissions from the residential sector, UK and Crown Dependencies 1990-2013 (MtCO₂e)



Source: Tables 3 to 7, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Agriculture

The agriculture sector was responsible for 9 percent of UK greenhouse gas emissions in 2013. Emissions of nitrous oxide (50 percent) and methane (41 percent) 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.

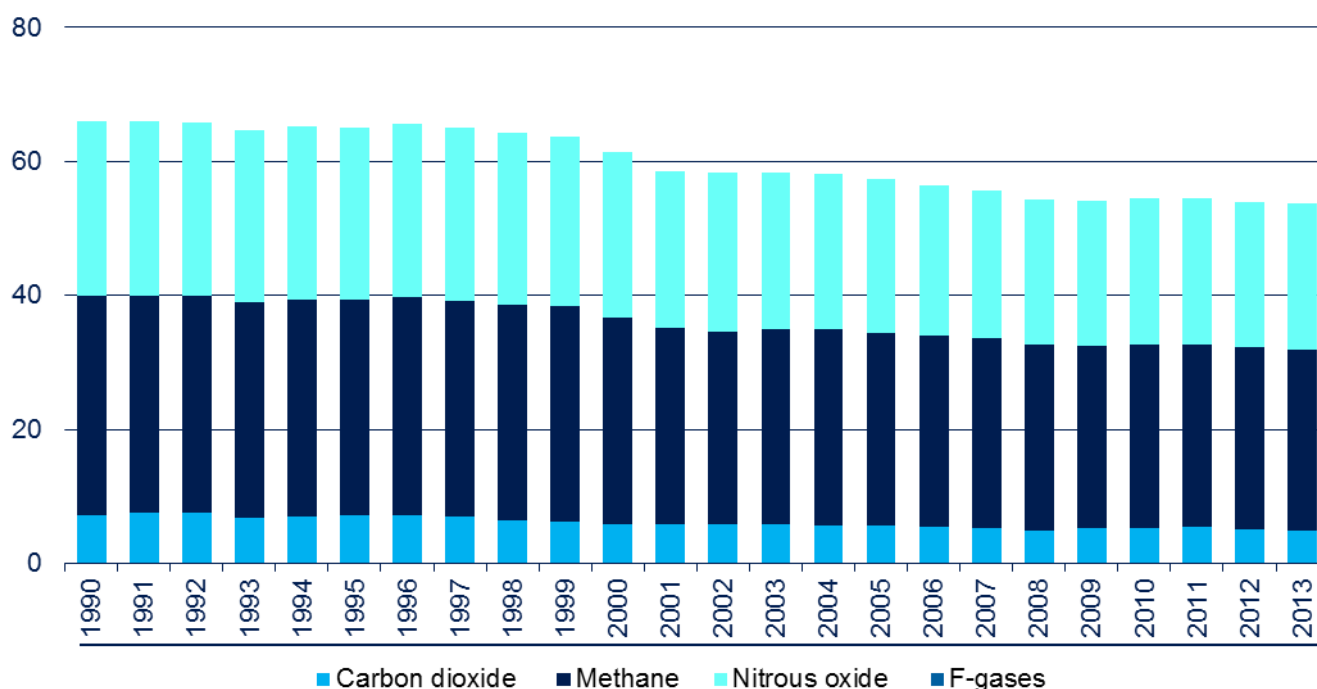
Between 1990 and 2013, greenhouse gas emissions from agriculture have decreased by around 19 percent, due to a general downward trend since the late 1990s. This reduction was driven by a fall in animal numbers over the period, together with a decrease in synthetic fertiliser use. Between 2012 and 2013 there was very little change in emissions from the agriculture sector.

Table 10: Agriculture sector emissions by gas
UK and Crown Dependencies, 1990-2013

	MtCO ₂ e						
	1990	1995	2000	2005	2010	2012	2013
Carbon dioxide	7.1	7.2	5.8	5.6	5.2	5.1	4.9
Methane	32.7	32.1	31.0	28.8	27.4	27.1	27.0
Nitrous oxide	26.1	25.8	24.6	22.9	22.0	21.7	21.8
F-gases	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	66.0	65.1	61.4	57.3	54.6	54.0	53.7

Source: Tables 3 to 7, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Figure 9: Greenhouse gas emissions from agriculture, UK and Crown Dependencies 1990-2013 (MtCO₂e)



Source: Tables 3 to 7, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Waste management

The waste management sector was responsible for around 4 percent of UK greenhouse gas emissions in 2013, with methane being by far the most prominent gas (91 percent). The vast majority of these emissions are from landfill sites.

Between 1990 and 2013, greenhouse gas emissions from the waste management sector decreased by 67 percent. 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 69 percent over the period.

Between 2012 and 2013, emissions from waste management fell by 14 percent (3.7 MtCO_{2e}), reflecting a continuation of the trend seen in recent years of a decrease in emissions from landfill waste.

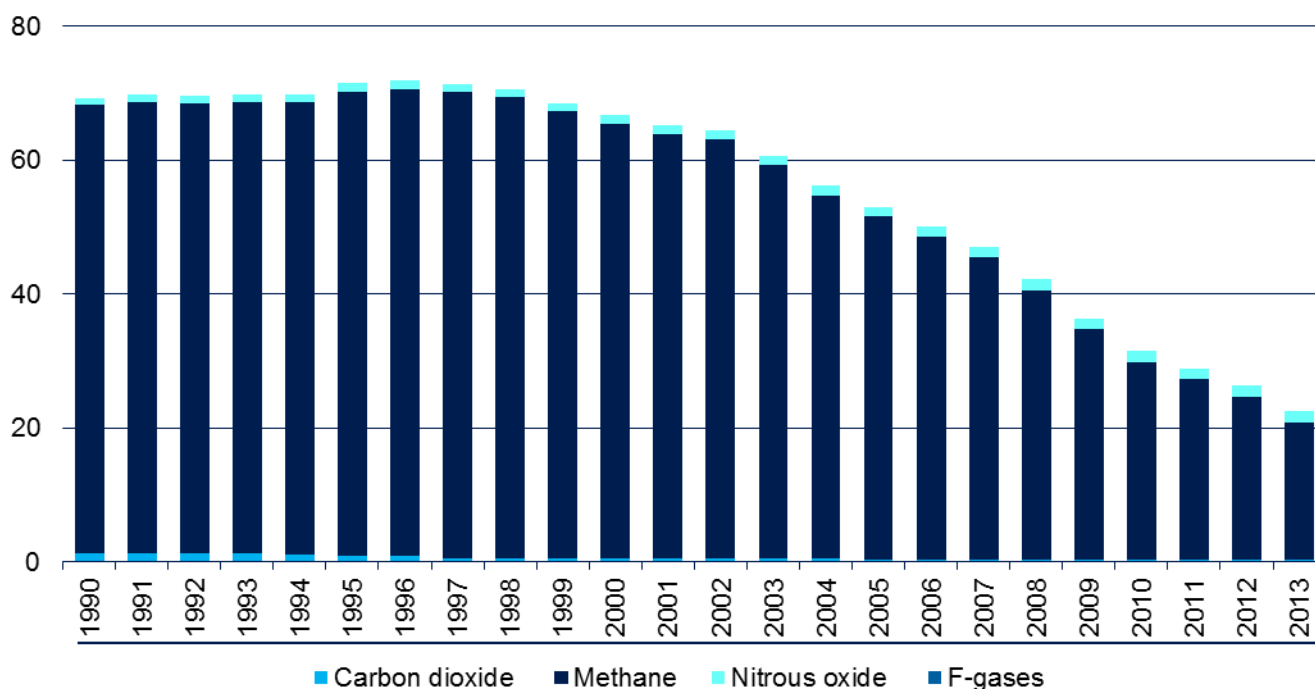
Table 11: Waste management sector emissions by gas

