Department of Energy & Climate Change

2014 UK Greenhouse Gas Emissions, Provisional Figures

Annex: 1990 - 2013 UK Greenhouse Gas Emissions, final figures by end-user sector including uncertainties estimates.

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This document is also available from our website at: https://www.gov.uk/government/collections/provisional-uk-greenhouse-gas-emissions-national-statistics

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Executive summary

- This publication provides the latest provisional estimates of 2014 UK greenhouse gas emissions by source, and final estimates of 2013 UK greenhouse gas emissions by end-user sector.

- In 2014, UK emissions of the basket of seven greenhouse gases covered by the Kyoto Protocol were provisionally estimated to be 520.5 million tonnes carbon dioxide equivalent ($MtCO_2e$). This was 8.4 percent lower than the 2013 figure of 568.3 $MtCO_2e$.

- In 2014, UK net emissions of carbon dioxide were provisionally estimated to be 422.0 million tonnes (Mt). This was 9.7 percent lower than the 2013 figure of 467.5 Mt. Carbon dioxide (CO_2) is the main greenhouse gas, accounting for 82 percent of total UK greenhouse gas emissions in 2013, the latest year for which final emissions are available.

- The largest decrease between 2013 CO_2 emissions and provisional 2014 emissions was a 15 percent (27.6 Mt) decrease in the energy supply sector, due to a decrease in electricity generation coupled with a change in the fuel mix for electricity generation, with less use of coal than there was in 2013. The next largest decrease was from the residential sector.

- The sectoral breakdowns for provisional emissions are based on the source of the emissions. 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.

- For 1990-2013 emissions, an end-user breakdown is presented which reallocates emissions to where the “end-use” occurred. The main impact is to reallocate emissions from the energy supply sector to other sectors, the business and residential sectors in particular.

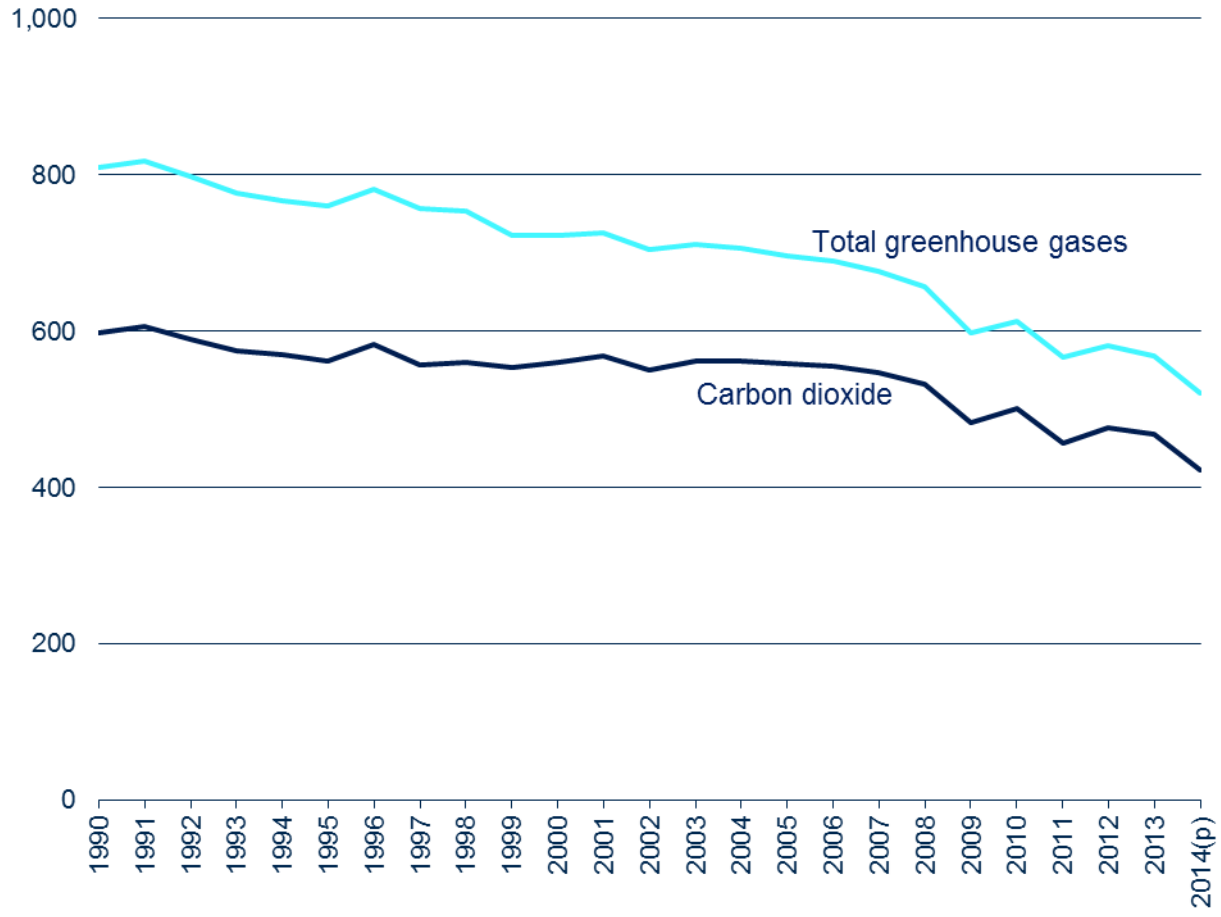
Table 1: Emissions of greenhouse gases
UK and Crown Dependencies

$MtCO_2e$

	2013	2014(p)	Change
Total greenhouse gas emissions	568.3	520.5	-8.4%
Carbon dioxide emissions	467.5	422.0	-9.7%

Note:
1. (p) 2014 estimates are provisional
2. Emissions are reported as net emissions, which include removals from the atmosphere by carbon sinks.

Figure 1: Emissions of greenhouse gases, UK and Crown Dependencies 1990-2014, ($MtCO_2e$)



Note: (p) 2014 estimates are provisional.

Introduction

This publication provides provisional estimates of UK greenhouse gas emissions by source sector for 2014. Due to the time taken to compile the UK's greenhouse gas emissions inventory, final estimates of 2014 emissions will not be available until February 2015. These provisional estimates are based on UK energy statistics for 2014, and provide an early indication of trends.

The provisional estimates are not used for any formal reporting of how the UK is performing against its emissions reduction targets, as this requires final estimates based on the UK's greenhouse gas inventory. However, these statistics give policy makers and other users an initial steer as to the trend in emissions between 2013 and 2014, which helps them to form an initial assessment of the extent to which the UK is on track to meet targets.

Final estimates of 1990 to 2013 UK greenhouse gas emissions by end-user, as well as uncertainty estimates for 2013 emissions by gas and sector, are included in the Annex to this publication. These are a follow up to, and are consistent with, the final estimates of 1990 to 2013 emissions by source which were published on 3rd February 2015. End user emissions re-allocate emissions from the Energy Supply sector to those sectors that use the energy. This makes it possible to see the full emissions impact of a particular end-use sector or sub-sector, and also enables the emissions to be further geographically disaggregated. Devolved administration and local authority emissions estimates, based on the end-user breakdown, will be published in June 2015.

The uncertainty estimates are used by government scientists to prioritise further research into improving emissions estimates, and more generally give users an indication of the robustness of the emissions estimates for different sectors.

Emissions by end user and by fuel type, and uncertainty data, are published separately in updated spreadsheet data tables alongside the final estimates for 2013 UK greenhouse gas emissions by source sector. Also published in this spreadsheet are uncertainties analysis for 2013 emissions by gas and sector. Note that this publication does not discuss 2013 emissions by fuel type, but these are included in the updated spreadsheet data tables published alongside this document.

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 (for example, emissions from cement manufacture).
- 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. The end-user breakdown reallocates emissions by source in to where the “end-use” occurred. The main impact is to reallocate emissions from the energy supply sector to other sectors, the business and residential sectors in particular. Some emissions are also allocated to an “exports” category in the end-user breakdown, this is for emissions within the UK from producing fuels (for example from a refinery or coal mine), which are subsequently exported or sent to bunkers for use outside the UK.

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.

No temperature or seasonal adjustments are applied to data in this publication. Temperature adjusted emissions are available in the quarterly emissions official statistics series, which will be updated to include emissions for the whole of 2014 on 14th April 2015.

Note that all 2014 greenhouse gas emissions and energy statistics figures in this statistics release are provisional and subject to change.

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. 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 ($CO_{2)}$ is reported in terms of *net* emissions, which means total emissions from burning fuel 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 ($MtCO_2e$).

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 emissions from 2013 onwards are not directly comparable with emissions from 1990 to 2012. 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.

2014 Provisional Emissions

Provisional estimates of carbon dioxide emissions are produced based on provisional inland energy consumption statistics which are being published at the same time in DECC's quarterly Energy Trends publication. Details of the provisional energy consumption statistics which have been used to estimate emissions can be found in Energy Trends.

Carbon dioxide accounts for the majority of UK greenhouse gas emissions (82 percent in 2013). However, in order to give an indication of what the latest provisional carbon dioxide emissions estimates imply for the basket total, an estimate of emissions is produced for the remaining gases in the basket. This estimate is based on a simple approach which assumes that the trend for these gases will be halfway between no change on 2013 and a repeat of the trend indicated by the last 14 years' data (2000-2013).

These provisional emissions estimates will be subject to revision when the final estimates are published in February 2016; however, they provide an early indication of emissions in the most recent full calendar year. The majority of provisional estimates in the past have been within 2 percent of the final figures.

In 2014, an estimated 36 percent of carbon dioxide emissions were from the energy supply sector, 28 percent from transport, 17 percent from business and 15 percent from the residential sector.

Between 2013 and 2014, provisional estimates indicate that carbon dioxide emissions decreased by 9.7 percent (45.5 million tonnes (Mt)). Emissions in the energy supply sector decreased by 15.3 percent (27.6 Mt) driven by a decrease in electricity generation and a change in the fuel mix for electricity generation, with less use of coal. Emissions decreased by 7.2 percent (5.5 Mt) in the business sector and 16.6 percent (12.4Mt) in the residential sector due a decrease in the use of natural gas for space heating. Transport sector emissions increased by 1.1 percent (1.2 Mt).

Since 1990, UK carbon dioxide emissions have decreased by 29 percent. This fall in emissions has coincided with a decrease in overall energy consumption over the period, of around 10 percent. If this figure is adjusted to allow for the effect of temperature, energy consumption has fallen by around 11 percent between 1990 and 2014. 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 and a decline in the relative importance of energy intensive industries.

Table 2: UK Greenhouse Gas Emissions 1990-2014, headline results

UK and Crown Dependencies 1990-2014

$MtCO_2e$

	1990	1995	2000	2005	2010	2013	2014 (p)
Energy supply	242.6	210.8	203.6	218.7	196.4	180.8	153.1
from power stations	*203.4*	*163.4*	*158.5*	*172.9*	*156.6*	*146.7*	*121.0*
other Energy supply	*39.1*	*47.4*	*45.1*	*45.9*	*39.9*	*34.1*	*32.2*
Business	112.8	110.1	109.7	97.1	79.3	75.5	70.0
Transport	119.7	119.9	124.9	129.3	119.3	115.7	116.9
Public	13.4	13.2	12.0	11.1	9.7	9.5	8.4
Residential	78.6	80.0	86.1	83.0	84.9	74.7	62.3
Agriculture	7.1	7.2	5.8	5.6	5.2	4.9	4.9
Industrial process	19.5	17.8	17.1	16.4	10.6	12.2	12.0
Waste Management	1.3	0.9	0.5	0.4	0.3	0.3	0.3
LULUCF	2.9	2.2	-0.2	-3.8	-5.1	-6.0	-6.0
Total CO_2	597.9	562.0	559.5	557.8	500.8	467.5	422.0
Other greenhouse gases	211.5	198.6	163.4	138.8	112.6	100.9	98.5
Total greenhouse gases	**809.4**	**760.6**	**722.8**	**696.6**	**613.3**	**568.3**	**520.5**

Note:

1. (p) 2014 estimates are provisional.
2. Provisional 2014 CO_2 emissions for the agriculture, waste and LULUCF sectors are assumed to be the same as 2013 estimates as unlike other CO_2 estimates these cannot be estimated from energy statistics.
3. The entire time series is revised each year to take account of methodological improvements in the UK emissions inventory.
4. Emissions are presented as carbon dioxide equivalent in line with international reporting and carbon trading. To convert carbon dioxide into carbon equivalents, divide figures by 44/12.
5. Figures shown do not include any adjustment for the effect of the EU Emissions Trading System (EU ETS), which was introduced in 2005.
6. Totals for CO_2 emissions, Energy Supply and Total greenhouse gases may not sum due to rounding.

Energy supply

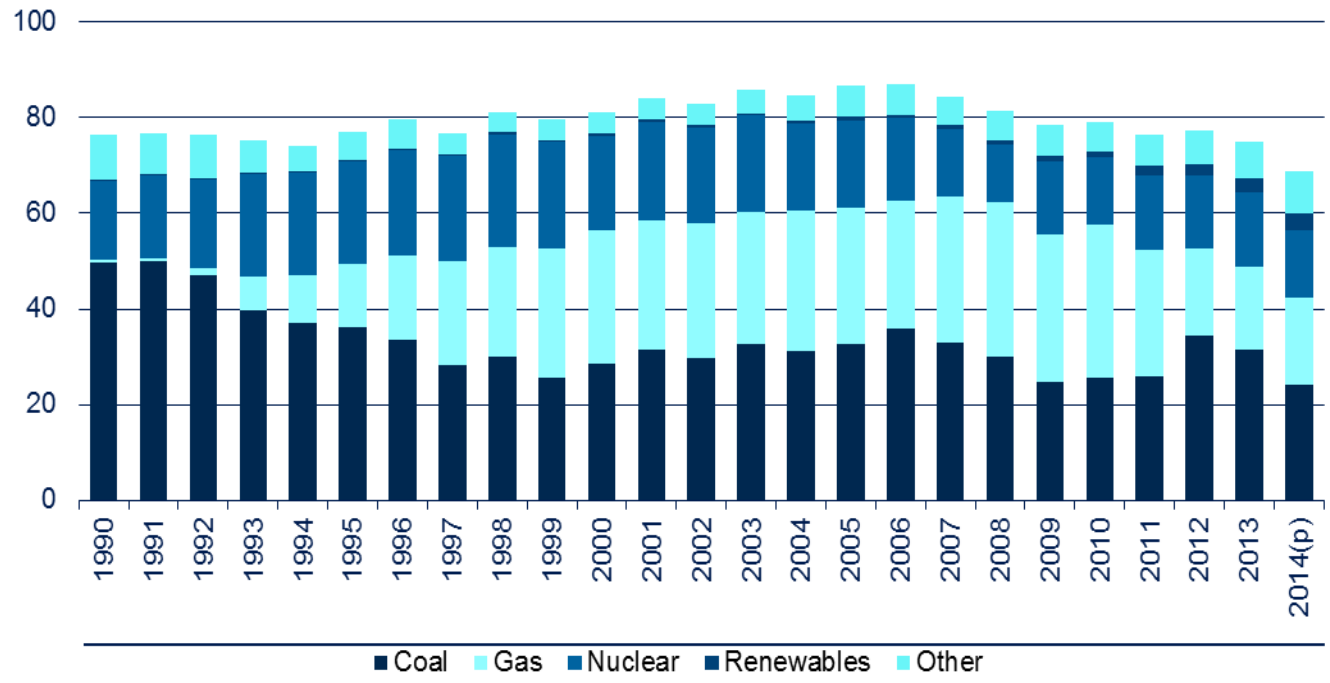
The energy supply sector was the largest contributor to the decrease in carbon dioxide emissions between 2013 and 2014. Carbon dioxide emissions from this sector were provisionally estimated to be 153.1 Mt in 2014, a decrease of around 15 percent (27.6 Mt) compared to 2013.

Since 2013 emissions from power stations have decreased by 18 percent, largely due to a reduction of 7 percent in electricity generation. There were also changes to the fuel mix used at power stations for electricity generation, with a 23 percent decrease in coal use for generation and increases in the use of gas and renewables. In 2014, carbon dioxide emissions from power stations, at 121.0 Mt, accounted for just over a quarter of all carbon dioxide emissions.

Looking at longer term trends, carbon dioxide emissions from the energy supply sector were estimated to be around 37 percent lower in 2014 than they were in 1990. This decrease has resulted mainly from changes in the mix of fuels being used for electricity generation, including fuel switching from coal to gas and the growth of renewables, together with greater efficiency resulting from improvements in technology.

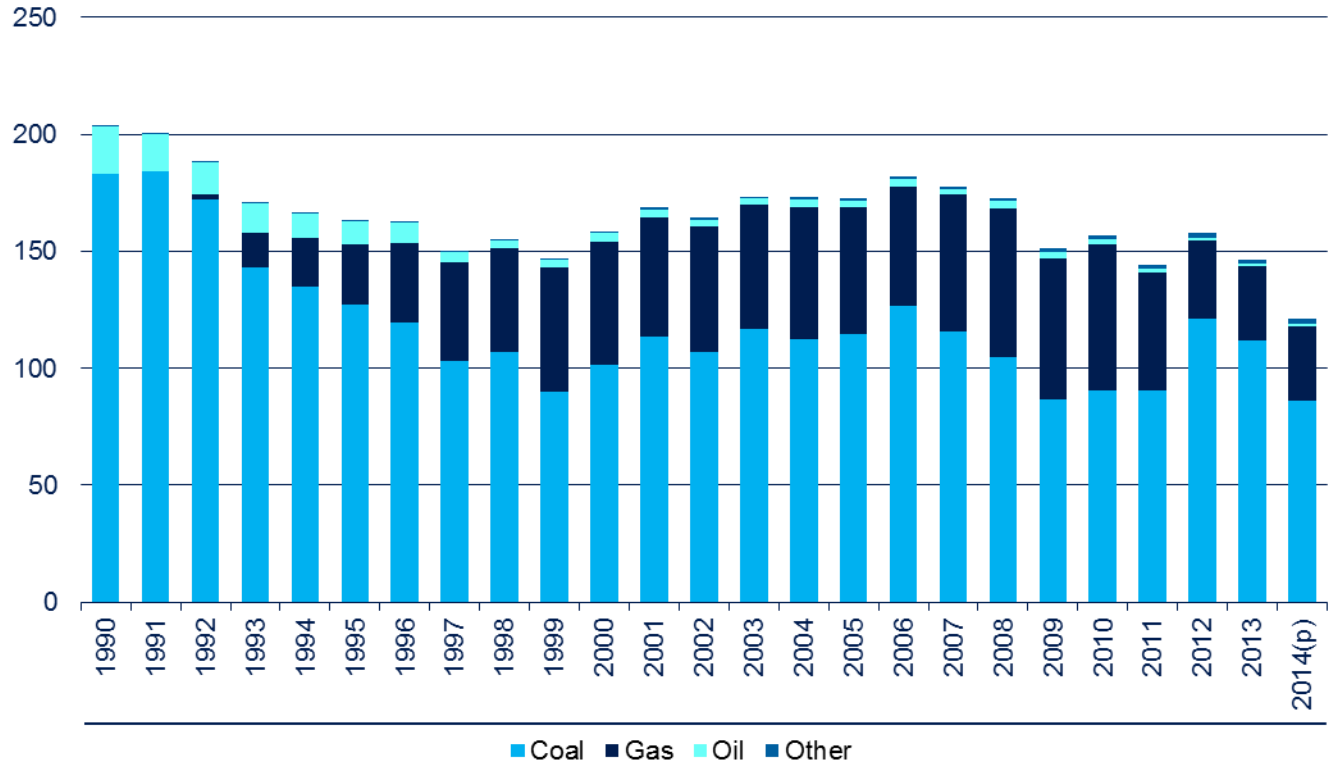
There has been an overall decline in the use of coal at power stations over the period (particularly during the 1990s), accompanied by an overall increase in the use of gas, which has a lower carbon content. Coal use in generation is estimated to have reduced by 52 percent between 1990 and 2014. Final consumption of electricity is provisionally estimated to be around 7 percent higher in 2014 than in 1990 (although it peaked in 2005 and has decreased since then); domestic electricity consumption in particular was around 13 percent higher in 2014 than in 1990. However, emissions from electricity generation have decreased by 41 percent over the same period.