UK and Crown Dependencies, 1990-2013

	MtCO _{2e}						
	1990	1995	2000	2005	2010	2012	2013
Carbon dioxide	1.3	0.9	0.5	0.4	0.3	0.2	0.3
Methane	66.9	69.4	65.0	51.2	29.6	24.4	20.6
Nitrous oxide	1.1	1.2	1.3	1.4	1.6	1.7	1.7
F-gases	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	69.3	71.5	66.8	53.0	31.5	26.3	22.6

Source: Tables 3 to 7, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Figure 10: Greenhouse gas emissions from waste management, UK and Crown Dependencies 1990-2013 (MtCO_{2e})



Source: Tables 3 to 7, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Industrial process

The industrial process sector was responsible for 2 percent of UK greenhouse gas emissions in 2013, with carbon dioxide being the most prominent gas. The largest source of emissions is cement production, with other processes such as sinter and lime production and blast furnace gas also contributing significantly.

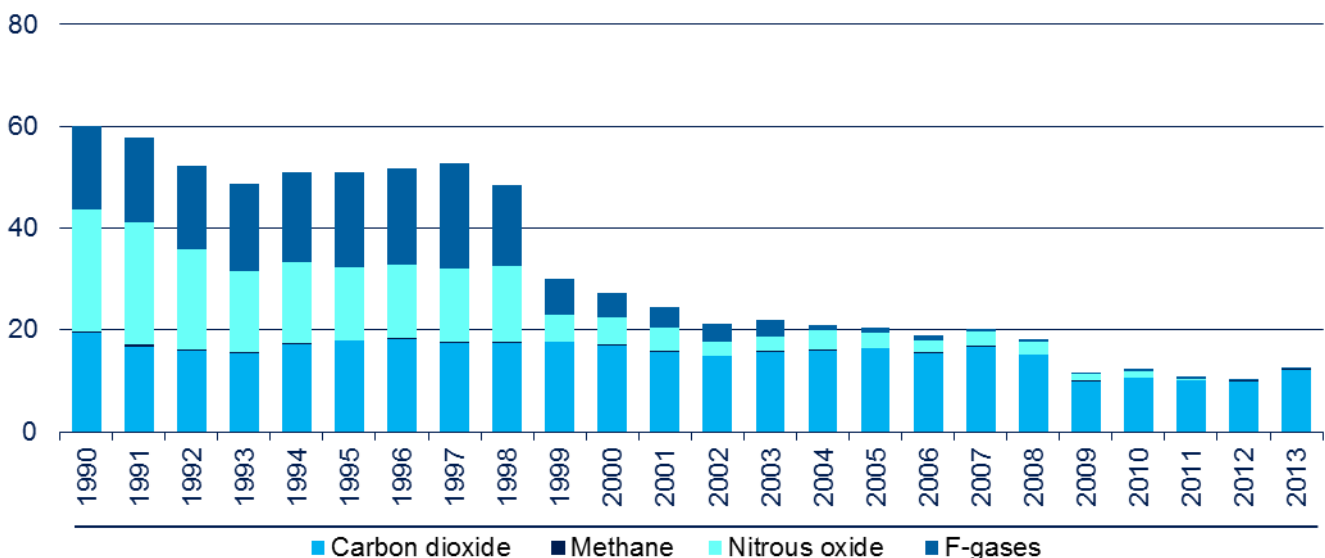
Between 1990 and 2013, there has been a large reduction in greenhouse gas emissions from the industrial process sector, with an overall decrease of around 79 percent. This was most notably due to a large reduction in emissions from adipic acid production and halocarbon production between 1998 and 1999 (combined emissions from which are now almost zero), although there has been a general downward trend in emissions over the period. Between 2012 and 2013, emissions from the industrial process sector increased by around 22 percent (2.3 MtCO₂e). This was due to increased sinter, cement, iron and steel production.

Table 12: Industrial process sector emissions by gas
UK and Crown Dependencies, 1990-2013

	MtCO ₂ e						
	1990	1995	2000	2005	2010	2012	2013
Carbon dioxide	19.5	17.8	17.1	16.4	10.6	9.9	12.2
Methane	0.3	0.2	0.2	0.1	0.1	0.1	0.1
Nitrous oxide	23.9	14.4	5.4	2.9	1.3	0.1	0.1
F-gases	16.3	18.5	4.6	1.0	0.5	0.3	0.3
Total	60.0	50.9	27.2	20.4	12.5	10.5	12.8

Source: Tables 3 to 7, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Figure 11: Greenhouse gas emissions from industrial processes, UK and Crown Dependencies 1990-2013 (MtCO₂e)



Source: Tables 3 to 7, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Public sector

The public sector was responsible for 2 percent of UK greenhouse gas emissions in 2013, with carbon dioxide making up almost all of these emissions. The main source of emissions from this sector is the use of natural gas for heating public buildings.

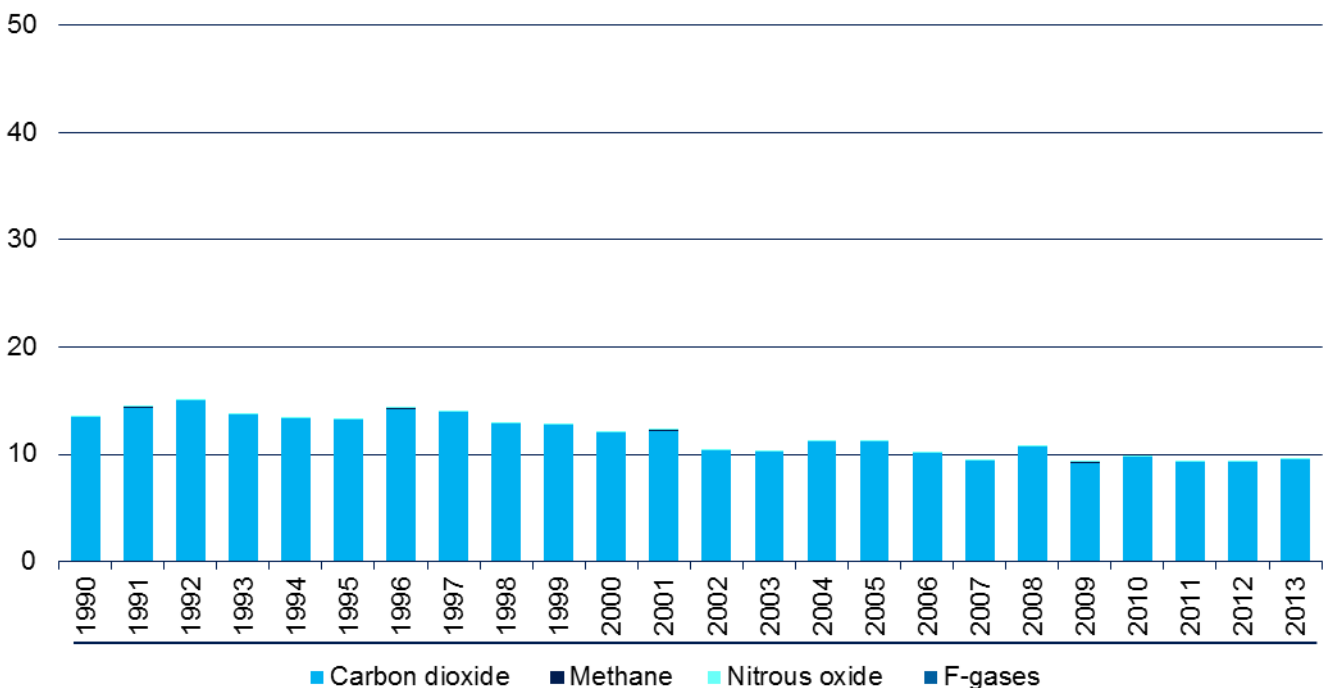
Between 1990 and 2013, there has been a general downward trend in greenhouse gas emissions from the public sector, with an overall decrease of around 30 percent. This has been largely driven by a reduction in the use of oil and coal in this sector. Between 2012 and 2013 there was little change in emissions from the public sector.

Table 13: Public sector emissions by gas
UK and Crown Dependencies, 1990-2013

	MtCO ₂ e						
	1990	1995	2000	2005	2010	2012	2013
Carbon dioxide	13.4	13.2	12.0	11.1	9.7	9.3	9.5
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	13.5	13.3	12.1	11.2	9.8	9.3	9.5

Source: Tables 3 to 7, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Figure 12: Greenhouse gas emissions from the public sector, UK and Crown Dependencies 1990-2013 (MtCO₂e)



Source: Tables 3 to 7, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Land Use, Land Use Change and Forestry (LULUCF)

The LULUCF sector acted as a net sink of UK greenhouse gas emissions in 2013, dominated by carbon dioxide emissions. 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.

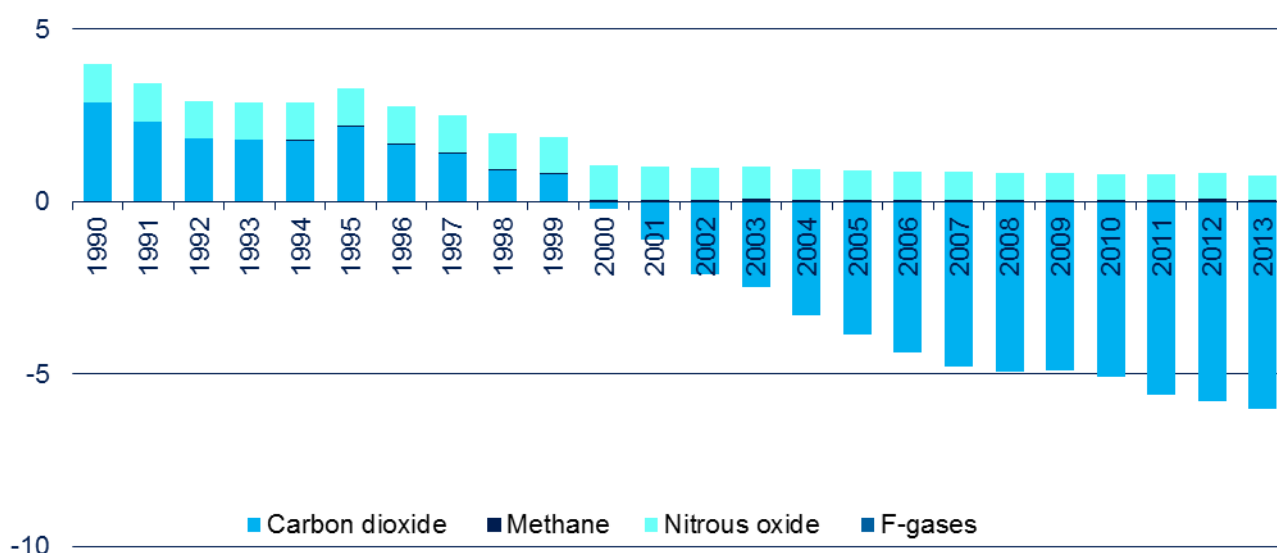
Between 1990 and 2013, the UK has gone from being a net source of LULUCF emissions to a net sink driven by land converted to cropland and forest land, with an increasing uptake of carbon dioxide by trees as they reach maturity, in line with the historical planting pattern. There has also been some reduction in emissions since 1990 due to less intensive agricultural practices. Between 2012 and 2013, LULUCF became a slightly larger emissions sink with net emissions decreasing by 0.3 MtCO₂e.