Figure 2: Fuel mix for UK electricity generation, UK and Crown Dependencies 1990-2014, (Millions of tonnes of oil equivalent)



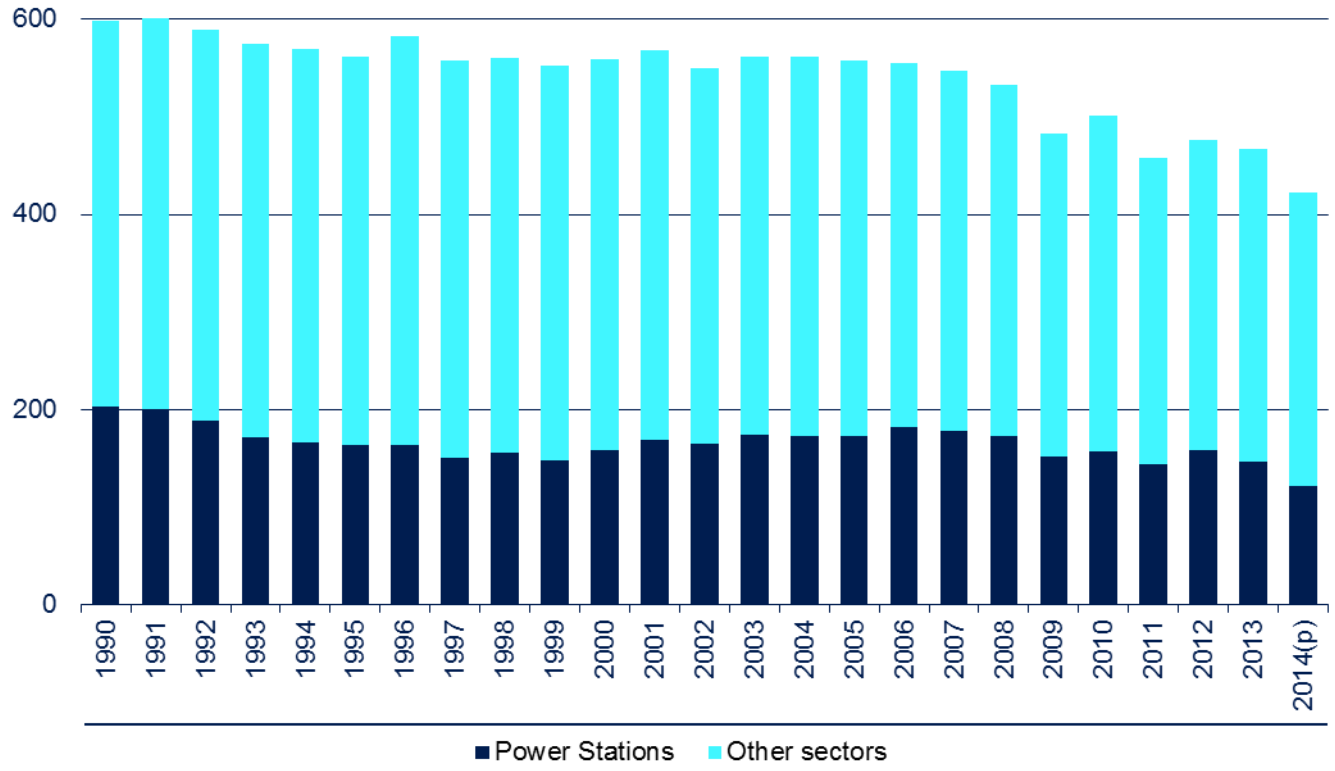
Note: (p) 2014 estimates are provisional.

Figure 3: Carbon dioxide emissions from electricity generation, UK and Crown Dependencies 1990-2014, ($MtCO_2$)



Note: (p) 2014 estimates are provisional.

Figure 4: Carbon dioxide emissions from power stations as a proportion of total carbon dioxide emissions, UK and Crown Dependencies 1990-2014, ($MtCO_2$)



Note: (p) 2014 estimates are provisional.

Transport

In 2014, carbon dioxide emissions from the transport sector, at 116.9 Mt, accounted for just over a quarter of all carbon dioxide emissions. Between 2013 and 2014, transport emissions increased by 1.1 percent (1.2 Mt). Provisional motor vehicle traffic estimates suggest that vehicle kilometres travelled increased in 2014 resulting in a higher use of total fuel.

Emissions from this sector are similar to 1990 levels (down 2 percent, or 2.8 Mt). Road transport is the most significant source of emissions in this sector, in particular passenger cars. Emissions from passenger cars have decreased since the early 2000s due to lower petrol consumption outweighing an increase in diesel consumption[1] and more recently, improvements in fuel efficiency of both petrol and diesel cars[2]. However, this decrease has been partially offset by an increase in emissions from light goods vehicles.

It should be noted that these estimates do not include emissions from international aviation and shipping; domestic aviation and shipping, however, are included.

Residential

In 2014, the residential sector, with emissions of 62.3 Mt, accounted for 15 percent of all carbon dioxide emissions. Between 2013 and 2014 there was a 16.6 percent (12.4 Mt) decrease in emissions from this sector due to 2014 being a warmer year than 2013.

2014 was 1.2 degrees Celsius warmer than 2013 and the warmest year on record for the UK[3]. In particular first quarter of 2014 was on average 3.1 degrees warmer than the first quarter of 2013 which has contributed to a decrease in the use of natural gas for space heating.

The main source of emissions from this sector is the use of natural gas for heating and cooking. Since 2004 there has been a general downward trend in emissions, although 2010 and 2012 were exceptions to this, due to the particularly cold weather experienced in 2010 and warm weather in 2011. In 2014, emissions from this sector were 21 percent lower than in 1990.

It should be noted that emissions from this sector do not include those related to domestic electricity consumption, as these emissions are included in the energy supply sector.

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[1] 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

[2] 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

[3] Energy trends section 7: weather

https://www.gov.uk/government/statistics/energy-trends-section-7-weather

Business

Carbon dioxide emissions from the business sector, at 70.0 Mt, accounted for around 17 percent of all carbon dioxide emissions in 2014. This was 7.2 percent (5.5 Mt) lower than in 2013, which was largely due to a reduction in use of natural gas for commercial use due to 2014 being a warmer year than 2013.

There has been a 38 percent decrease in business sector emissions since 1990. Most of this decrease came between 2001 and 2009, with a significant drop in 2009 likely driven by economic factors. The main driver of the overall decrease in emissions since 1990 is a reduction in emissions from industrial combustion (including iron and steel).

Industrial Process

In 2014, carbon dioxide emissions from the industrial process sector were estimated to be 12.0 Mt, a decrease of around 1.6 percent (0.2 Mt) compared with 2013. Between 1990 and 2014, emissions from this sector are estimated to have decreased by around 38 percent driven by a reduction in emissions from cement production due to lower manufacturing output from this sector.

Public Sector

Carbon dioxide emissions from the public sector, at 8.4 Mt, were estimated to have decreased by about 11.3 percent (1.1 Mt) from 2013 emissions. This has been largely driven by a reduction in the use of gas for space heating as a result of 2014 being a warm year. Between 1990 and 2014, emissions from this sector are estimated to have decreased by around 37 percent.

Agriculture, waste management and land use, land use change and forestry

Updated emissions estimates for these sectors are not yet available for 2014, so for these statistics, emissions from these sectors are assumed to be the same as they were in 2013[4].

[4] Final UK greenhouse gas emissions national statistics

https://www.gov.uk/government/collections/final-uk-greenhouse-gas-emissions-national-statistics

Carbon dioxide emissions by fuel type

The amount of carbon dioxide released by the consumption of one unit of energy depends on the type of fuel consumed. For example, since coal has a higher carbon content than gas, more carbon dioxide emissions result from burning one unit of coal than from one unit of gas.

Emissions per unit of electricity supplied by major power producers from fossil fuels are estimated to have been 730 tonnes of carbon dioxide per GWh overall in 2014; within this, emissions from electricity generated from coal (880 tonnes of carbon dioxide per GWh electricity supplied) were over two times higher than for electricity supplied by gas (320 tonnes of carbon dioxide per GWh). For all sources of electricity (including nuclear, renewables and autogeneration), the average amount of carbon dioxide emitted in 2014 amounted to 440 tonnes per GWh of electricity supplied.

In 2014, carbon dioxide emissions from the use of fossil fuels, including fuel used for generating electricity, were estimated at 412.4 Mt. This was 10 percent lower than the 2013 figure of 457.9 Mt. The biggest change in emissions was from the use of coal and other solid fuels, down 27.6 Mt (21 percent) from 130.7 Mt in 2013 to 103.1 Mt in 2014. This largely resulted from decreased fossil fuel use for electricity generation at power stations, and in particular a decrease in the use of coal following the closure or conversion of several power stations.

Over the period 1990 to 2014, carbon dioxide emissions from fossil fuels decreased by 28 percent. Over the same period, overall primary consumption of fossil fuels has dropped by nearly 11 percent. The relatively higher decrease in emissions can be attributed to an increase in the use of gas accompanied by a decrease in the use of coal and other solid fuels; gas consumption as a proportion of all fossil fuels has increased from 26 percent in 1990 to 41 percent in 2014, whilst use of coal and other solid fuels as a proportion of all fossil fuels has decreased from 41 percent to 25 percent over the same period. Oil use, as a proportion of all fossil fuels, has remained relatively stable over the period; this accounted for almost 34 percent of all fossil fuels used in both 1990 and 2014.

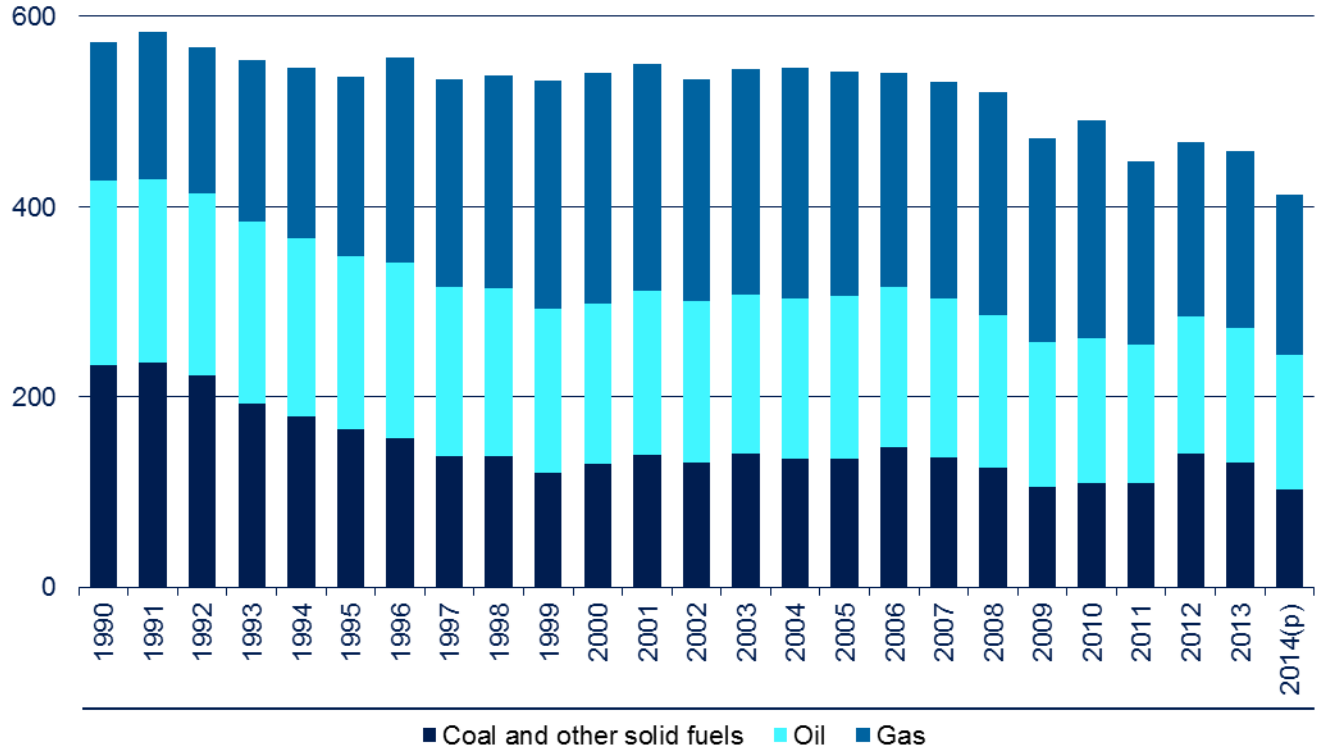
Table 3: UK Carbon dioxide emissions by fuel
UK and Crown Dependencies 1990-2014

$MtCO_2e$

	1990	1995	2000	2005	2010	2013	2014 (p)
Gas	146.5	189.4	241.8	235.3	228.8	185.2	168.5
Oil	193.0	181.1	169.6	171.3	151.7	142.1	140.8
Coal	219.7	152.7	117.3	124.9	100.9	121.6	94.7
Other solid fuels	14.1	13.4	11.7	10.2	8.9	9.1	8.4
Non-fuel	24.6	25.5	19.1	16.0	10.4	9.6	9.6
Total	**597.9**	**562.0**	**559.5**	**557.8**	**500.8**	**467.5**	**422.0**

Note: (p) 2014 estimates are provisional.

Figure 5: Carbon dioxide emissions by fossil fuels, UK and Crown Dependencies 1990-2014, ($MtCO_2$)



Note: (p) 2014 estimates are provisional.

UK performance against emissions reduction targets

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

Kyoto Protocol

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

The second commitment period will run for eight years, from 2013 to 2020 inclusive. Details of the UK's target for the second commitment period are still being finalised.

The Climate Change Act 2008

The UK Climate Change Act 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.

EU Effort Sharing Decision

This was agreed as part of the 2008 EU Climate and Energy package and came into force from January 2013. 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.

In reporting emissions reductions against these targets, the UK is required to take account of emissions trading through the various flexible mechanisms which have been established, including the European Union Emissions Trading System (EU ETS).

DECC reported on performance against these targets in detail in statistics released on 19th March 2015[5], based on emissions from 1990 to 2013. It is not possible to produce a further update based on the provisional 2014 figures at this time, as EU ETS data for 2014 are not yet available.

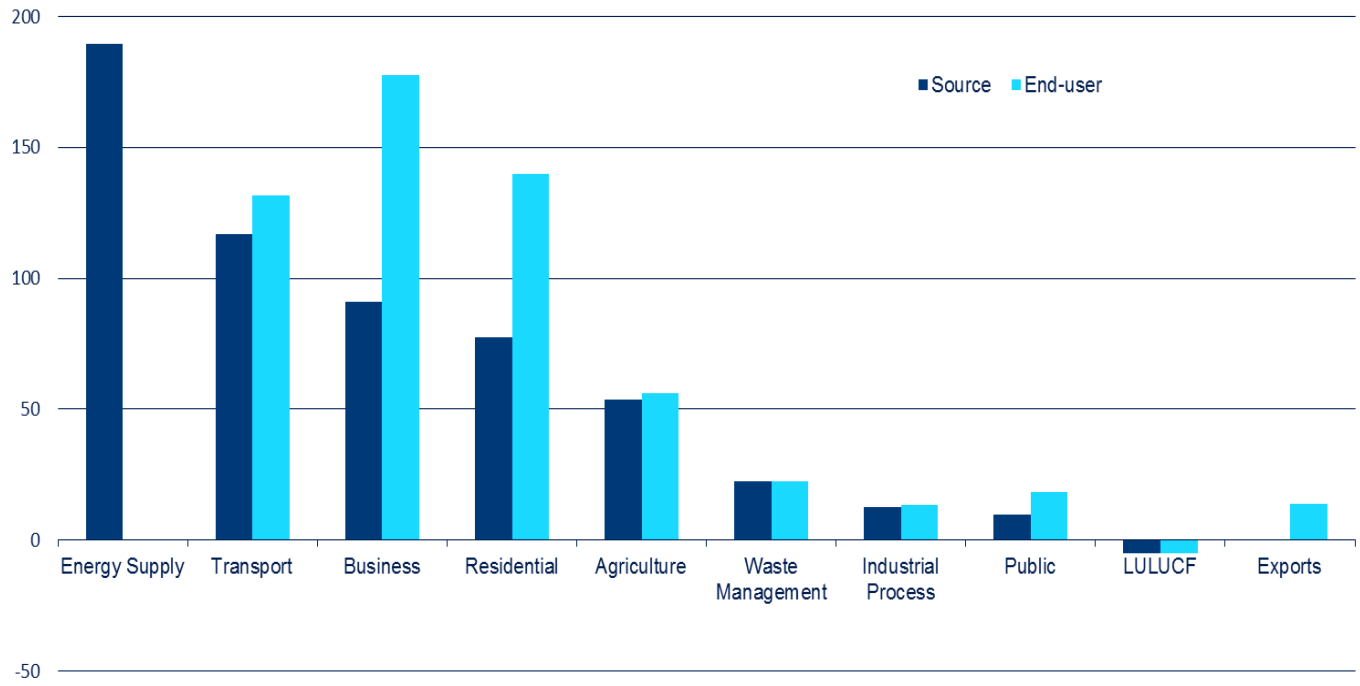
[5] https://www.gov.uk/government/statistics/final-uk-emissions-estimates

Annex: 1990- 2013 UK greenhouse gas emissions, final figures by end-user sector including uncertainties estimates.