Table 14: LULUCF sector emissions by gas
UK and Crown Dependencies, 1990-2013

	MtCO ₂ e						
	1990	1995	2000	2005	2010	2012	2013
Carbon dioxide	2.9	2.2	-0.2	-3.8	-5.1	-5.8	-6.0
Methane	0.0	0.0	0.0	0.1	0.0	0.1	0.0
Nitrous oxide	1.1	1.1	1.0	0.9	0.7	0.7	0.7
F-gases	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	4.0	3.3	0.8	-2.9	-4.3	-5.0	-5.3

Source: Tables 3 to 7, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Figure 13: Greenhouse gas emissions from the LULUCF sector, UK and Crown Dependencies 1990-2013 (MtCO₂e)



Source: Tables 3 to 7, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

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 2013, emissions from international aviation fuel use were estimated to be 32.2 million tonnes carbon dioxide equivalent. This was 0.6 percent lower than the 2012 figure of 32.4 million tonnes of carbon dioxide equivalent. Between 1990 and 2006, when emissions peaked, emissions more than doubled from 15.6 million tonnes of carbon dioxide equivalent to 35.6 million tonnes of carbon dioxide equivalent. Since 2006 there has been a slowly declining trend. Emissions in 2013, though lower than in 2012, 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 2013, emissions from UK international shipping bunkers were estimated to be 8.7 million tonnes carbon dioxide equivalent. This was 2.5 percent lower than the 2012 figure of 9.0 million tonnes. Since 1990, emissions from UK shipping bunkers have gone up and down, as can be seen in the graph below. The level of these emissions in 2013 was very similar to the 1990 level.

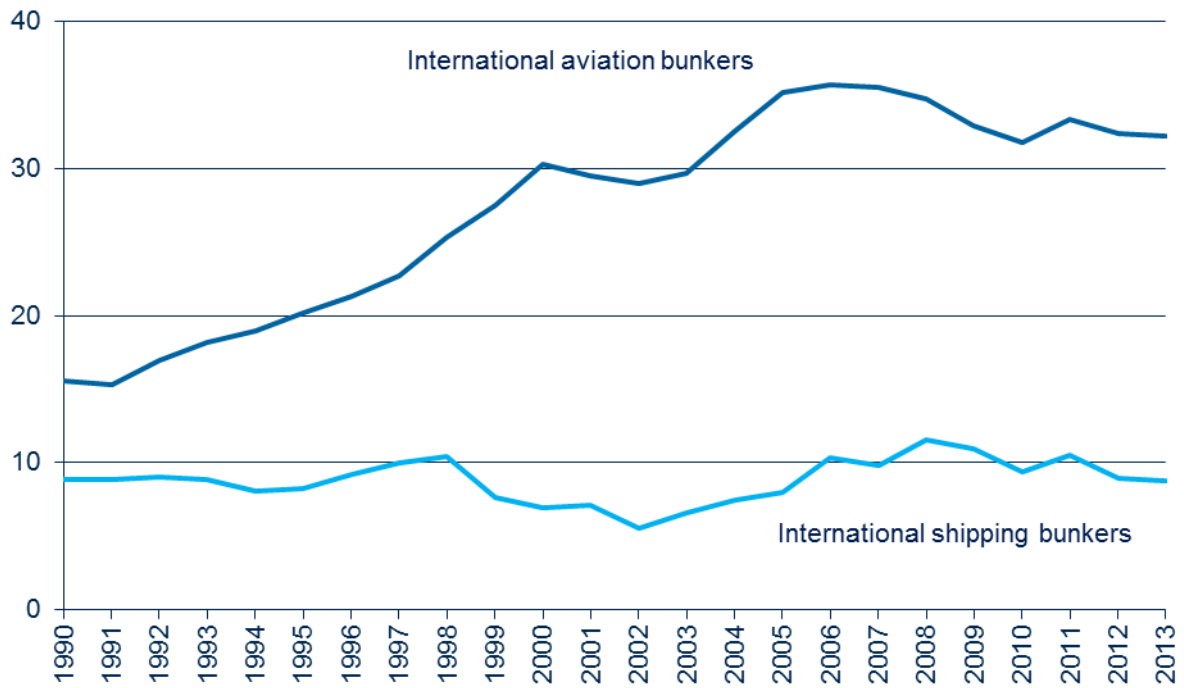
Table 15: Greenhouse gas emissions from UK-based international aviation and shipping bunkers
UK and Crown Dependencies, 1990-2013

	1990	1995	2000	2005	2010	2012	2013
International aviation	15.6	20.2	30.3	35.1	31.8	32.4	32.2
International shipping	8.9	8.3	6.9	8.0	9.4	9.0	8.7
Total	24.4	28.5	37.2	43.1	41.2	41.4	41.0

Source: Table 8, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Note: This table was republished to display the correct geographical coverage in the title due to it being incorrect at the time of publication on 3rd February 2015. No data has been revised.

Figure 14: Greenhouse gas emissions from UK-based international aviation and shipping bunkers, UK only, 1990-2013 (MtCO₂e)



Source: Table 8, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Revisions from provisional estimates of greenhouse gas emissions

Provisional estimates of 2013 UK greenhouse gas and carbon dioxide emissions were published in March 2014, 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, use of actual data to estimate non-CO₂ emissions which are only crudely estimated in the provisional estimates, and methodological changes to the way emissions are calculated.

Typically the provisional estimates provide a better indication of emissions trends than of absolute emissions, as they do not take account of any methodological improvements that may be made to the way emissions are calculated and which can lead to revisions to the whole emissions time series from 1990 onwards. More information on revisions to the time series can be found in the next section.

In March 2014, it was provisionally estimated that total greenhouse gas emissions in 2013 for the UK and Crown Dependencies would be 564.2 million tonnes carbon dioxide equivalent, a 1.9 percent decrease on 2012 emissions. The final estimate of 2013 emissions is 568.3 million tonnes, around 1 percent higher than the provisional estimate and representing a 2.4 percent decrease on 2012 emissions.

It should be noted that the headline figures reported in the 2013 provisional emissions statistics were based on UK Kyoto Protocol coverage and accounting, and are slightly different to the figures quoted above which are for UK and Crown Dependency emissions. The reason for the change is that because the second commitment period of the Kyoto Protocol started in 2013, there have been some changes to Kyoto Protocol accounting which mean that Kyoto Protocol coverage figures for 2012 and 2013 are not directly comparable.

The provisional estimates are focused on carbon dioxide emissions from the energy sector, and only provide a crude estimate of non-CO₂ gases. Looking just at carbon dioxide emissions, it was provisionally estimated that net UK carbon dioxide emissions in 2013 would be 464.3 million tonnes. The final 2013 figure of 467.5 million tonnes is around 1 percent higher than the provisional estimate. The difference between 2012 and 2013 emissions in the provisional estimate was very close to the actual figure (a decrease of around 2 percent).

Table 16: Comparison of 2013 provisional and final estimates
UK and Crown Dependencies, 2012-2013

MtCO₂e

	Provisional estimates				Final estimates			
	2012	2013	Change	% change	2012	2013	Change	% change
Energy Supply	192.9	178.5	-14.5	-7.5%	193.3	180.8	-12.5	-6.5%
Transport	116.9	116.7	-0.2	-0.2%	116.9	115.7	-1.3	-1.1%
Business	73.3	75.4	2.1	2.9%	72.9	75.5	2.6	3.5%
Residential	74.9	76.9	2.0	2.6%	74.4	74.7	0.3	0.4%
Agriculture	4.1	4.1	0.0	0.0%	5.1	4.9	-0.2	-4.1%
Waste Management	0.3	0.3	0.0	0.0%	0.2	0.3	0.0	1.1%
Industrial Process	9.3	9.8	0.6	6.2%	9.9	12.2	2.3	23.3%
Public	10.1	10.4	0.2	2.4%	9.3	9.5	0.2	2.6%
LULUCF	-7.7	-7.7	0.0	0.0%	-5.8	-6.0	-0.2	3.7%
Total CO ₂	474.1	464.3	-9.8	-2.1%	476.3	467.5	-8.8	-1.8%
Other greenhouse gases	101.3	99.9	-1.4	-1.4%	105.9	100.9	-5.1	-4.8%
Total greenhouse gas emissions	575.4	564.9	-11.2	-1.9%	582.2	568.3	-13.9	-2.4%

Source: Tables 2 to 3, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Table 1, Provisional UK greenhouse gas emissions national statistics 2013 Excel data tables

Note: The breakdown by sector shown in the table is for carbon dioxide emissions only.

Revisions to the UK's Greenhouse Gas 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 emissions time series 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 2013 Inventory (the time series of emissions from 1990 to 2013 which is consistent with these statistics), the most notable changes to the historical series since the 2012 Inventory was published are linked to new data and research which have become available in relation to a number of specific sectors, and to the introduction of new reporting guidelines. Details of the changes made to emissions estimates are given below.

Table 17: Revisions in the 2013 inventory, by sector
UK and Crown Dependencies, 1990-2013

	1990 emissions			2012 emissions			MtCO ₂ e
	2012	2013	Change	2012	2013	Change	
	inventory	inventory		inventory	inventory		
Energy Supply	272.4	278.8	6.5	202.0	203.5	1.5	
Transport	121.6	121.7	0.2	118.0	118.0	0.0	
Business	116.0	115.4	-0.6	86.7	88.4	1.7	
Residential	80.8	80.6	-0.2	77.5	77.3	-0.2	
Agriculture	71.1	66.0	-5.1	56.6	54.0	-2.6	
Waste Management	47.3	69.3	22.1	21.6	26.3	4.7	
Industrial Process	54.8	60.0	5.2	9.8	10.5	0.6	
Public	13.1	13.5	0.4	10.1	9.3	-0.9	
LULUCF	1.9	4.0	2.1	-7.0	-5.0	2.0	
Total	778.9	809.4	30.5	575.4	582.2	6.8	

Source: Table 3, Final UK greenhouse gas emissions national statistics 1990-2013 Data tables
Table 3, Final UK greenhouse gas emissions national statistics 1990-2012 Data tables

Changes as a result of updated reporting guidelines from the Intergovernmental Panel on Climate Change (IPCC)

The UK's greenhouse gas inventory is required to comply with reporting guidelines published by the IPCC. These guidelines have been revised for this year and have added new sources and new gases. New sources include nitrous oxide use in anaesthesia and emissions from UK composting. Nitrogen trifluoride gas (NF₃) has been included for the first time, although it is only emitted in tiny amounts in the UK. Some existing sources have also been updated with new methodologies.

Finally, the global warming potentials (GWPs) used for each gas have been updated to those published in the IPCC's 4th Assessment Report⁸. GWPs allow each gas to be put in the same context. Carbon dioxide is used as the basis for comparison and is given a value of '1'. The GWP for methane has increased from 21 to 25 (meaning that methane emissions expressed as CO₂ equivalent are higher than they previously were), and the GWP for nitrous oxide has decreased from 310 to 298 (meaning that nitrous oxide emissions expressed as CO₂ equivalent are lower than they previously were). The largest impact of the GWP changes is on the agriculture and waste management sectors.

Waste Management - changes to estimates of emissions from landfill sites

There have been several specific changes in this area. New information from the Environment Agency and the Scottish Environmental Protection Agency on the volumes of landfill gas flared at UK landfill sites has been used; previously these volumes had been estimated. New research from Defra has shown that the rate at which degradable waste is estimated to decay over time is slightly higher than previously thought, which increases emissions in the early part of the time series and decreases them after 2009. More minor updates included changes to assumptions of gas combustion engine efficiency and new data on waste composition. Overall these are estimated to increase emissions by around 11 MtCO₂e in 1990 and reduce them by around 2 MtCO₂e in 2012.

Agriculture – methodological changes

New research from Defra has produced updated estimates of the average weights of dairy cattle and beef cattle. In addition new information on the manure management practices of UK farms has been included and the total area of organic soils in the UK has been updated. The latter issue is also described in the point below. These changes are estimated to increase emissions by around 3 MtCO₂e in both 1990 and 2012 (though overall emissions from the agriculture sector have decreased).

LULUCF - changes to the area of UK cropland on drained organic soils

Defra have published revised UK land areas of cropland on organic soils which have been drained for agricultural purposes. Therefore emissions from this change of land use have been revised, causing an increase in emissions of around 4 MtCO₂e across the time series.