These results are based on, and consistent with, the breakdown by gas and sector of 2013 emissions by source which was published on 3rd February 2015. Total 2013 greenhouse gas emissions for the UK and Crown Dependencies were 568.3 million tonnes carbon dioxide equivalent ($MtCO_2e$).

The end-user breakdown reallocates emissions by source to where the "end-use" occurred. The main impact is to reallocate emissions from the energy supply sector to flows of energy i.e. to other sectors, the business and residential sectors in particular. Amongst other things, this therefore reallocates emissions occurring at power stations in generating electricity to where the electricity is actually consumed. It should be noted that the results shown by this breakdown are based on a number of assumptions, and we would therefore expect them to be subject to a wider margin of error than the breakdown of emissions by source.

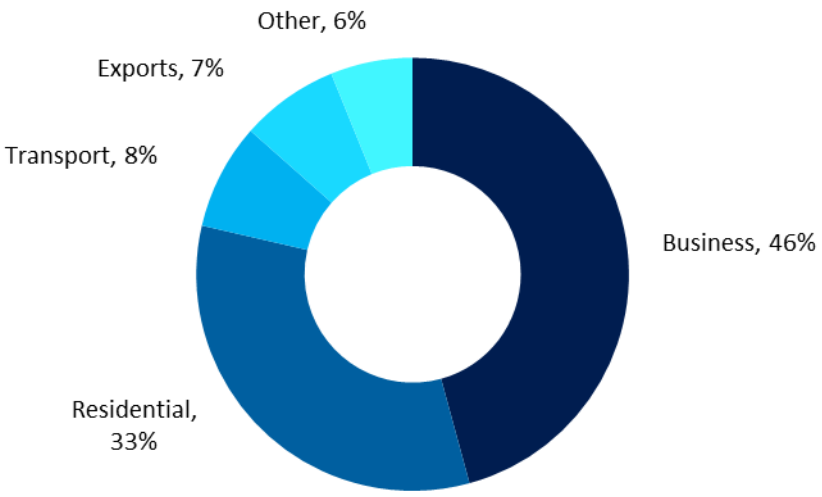
Figure 6: Allocation of 2013 greenhouse gas emissions from source sectors to end-user sectors, UK and Crown Dependencies ($MtCO_2e$)



Looking at the end-user sector breakdown, in 2013 31 percent of greenhouse gas emissions were from the business sector, 23 percent from transport, 25 percent from the residential sector and 10 percent from agriculture. The remainder were attributable to the industrial processes, public, waste management, land use, land use change and forestry sector (LULUCF) and exports sectors. No emissions are reallocated to the waste management or LULUCF sectors.

The majority of emissions from Energy Supply are reallocated to two sectors, with business accounting for nearly half and residential accounting for around a third of reallocated emissions.

Figure 7: Breakdown of which end-user sectors greenhouse gas emissions from the energy sector are reallocated to, UK and Crown Dependencies, 2013



Data tables showing the full end-user breakdown by sector, from 1990 to 2013, can be found on the Final Greenhouse Gas Emissions Statistics page of the Gov.uk website. These tables were originally published on 3rd February 2015 showing emissions by source only, but were updated with end-user and fuel type breakdowns on 26th March 2015.

Table 4: UK greenhouse gas emissions by gas and end-user sector
UK and Crown Dependencies 2013

$MtCO_2e$

	Carbon dioxide	Methane	Nitrous oxide	Fluorinated gases	Total
Transport	130.0	0.7	1.1	0.0	131.8
Business	158.9	2.9	1.4	14.6	177.8
Residential	133.5	3.6	0.6	2.2	139.9
Industrial Process	12.6	0.3	0.1	0.3	13.3
Public	17.7	0.4	0.1	0.0	18.2
Agriculture	7.2	27.1	21.8	0.0	56.1
Waste Management	0.3	20.6	1.7	0.0	22.6
LULUCF	-6.0	0.0	0.7	0.0	-5.3
Exports	13.3	0.6	0.1	0.0	13.9
Total	**467.5**	**56.2**	**27.6**	**17.1**	**568.3**

Table 5: UK greenhouse gas emissions by gas and end-user sector % of total UK emissions, excluding LULUCF
UK and Crown Dependencies 2013

$MtCO_2e$

	Carbon dioxide	Methane	Nitrous oxide	Fluorinated gases	Total
Transport	22.9%	0.1%	0.2%	0.0%	23.2%
Business	28.0%	0.5%	0.2%	2.6%	31.3%
Residential	23.5%	0.6%	0.1%	0.4%	24.6%
Industrial Process	2.2%	0.0%	0.0%	0.1%	2.3%
Public	3.1%	0.1%	0.0%	0.0%	3.2%
Agriculture	1.3%	4.8%	3.8%	0.0%	9.9%
Waste Management	0.0%	3.6%	0.3%	0.0%	4.0%
Exports	2.3%	0.1%	0.0%	0.0%	2.5%
Total	**82.3%**	**9.9%**	**4.9%**	**3.0%**	**100.0%**

Note: This table does not include emissions from the LULUCF sector, since in 2013 this sector, and emissions were therefore effectively negative. Sector values may sum to more than gas totals due to exclusion of LULUCF emissions.

Table 6: Greenhouse gas emissions by end-user sector
UK and Crown Dependencies 1990-2013

$MtCO_2e$

	1990	1995	2000	2005	2010	2012	2013
Transport	139.8	143.2	146.8	150.5	137.4	133.9	131.8
Business	250.1	220.5	218.9	212.5	186.6	180.7	177.8
Residential	172.3	158.0	158.7	163.0	156.1	145.3	139.9
Industrial Process	63.1	53.5	29.2	21.1	13.3	11.2	13.3
Public	31.6	29.0	24.4	22.4	19.3	19.0	18.2
Agriculture	69.8	68.3	64.1	60.1	57.2	56.5	56.1
Waste Management	69.3	71.5	66.8	53.0	31.5	26.3	22.6
LULUCF	4.0	3.3	0.8	-2.9	-4.3	-5.0	-5.3
Export	9.3	13.3	13.1	16.9	16.2	14.3	13.9
Total	809.4	760.6	722.8	696.6	613.3	582.2	568.3

Details of changes over time for each sector are set out in the following sections of this statistical release. The commentary in these sections focuses on the differences between end user and by source breakdowns. For more information on trends of emissions by source sector, see the Final Greenhouse Gas Emissions statistics release published on 3rd February 2015.

Transport

The transport sector was responsible for around 23 percent of UK greenhouse gas end-user emissions in 2013, 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.

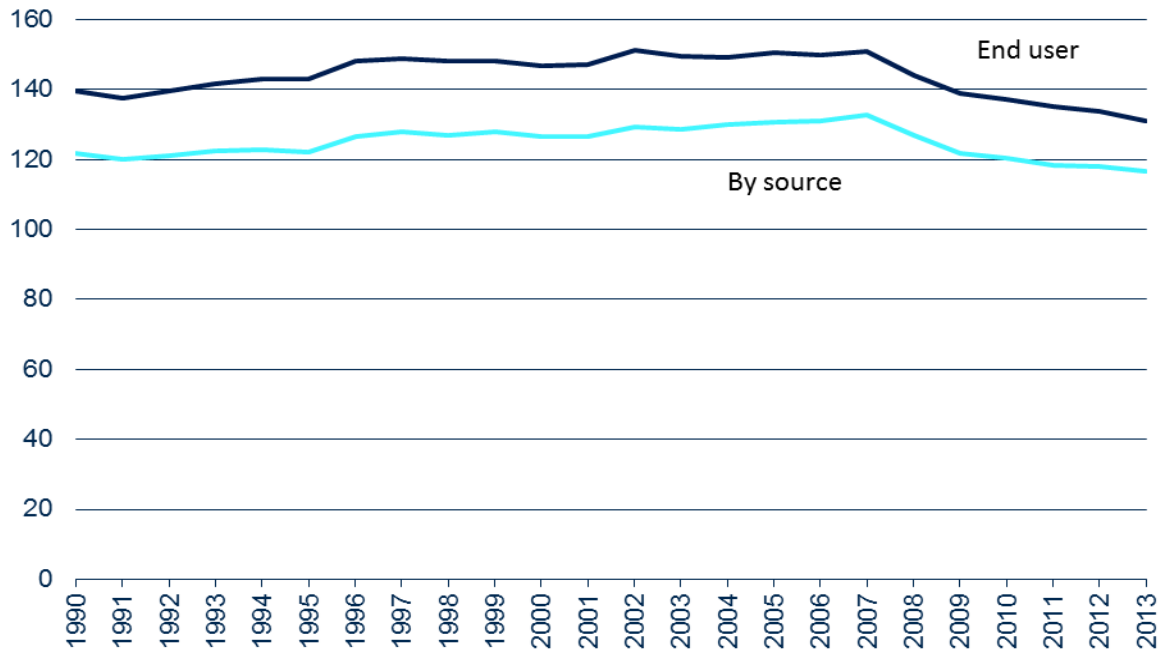
End user emissions from the transport sector are around 15 to 20 $MtCO_2e$ higher than by source emissions, but follow a very similar trend. Emissions increased slightly between 1990 and 2007 and have decreased since then. As with by source emissions, the main drivers of the decrease since 2007 are reduced petrol consumption from passenger cars and improved fuel efficiency.

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

$MtCO_2e$

	1990	1995	2000	2005	2010	2012	2013
Carbon dioxide	136.4	139.5	144.0	148.3	135.7	132.0	130.0
Methane	2.0	1.8	1.2	0.8	0.7	0.7	0.7
Nitrous oxide	1.4	1.9	1.7	1.4	1.1	1.1	1.1
F-gases	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**139.8**	**143.2**	**146.8**	**150.5**	**137.4**	**133.9**	**131.8**

Figure 8: Greenhouse gas end-user emissions from transport, UK and Crown Dependencies 1990-2013 ($MtCO_2e$)



Business

The business sector was responsible for 31 percent of UK greenhouse gas end-user 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 significant. The business sector is responsible for the majority of emissions from F-gases.

Between 1990 and 2013, there was a general downward trend in greenhouse gas end-user emissions from the business sector, resulting in an overall decrease of around 29 percent. Between 2012 and 2013 emissions decreased by around 2.9 $MtCO_2e$ (1.6 percent). This is in contrast to an increase of 2.5 $MtCO_2e$ (2.9 percent) seen in emissions by source from this sector between 2012 and 2013, and is due to a reduction in emissions from electricity generation reallocated to this sector from the energy supply sector for the end user breakdown.

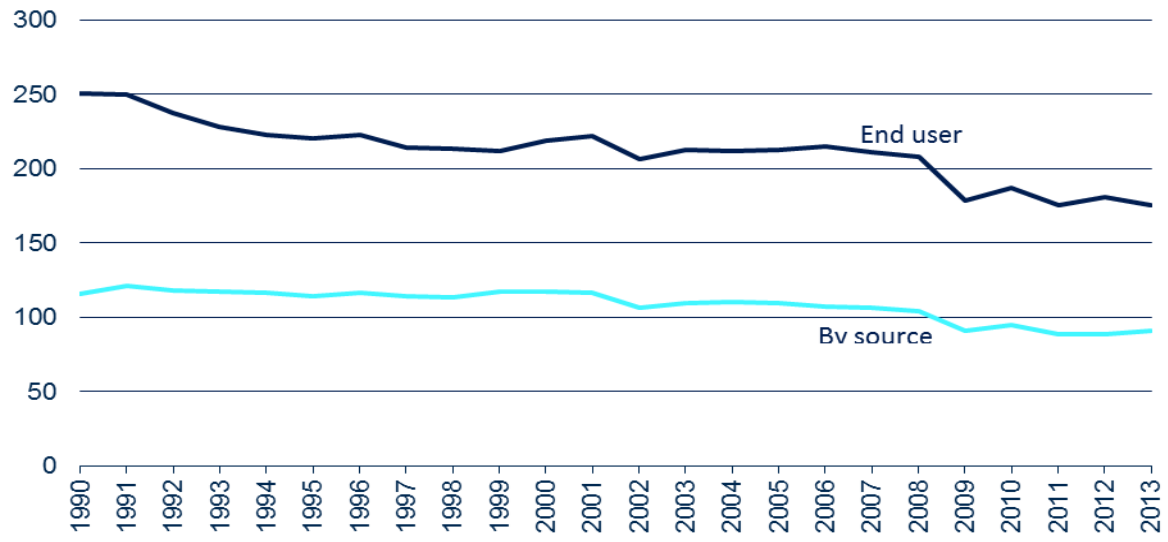
The overall downward trend for end-user emissions since 1990 is similar to the trend for by source emissions, though end-user emissions are much higher due to the inclusion of emissions from electricity generation.

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

$MtCO_2e$

	1990	1995	2000	2005	2010	2012	2013
Carbon dioxide	231.1	204.7	203.5	194.9	167.5	161.2	158.9
Methane	15.5	11.7	7.4	4.7	3.6	3.4	2.9
Nitrous oxide	2.3	2.0	1.7	1.8	1.4	1.5	1.4
F-gases	1.1	2.2	6.3	11.1	14.1	14.6	14.6
Total	**250.1**	**220.5**	**218.9**	**212.5**	**186.6**	**180.7**	**177.8**

Figure 9: Greenhouse gas end-user emissions from business, UK and Crown Dependencies 1990-2013 ($MtCO_2e$)



Residential

The residential sector was responsible for around 25 percent of UK greenhouse gas end-user emissions in 2013, with carbon dioxide being the most prominent gas for this sector. It should be noted that, unlike emissions by source, which only cover activities related to residential fossil fuel use, emissions reported by end-user also include residential electricity use which have been re-allocated from the energy supply sector.

Between 1990 and 2013, there has been considerable variation in greenhouse gas end-user emissions from year to year in the residential sector. Both the end-user and by source emissions from this sector are heavily influenced by external temperatures. End-user emissions have seen a bigger overall decrease since 1990 than by source emissions, due to a decrease in emissions from electricity consumption which are included in the residential end-user emissions but are in the energy supply sector for the by source emissions.

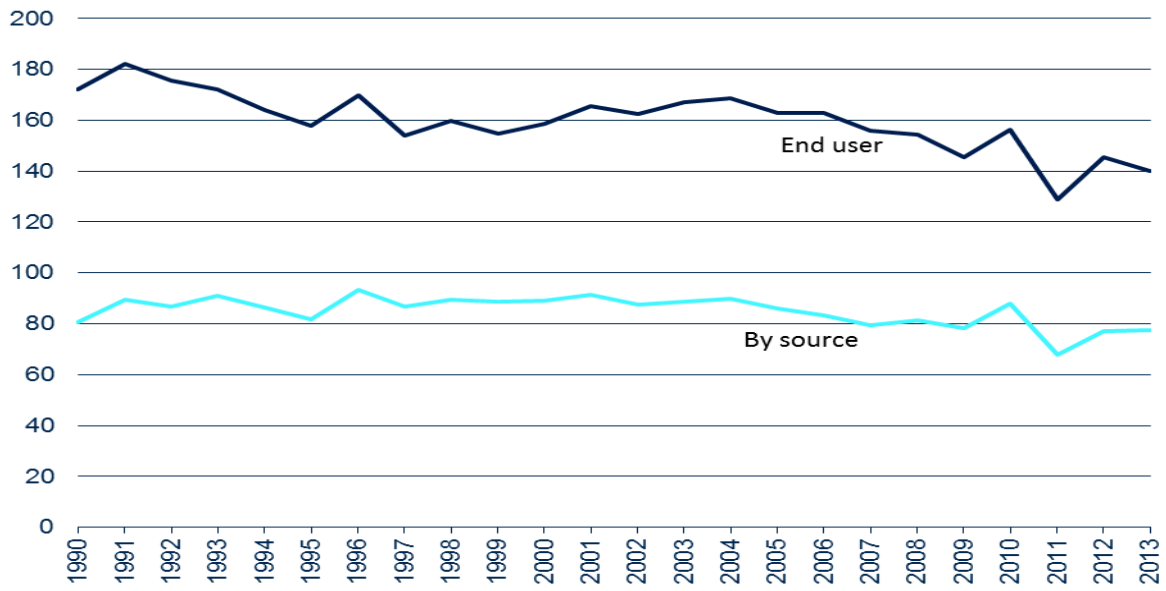
Between 2012 and 2013 end user emissions in the residential sector decreased by 3.7 percent, while by source emissions were largely unchanged. The decrease in end user emissions was due to a reduction in emissions from electricity generation.

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

$MtCO_2e$

	1990	1995	2000	2005	2010	2012	2013
Carbon dioxide	156.9	146.1	149.6	155.2	149.2	138.5	133.5
Methane	14.5	10.5	6.6	4.8	4.2	4.1	0.4
Nitrous oxide	0.9	0.7	0.6	0.6	0.5	0.6	0.6
F-gases	0.0	0.7	2.0	2.4	2.1	2.2	2.2
Total	**172.3**	**158.0**	**158.7**	**163.0**	**156.1**	**145.3**	**139.9**

Figure 10: Greenhouse gas end-user emissions from the residential sector, UK and Crown Dependencies 1990-2013 ($MtCO_2e$)



Industrial process

The industrial process sector was responsible for 2 percent of UK greenhouse gas end-user emissions in 2013, 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.