Other changes to emissions

Some allocations of fuel use have been changed in the Digest of UK Energy Statistics in response to conversations with the relevant industries. This has increased emissions as more fuel use has been allocated to activities which combust the fuel, and therefore release emissions.

The EU Emissions Trading Scheme has increased its scope as of 2013, and more installations and processes have been included. This has provided new information for the inventory, for example chemical flaring at ethylene plant, which is included for the first time.

⁸ IPCC's 4th Assessment Report, <http://www.ipcc.ch/report/ar4/>

Emissions from fugitive emissions from gas and oil extraction in the UK have been revised to account for venting from the gas distribution network and better estimates of emissions from small coal mines.

Emission factors for coal, anthracite and coke have been updated to the IPCC default values as a result of questions received during the international review process. This has increased emissions by a small amount.

Overall impact on emissions

In total, the changes made to the methods and data for the 2015 inventory submission have increased emissions in 2012 by around 6.8 MtCO₂e and in 1990 by around 30.5 MtCO₂e.

UK emissions reduction targets

The UK has both international and domestic targets for reducing greenhouse gas emissions. Further details of each are summarised below.

2013 is the first year of the second commitment period of the Kyoto Protocol, and also the first year of the UK's second carbon budget period. It is also the first year to which EU Effort Sharing Decision targets apply. Because of these changes, there are a number of details about the targets and the UK's emissions under these targets which have yet to be finalised. This means that these statistics don't include as complete an update on UK progress against emissions reduction targets as has been the case in previous years. Further information about progress against emissions targets can be found in the "UK performance against emissions reduction targets" section on page 38.

Because of this a separate statistical note on UK progress against emissions targets will be published once more data become available (during March 2015), which will provide a further update on UK progress against the second carbon budget and its 2013 Effort Sharing Decision target. Once this note is published a link to it will be added to the webpage for these statistics.

Kyoto Protocol target

Under the first commitment period of the Kyoto Protocol, EU countries collectively made a commitment to reduce greenhouse gas emissions across the EU by 8 percent on 1990 levels by 2012. As part of this, the UK undertook to reduce total greenhouse gas emissions by 12.5 percent below base year levels (1990) over the five-year period 2008-12 under the EU burden sharing agreement (EU Decision 2002/358/EC).

While the first commitment period is now over and these statistics contain an estimate of UK emissions over this period, final reporting against the target will not take place until late 2015 or early 2016 to allow time for the UN to complete reviews of countries' final emissions inventories for the first commitment period, and for countries to carry out any emissions trading required to comply with targets. However, it is likely that when final reporting takes place the UK's emissions for the first commitment period will be the same as or very similar to the emissions presented in these statistics for the Kyoto basket of greenhouse gases over the period 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. In July 2007, the UK's Kyoto base year figure was set at 779.9 MtCO₂e, based on the 2006 UK Inventory submission. This means that to meet the UK's Kyoto commitment for the first commitment period (2008-2012), greenhouse gas emissions must be below 3,412 million tonnes carbon dioxide equivalent over the full five year period, or below 682.4 MtCO₂e on average per year.

The second commitment period of the Kyoto Protocol will run for eight years, from 2013 to 2020 inclusive. For this second commitment period, alongside the EU and its member States, the UK (including Gibraltar) communicated an independent quantified economy-wide emission reduction target of a 20 percent emission reduction by 2020 compared with 1990 levels (base year). The target for the European Union and its Member States is based on the understanding that it will be fulfilled jointly with the European Union and its Member States. The 20 percent

emission reduction target by 2020 is unconditional and supported by legislation in place since 2009 (Climate and Energy Package).

The climate and energy package implements the goal of reducing EU GHG emissions to 20 percent below 1990 levels by 2020. The reduction effort is shared out as follows:

- 21 percent reduction in emissions from sectors covered by the EU emissions trading system (EU ETS) compared to 2005 levels;
- Around a 10 percent reduction from most other sectors compared to 2005. These sectors are covered by the Effort Sharing Decision (ESD).

Once ratified this Kyoto target will cover the UK, and the relevant Crown Dependencies and Overseas Territories that wish to join the UK's ratification. As ratification is not yet complete and exact details of the UK's target for the second commitment period are still being finalised, these statistics do not include information on the UK's progress against its second commitment period target.

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 percent below 1990 baselines by 2050, with an interim target to reduce GHG emissions by at least 34 percent 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 emissions the UK 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 required that total UK greenhouse gas emissions did 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 percent 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 18 below shows details of the first four carbon budgets.

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

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

Source: Carbon Budgets. <https://www.gov.uk/government/policies/reducing-the-uk-s-greenhouse-gas-emissions-by-80-by-2050/supporting-pages/carbon-budgets>

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.

EU Effort Sharing Decision

The Effort Sharing Decision (ESD) was agreed as part of the 2008 EU Climate and Energy package and came into force from January 2013. It sets out targets for Member States to either reduce or limit emissions by a certain percentage in the non-traded sector (i.e. activities not included in the EU Emissions Trading System, but excluding LULUCF and NF₃ emissions) by 2020 from a 2005 baseline. The UK's target is to reduce emissions by 16 percent from 2005 levels, to be achieved through a declining target for emissions for each year from 2013-2020. This is reported annually through the inventory submission to the European Commission.

In March 2013, the European Commission published member state targets consistent with the scope of the EU ETS during the second trading period, from 2008 to 2012. In October 2013, the Commission published adjustments (under Article 10 of the ESD), to account for the change in the scope of the EU ETS between the second trading period and the third trading period (from 2013 to 2020). The final values were therefore calculated on the basis of these two Commission decisions.

The original deadline for reporting to the European Commission on 2013 ESD emissions was 15th January 2015, but this has been delayed due to software issues. UK 2013 emissions under the ESD are therefore not included in these statistics, but will be reported in a separate statistical note on UK progress against emissions targets once data become available.

Table 19: UK emission allocations under the Effort Sharing Decision

UK & Gibraltar, 2013-2020

MtCO ₂ e	
Year	Annual Emission Allocations
2013	358.7
2014	354.2
2015	349.7
2016	345.2
2017	340.7
2018	336.1
2019	331.6
2020	327.1

Source: Annual emission allocations, European Commission
http://ec.europa.eu/clima/policies/effort/framework/documentation_en.htm

Emissions Trading

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)*. 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 of the net ETS position 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.