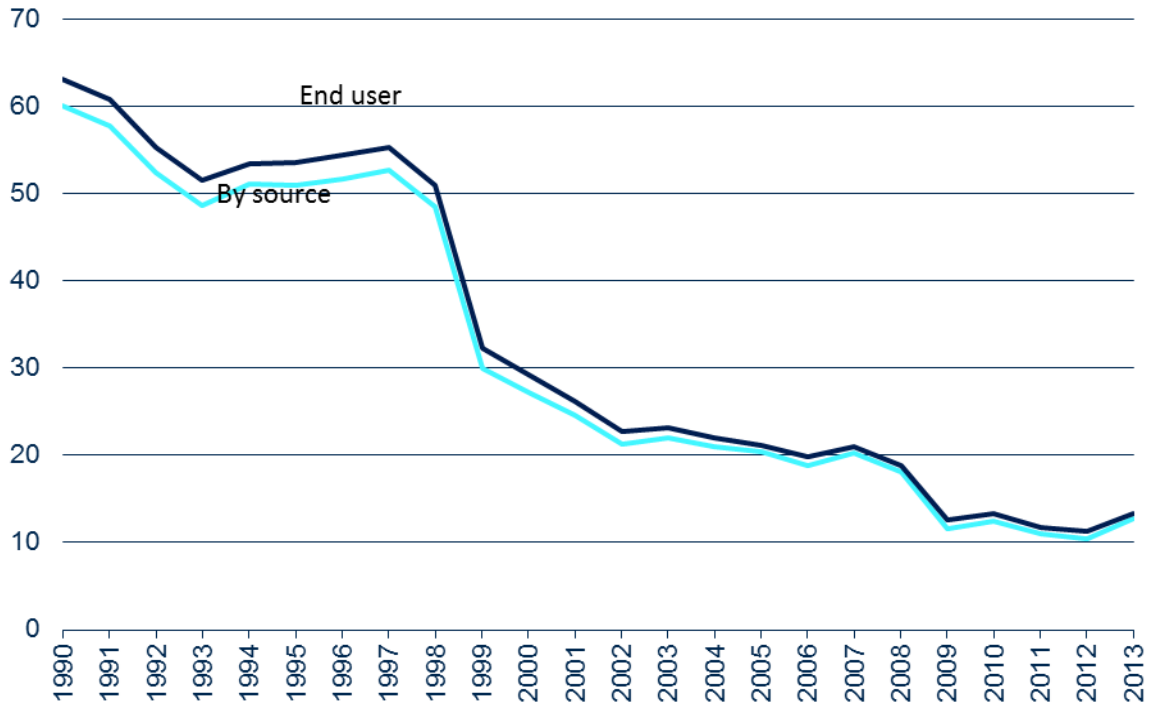
The end-user emissions from this sector are only slightly higher than by source emissions, and follow a very similar trend, with a decrease of around 80 percent since 1990. Both end user and by source emissions increased between 2012 and 2013 however, due to increased sinter, cement, iron and steel production.

Table 10: Industrial process sector end-user emissions by gas
UK and Crown Dependencies 1990-2013

$MtCO_2e$

	1990	1995	2000	2005	2010	2012	2013
Carbon dioxide	20.9	18.9	18.1	16.7	11.1	10.5	12.6
Methane	2.0	1.7	1.1	0.5	0.4	0.3	0.3
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	**63.1**	**53.5**	**29.2**	**21.1**	**13.3**	**11.2**	**13.3**

Figure 11: Greenhouse gas end-user emissions from industrial processes, UK and Crown Dependencies 1990-2013 ($MtCO_2e$)



Public sector

The public sector was responsible for 3 percent of UK greenhouse gas end-user emissions in 2013, with carbon dioxide making up almost all of these emissions.

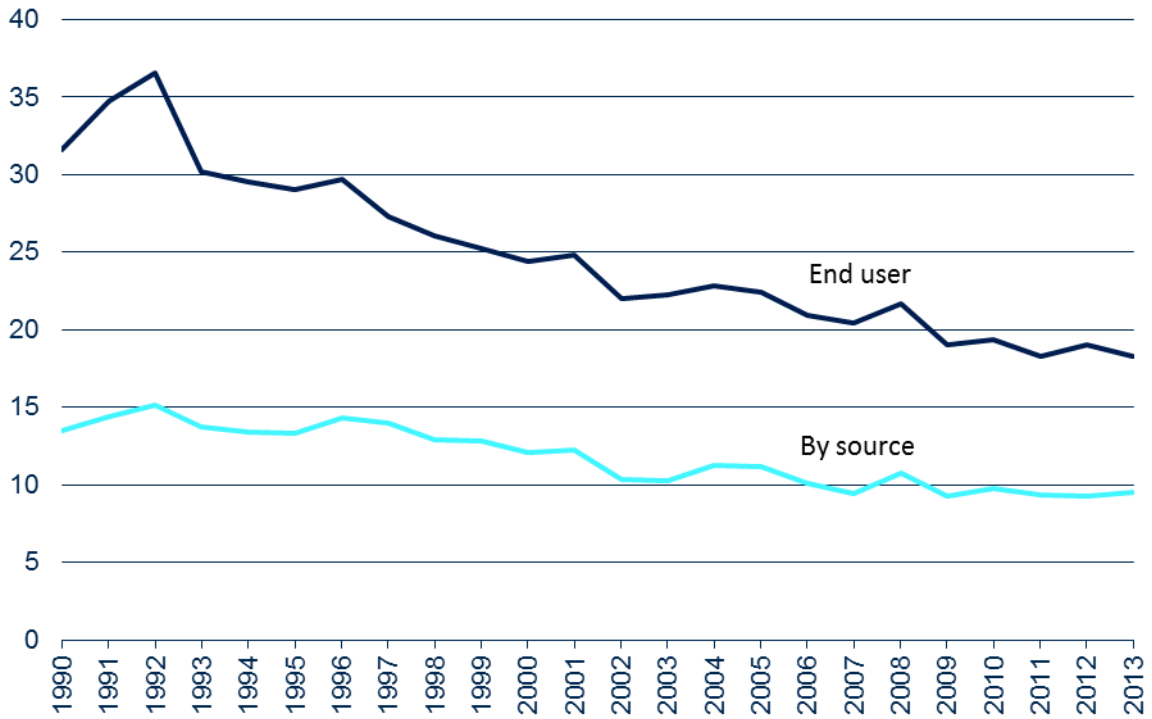
End user emissions from the public sector are roughly double by source emissions, due to the inclusion of emissions from electricity generation in the end user breakdown. Since 1990 end user emissions have shown a more pronounced decrease than by source emissions, driven by a reduction in emissions from electricity generation.

Table 11: Public sector end-user emissions by gas, 1990-2013 ($MtCO_2e$)
UK and Crown Dependencies 1990-2013

$MtCO_2e$

	1990	1995	2000	2005	2010	2012	2013
Carbon dioxide	29.3	27.2	23.3	21.7	18.8	18.4	17.7
Methane	2.1	1.7	0.9	0.6	0.5	0.5	0.4
Nitrous oxide	0.2	0.1	0.1	0.1	0.1	0.1	0.1
F-gases	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**31.6**	**29.0**	**24.4**	**22.4**	**19.3**	**19.0**	**18.2**

Figure 12: Greenhouse gas end-user emissions from the public sector, UK and Crown Dependencies 1990-2013 ($MtCO_2e$)



Agriculture

The agriculture sector was responsible for 10 percent of UK greenhouse gas end-user emissions in 2013. Emissions of nitrous oxide (48 percent) and methane (39 percent) dominate this sector. End-user and by source emissions are very similar for this sector, with the most significant sources being emissions of methane due to enteric fermentation from livestock, particularly cattle, and nitrous oxide emissions related to the use of fertilisers on agricultural soils.

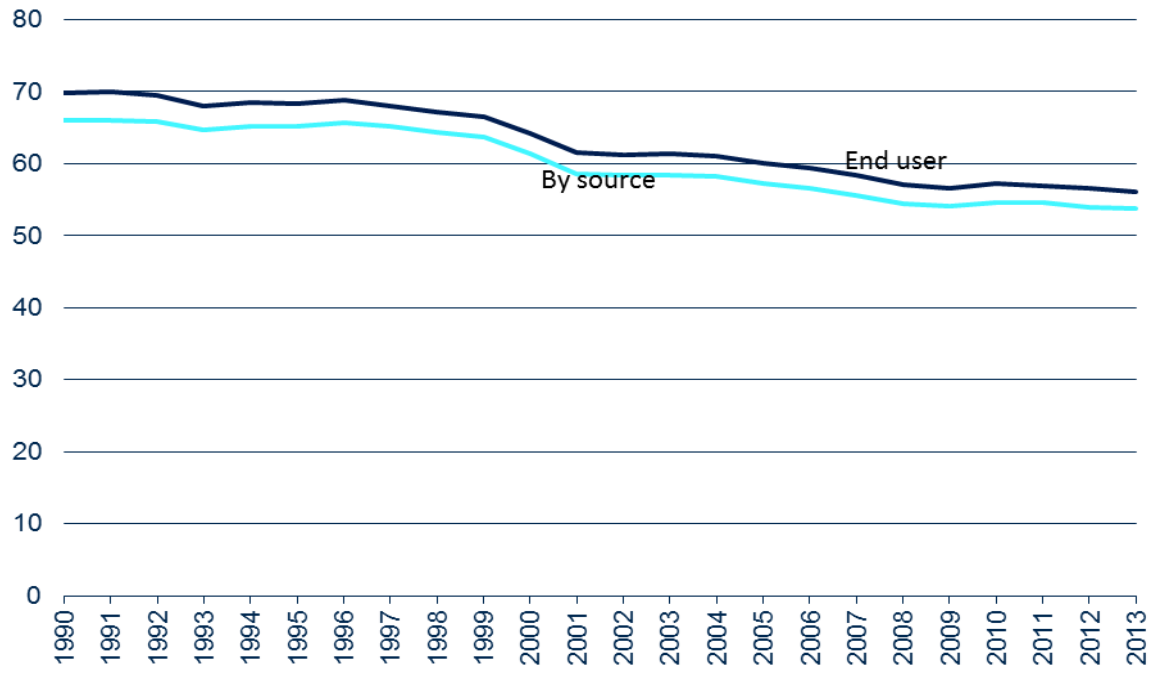
End user emissions follow the same trend as by source emissions. Emissions have decreased by around 20 percent since 1990 due to a fall in animal numbers over the period, together with a decrease in synthetic fertiliser use. Between 2012 and 2013 there was very little change in emissions from the agriculture sector.