The net ETS position for 2013 is unavailable at the time of publication as unlike Phase II, for Phase III of the EU ETS no annual caps have been specified at member state level. For UK carbon budget reporting purposes, a notional UK cap must be estimated for each year between 2013 and 2020. The details of how this notional cap will be calculated are still being agreed. Further information will be published in the UK's Annual Statement of Emissions for 2013, which will be published by 31st March 2015; and in a separate statistical note on progress against emissions reduction targets.

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. This means that emissions are either emitted elsewhere or emitted at a later stage, so they may not be used to offset UK emissions. The opposite occurs when reported emissions from EU ETS installations exceed the cap.

Table 20: EU ETS net trading position
UK, 2005-2012

	MtCO ₂ e							
	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	(1.9)	(1.9)	(1.9)	-	-	-	-	-
Net cancelled unallocated allowances/(sales) by UK Government ²	-	-	-	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)

Source: Table 9, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Note:

1. 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. These have been spread equally over each of the three years in Phase I.
2. 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 2008-2012, effectively reducing the cap by 0.9 MtCO₂e each year.

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 for all flights from, to and within the European Economic Area (EEA). However UK carbon budgets only cover domestic aviation (that is, aviation within the UK). Taking into account these changes in EU ETS, from 2013 onwards domestic aviation emissions will be included in the traded sector for UK carbon budget reporting purposes. To do so requires the calculation of a separate notional cap for UK domestic aviation, covering flights within the UK only. This information is not available at the time of publication, further details of this cap and its calculation will be presented in the 2013 Annual Statement of Emissions.

UK performance against emissions reduction targets

Kyoto Protocol target

UK emissions of the basket of six greenhouse gases covered by the Kyoto Protocol were an average 607.9 MtCO₂e per year over the first commitment period (2008-12), 22 percent lower than base year emissions. The UK's target for this period was a 12.5 percent reduction on base year emissions. Final reporting on the UK's emissions under the first commitment period will not take place until late 2015 or early 2016, but it is unlikely that there will be any significant changes to the emissions presented in these statistics.

For the second commitment period a UK target is yet to formally be agreed.

The Climate Change Act 2008

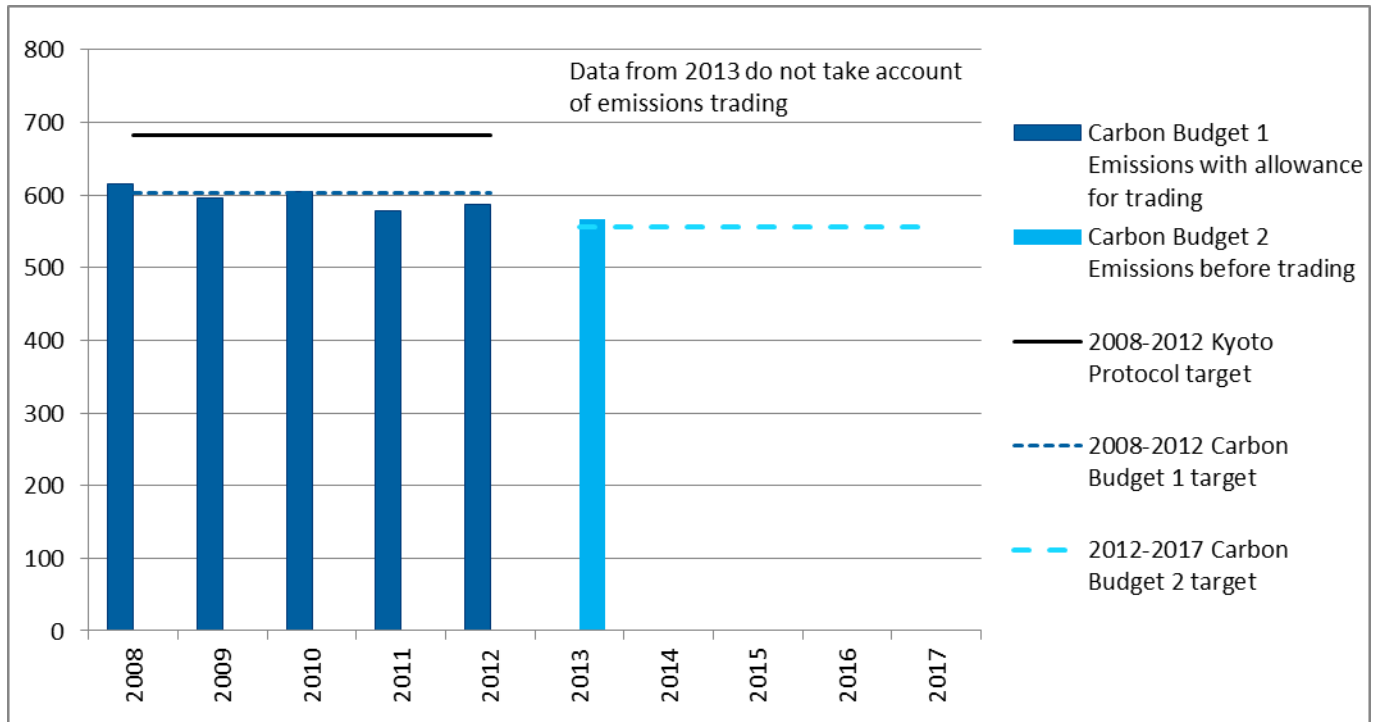
The first carbon budget ran from 2008 to 2012. In 2014, the UK confirmed that it had met the first carbon budget, with emissions 36 MtCO₂e below the cap of 3,018 MtCO₂e over the first carbon budget period.

UK greenhouse gas emissions for 2013 under carbon budget coverage (UK only, excluding Crown Dependencies and NF₃ emissions) were 566.5 MtCO₂e. However, for measuring progress against carbon budgets a figure for emissions net of EU ETS emissions trading is required. This information is not yet available for 2013, as a notional UK EU ETS cap for 2013 has not yet been finalised (see previous section). Further information will be published in the UK's Annual Statement of Emissions for 2013 (which will be published by 31st March 2015), and in a separate statistical note on UK progress against emissions reduction targets which will be published once data become available.

EU Effort Sharing Decision

UK greenhouse gas emissions for 2013 under the Effort Sharing Decision are not yet available, as the reporting deadline to the European Commission has been delayed due to software issues. These will be published in a separate statistical note on UK progress against emissions reduction targets once data become available.

Figure 15: UK's progress towards meeting Kyoto Protocol and carbon budget targets



Source: Table 9, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Note:

1. The chart shows emissions under carbon budgets coverage. These are slightly different to the emissions used to assess compliance against the Kyoto Protocol target.
2. For 2013 the emissions shown are before taking account of emissions trading, as emissions net of trading are not yet available. It is emissions net of trading that are used to assess final compliance against carbon budget targets.

Table 21: Performance against emissions reduction targets (MtCO₂e)
Kyoto Protocol and UK Carbon Budgets coverages, 1990-2013

								MtCO ₂ e
		Baseline	2008	2009	2010	2011	2012	2013
Kyoto Protocol greenhouse gas target								
No allowance for emission trading	All greenhouse gases (including net emissions/removals from LULUCF)	779.9	648.9	594.3	610.3	566.2	583.1	:
	Percentage change from baseline		-16.8%	-23.8%	-21.7%	-27.4%	-25.2%	:
EU ETS	Net purchases/(sales) by UK installations		19.9	(13.7)	(7.7)	(25.0)	(14.7)	:
	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)		20.8	(12.8)	(6.8)	(24.1)	(13.8)	:
With allowance for emissions trading	All greenhouse gases (including net emissions/removals from LULUCF)	779.9	628.2	607.1	617.1	590.3	596.9	:
	Percentage change from baseline		-19.5%	-22.2%	-20.9%	-24.3%	-23.5%	:
United Kingdom Carbon Budgets								
No allowance for emission trading	All greenhouse gases (including net emissions/removals from LULUCF)	811.4	635.9	582.5	598.0	554.9	573.5	566.5 ^b
	Percentage change from baseline		-18.5%	-25.3%	-23.4%	-28.9%	-26.5%	-30.2% ^b
	Net purchases/(sales) by UK installations		19.3	(13.5)	(7.6)	(24.9)	(14.5)	:
EU ETS	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)	811.4	615.7	595.2	604.7	579.0	587.1	:
	Percentage change from baseline		-21.1%	-23.7%	-22.5%	-25.8%	-24.8%	:

Source: Table 9, Final UK greenhouse gas emissions national statistics 1990-2013 Excel data tables

Note:

: means data not available. b means time series break

1. The EU ETS is the EU Emissions Trading System.
2. The Kyoto Protocol 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.
3. The Kyoto Protocol target includes emissions from the UK, Crown Dependencies and those UK Overseas Territories that have ratified the Kyoto Protocol. The target uses a narrower definition for the Land Use, Land-Use Change and Forestry sector (LULUCF) than is used elsewhere in these data tables.
4. Kyoto Protocol emissions are based on final figures from the UK's 2012 greenhouse gas inventory, as this is the inventory that will be used to assess compliance with the UK's target for the first commitment period of the Kyoto Protocol
5. The second commitment period of the Kyoto Protocol will run from 2013 to 2020. The UK's target for this period has not yet been finalised.
6. UK Carbon Budgets were introduced in 2008. Figures include emissions solely from the UK and exclude emissions from Crown Dependencies and UK Overseas Territories. NF₃ emissions are also excluded.
7. The carbon budget base year consists of emissions of CO₂, CH₄ and N₂O in 1990, and of HFCs, PFCs and SF₆ in 1995. Carbon budget percentage reductions against base year may not be consistent with target percentage reductions set out in the Carbon Plan and elsewhere, as the base year is revised each year to take account of revisions to 1990 and 1995 emissions data.
8. Emissions and percentage reductions against baseline shown for the first carbon budget period (2008 to 2012) are the final figures for the first carbon budget which were reported in 2014. This means that there is a time series break between 2012 and 2013, as 2013 figures are based on the most recent greenhouse gas inventory
9. Net EU ETS figures for 2013 are not yet available, as the notional UK EU ETS cap that will be used to calculate UK carbon budget emissions in 2013 has not yet been finalised.

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 2015, covered emissions up to and including the third quarter of 2014. This publication therefore included estimates of emissions for the 2013 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 2012 and 2013 were estimated to be 473.2 Mt and 458.7 Mt respectively. The decrease in carbon dioxide emissions between 2012 and 2013 in the temperature adjusted figures is therefore 14.5 Mt, greater than the decrease seen in the non-temperature adjusted figures (as can be seen in the table below).

Table 22: Comparison of quarterly emissions estimates with final emissions estimates
UK and Crown Dependencies, 1990-2013

	MtCO ₂ e			
	2012 CO ₂ emissions (Mt)	2013 CO ₂ emissions (Mt)	Absolute change (Mt)	Percentage change
Final estimates	476.3	467.5	-8.8	-1.8%
➤ actual emissions				
Quarterly estimates	474.1	464.9	-9.2	-1.9%
➤ actual emissions				
Quarterly estimates	473.2	458.7	-14.5	-3.1%
➤ Temperature adjusted emissions				

Source: Table 1, Final UK greenhouse gas emissions national statistics 1990-2013 Data tables

Table 1 & 3, Quarterly provisional emissions January 2015 Data tables.

Note: The actual emissions estimates from the quarterly figures differ from the actual emissions estimates in these statistics because the quarterly statistics were published before the 2013 inventory figures presented here were finalised. Quarterly statistics including final 2013 emissions figures will be published in April 2015.

Future updates to emissions estimates

DECC will publish a statistical note with a further update on the UK's progress against emissions reductions targets once data on the UK's 2013 Effort Sharing Decision emissions and on 2013 carbon budget emissions net of EU ETS trading are available. This is likely to be in early March 2015.

On Thursday 26th March 2015 DECC will be publishing a breakdown of 2013 UK emissions by end-user sector and fuel type, to supplement the source sector breakdown published today.

Also on Thursday 26th March DECC will be publishing provisional estimates of UK greenhouse gas emissions for 2014 as National Statistics. This will coincide with the publication of *Energy Trends*, which will include estimates of 2014 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 1970-2013, 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. 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 2013 must be laid before Parliament and published no later than 31st March 2015. This will give details of the net UK carbon account for 2013, 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 [2014 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 percent 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 2014 [Emissions of air pollutants in the UK, 1970 to 2013](#)

A National Statistics publication

National Statistics are produced to high professional standards set out in the Official Statistics Code of Practice. They undergo regular quality assurance reviews to ensure they meet customer needs.

© Crown copyright 2015

Department of Energy & Climate Change

3 Whitehall Place

London SW1A 2AW

www.gov.uk/decc

URN 15D/031