Table 12: Agriculture sector end-user emissions by gas, 1990-2013 ($MtCO_2e$)
UK and Crown Dependencies 1990-2013

$MtCO_2e$

	1990	1995	2000	2005	2010	2012	2013
Carbon dioxide	10.7	10.1	8.3	8.3	7.7	7.6	7.2
Methane	33.0	32.4	31.1	28.9	27.4	27.2	27.1
Nitrous oxide	26.1	25.8	24.7	23.0	22.0	21.7	21.8
F-gases	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**69.8**	**68.3**	**64.1**	**60.1**	**57.2**	**56.5**	**56.1**

Figure 13: Greenhouse gas end-user emissions from agriculture, UK and Crown Dependencies 1990-2013 ($MtCO_2e$)



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

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

Exports

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

The exports sector was responsible for around 2 percent of UK greenhouse gas end user emissions in 2013, with carbon dioxide representing almost the entirety of these emissions.

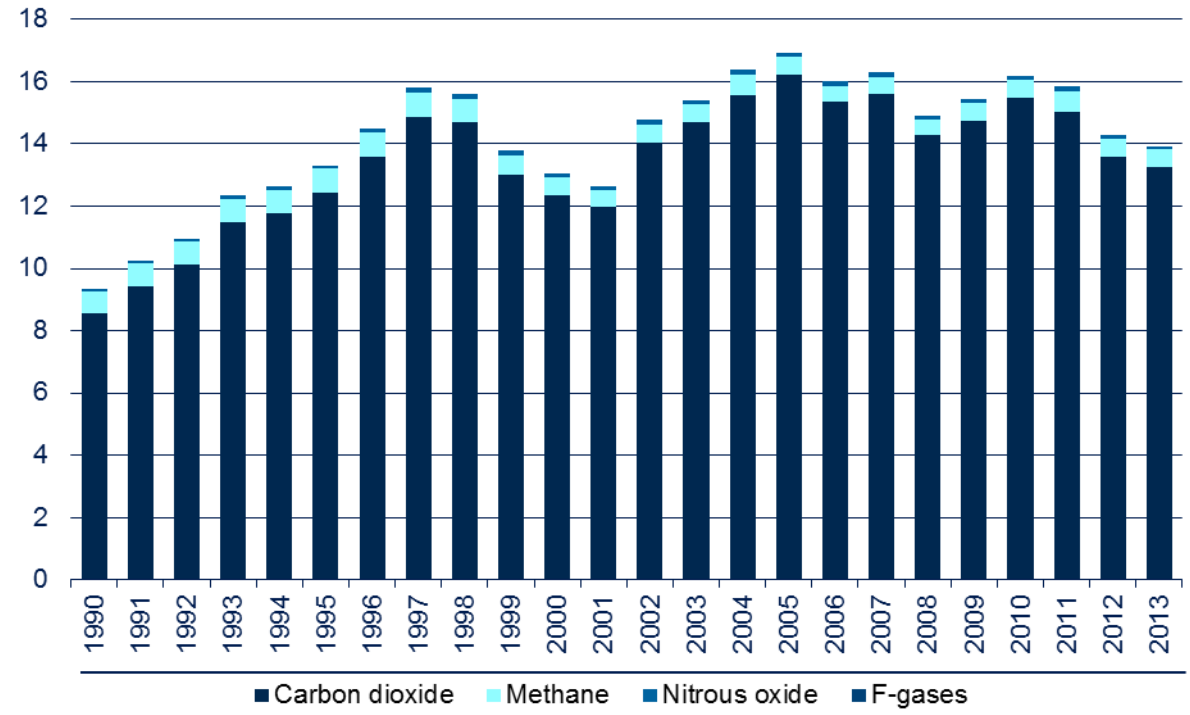
Emissions from the exports sector increased during most of the 1990s, largely driven by changes in throughput at refineries, which have fed through to increased exports rather than increased deliveries to the domestic market. Since then the overall trend has been fairly flat, though with some year on year variation. Between 2012 and 2013 emissions from the exports sector decreased by 0.4 Mt (2.6 percent).

Table 13: Exports sector emissions by gas, 1990-2013 ($MtCO_2e$)
UK and Crown Dependencies 1990-2013

$MtCO_2e$

	1990	1995	2000	2005	2010	2012	2013
Carbon dioxide	8.6	12.4	12.3	16.2	15.5	13.6	13.3
Methane	0.7	0.8	0.6	0.5	0.5	0.6	0.6
Nitrous oxide	0.1	0.1	0.1	0.2	0.1	0.1	0.1
F-gases	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**9.3**	**13.3**	**13.1**	**16.9**	**16.2**	**14.3**	**13.9**

Figure 14: Greenhouse gas end-user emissions from the exports sector, UK and Crown Dependencies 1990-2013 ($MtCO_2e$)



Revisions to the estimates of end-user emissions

It should be noted that the historical time series of emissions by end-user is revised each year to reflect any revisions made to either the estimates of emissions by source or the other energy consumption data used in the end-user emissions calculation. In this publication, this has resulted in revisions to some end-user emissions figures for all years up to and including 2012. Further details of these revisions can be found in Final Greenhouse Gas Emissions statistics, which covered 2013 UK greenhouse gas emissions by source.

Embedded Emissions

End-user emissions do not take account of the emissions "embedded" within the manufactured goods and services which the UK imports and exports. Embedded emissions capture what is sometimes referred to as the UK's "carbon footprint". This calculation of emissions on a "consumption" basis, reporting on emissions embedded in goods and services across international borders, is considerably more challenging.

The Department for Environment, Food and Rural Affairs (Defra) provide the lead in this area. They publish annual statistics on the UK's Carbon Footprint that investigates the impact the UK consumption has on carbon dioxide emissions. These are published in December of each year and are reported 23 months in arrears[6].

[6] UK's carbon footprint
https://www.gov.uk/government/statistics/uks-carbon-footprint

Uncertainties around the 2013 estimates

We are now also able to publish the uncertainty ranges associated with the final 2013 emissions estimates by source, which were published on 3rd February 2015.

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

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

The uncertainties are expressed as a 95 percent confidence interval. In terms of the uncertainty model, this means that 95 percent of the simulated values fell between the stated parameters.

Detailed data tables are published separately in spread sheet data tables alongside the final estimates for 2013 UK greenhouse gas emissions by source sector where further information on trend uncertainty is available. For details of how the uncertainty estimates are calculated, see the Uncertainties Annex of the UK's National Inventory Report.

The uncertainty estimates vary a lot for different sectors and gases. For gases, carbon dioxide estimates have the least uncertainty associated with them while nitrous oxide estimates are the most uncertain. At sector level, the land use change, agriculture and waste management sectors are the most uncertain. The overall uncertainty around total GHG emissions for 2013 is estimated to be 4 percent.

Table 14: Uncertainty in estimates of 2013 UK greenhouse gas emissions by gas, ($MtCO_2e$)

UK, Crown Dependencies and Overseas Territories

$MtCO_2e$

	2013 emissions	Uncertainty around 2013 estimate, expressed as a 95% confidence interval	
		Lower bound	Upper bound
Carbon dioxide	469.2	459.1	479.5
Methane	56.5	46.9	68.3
Nitrous Oxide	27.8	17.6	49.6
Hydrofluorocarbons	16.3	14.9	17.7
Perfluorocarbons	0.3	0.2	0.3
Sulphur hexafluoride	0.6	0.5	0.7
Nitrogen trifluoride	0.0	0.0	0.0
Total	**570.6**	**551.9**	**596.6**

Note: 2013 estimates are presented as the central estimate from the model used to calculate uncertainties. These differ slightly from the actual emissions estimates.

Table 15: Uncertainty in estimates of 2013 UK greenhouse gas emissions by sector ($MtCO_2e$)

UK, Crown Dependencies and Overseas Territories

$MtCO_2e$

	2013 emissions	Uncertainty around 2013 estimate, expressed as a 95% confidence interval	
		Lower bound	Upper bound
Energy Supply	190.9	185.8	196.2
Transport	117.3	115.0	119.6
Residential	77.6	75.2	80.0
Business	91.0	85.1	97.0
Public	9.5	7.4	11.6
Industrial Process	12.8	12.5	13.0
Agriculture	54.0	42.6	75.9
Land Use Change	-5.2	-13.5	3.2
Waste Management	22.7	15.0	34.2
Total	**570.6**	**551.1**	**597.2**

Note: 2013 estimates are presented as the central estimate from the model used to calculate uncertainties. These differ slightly from the actual emissions estimates.

Future updates to emissions estimates

Final estimates of UK greenhouse gas emissions for 2014 will be published as National Statistics on 2nd February 2016. These estimates will be based on the UK's Greenhouse Gas Inventory for 2014.

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/collections/uk-greenhouse-gas-emissions-statistics

Notes for editors

A full set of data tables can be accessed via the UK greenhouse gas emissions pages of the Gov.uk website.

1. The figures for 1990 to 2013 in this statistical release are from the National Atmospheric Emissions Inventory (NAEI), 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.

2. 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. It is also important to note that the provisional 2014 estimates are subject to a greater range of uncertainty than the final figures for earlier years. For more information on these uncertainties see Annex 7 of the UK greenhouse gas inventory report on the Gov.uk website.

3. The latest UK energy statistics, including revisions to earlier years' data, can be found in the Energy Trends quarterly bulletin produced by DECC.

4. Detailed UK temperature data can be found on both the Met Office website and the Energy Statistics section of the Gov.uk website.

5. When emissions are measured on this basis, UK emissions account for less than 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.

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