



Department
of Energy &
Climate Change

Annual Statement of Emissions for 2014

March 2016

Annual Statement of Emissions for 2014

**Presented to Parliament pursuant to section 16
of the Climate Change Act 2008**

March 2016



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Background

This is the seventh annual statement of emissions required under section 16 of the Climate Change Act 2008. It confirms emissions for 2014 – the second year of the second carbon budget.

Under the Act, this report sets out: the total amount of UK greenhouse gases (GHGs) emitted to and removed from the atmosphere in 2014; the methods used to calculate those figures; and whether there was an increase or a decrease in emissions from the previous year. It also sets out the steps taken to calculate the “net UK carbon account” which includes the effect of carbon trading. The net carbon account for the second carbon budget must be below the cap of 2,782 million tonnes of carbon dioxide equivalent (MtCO_{2e}).

Part one of this statement shows that, in 2014, net UK emissions were **514.4 MtCO_{2e}**. **This is a 36% reduction in GHG emissions from 1990 year and includes 29% reduction in Carbon Dioxide and 61% in Methane.**

Part two of this statement sets out the how we calculated the net carbon account for 2014. The net carbon account is the total UK emissions after we have taken into account carbon trading. This allows us to reflect the EU ETS in the carbon budget system and we call this the ‘traded sector’. When we set the second carbon budget, the rules around the EU ETS were not known and therefore we estimated the size of the UK’s share of the EU ETS. The rules are now known and so we are able to more accurately calculate the UK share of the cap in carbon budgets. This shows that after taking into account crediting or debiting of units due to the EU ETS and domestic aviation emissions, the net UK carbon account in 2014 was 455.6 MtCO_{2e}. This means that in 2014 the ETS cap was 76.9 MtCO_{2e} smaller than that included in the fixed cap approach.

Annual statements are based on national greenhouse gas statistics which take two years to be finalised so this annual statement is for 2014 emissions. Emissions for 2015 will not be published until March 2017.

Introduction

1. The Climate Change Act 2008¹ introduced a legally binding target to reduce greenhouse gas emissions by at least 80% below the 1990 baseline² in 2050, with an interim target to reduce emissions by at least 34% in 2020. The Act also introduced ‘carbon budgets’, which set the trajectory to ensure the targets in the Act are met. These budgets are legally-binding limits on the total amount of greenhouse gases that can be emitted in the UK for a given five-year period.
2. We are now in the second budgetary period, which runs from 2013 to 2017 with a emissions cap of 2,782 MtCO₂e. The third budget will cover the period 2018-2022 (2,544 MtCO₂e) and the fourth budget 2023-2027 (1,950 MtCO₂e). The level of the fifth carbon budget, which will cover the period 2028-2032, will be set in June 2016.
3. In order to monitor progress towards the carbon budgets in each year, section 16 of the Climate Change Act requires that the Government lays before Parliament an annual statement of emissions. The statements must include information on both emissions of greenhouse gases in the UK and removals of greenhouse gas emissions from the atmosphere (e.g. from forestry activities), as well as the use of carbon units – whether they have been credited to or debited from the net UK carbon account. This ensures that an amount for “the net UK carbon account” can be calculated in each year, in accordance with the requirements in the Act.

Calculating the net UK carbon account

4. Section 27 of the Climate Change Act defines the “net UK carbon account”. This is what we compare against carbon budgets to determine whether we are meeting them. The net UK carbon account must not exceed the level of the carbon budget at the end of each budgetary period. The process for determining the net UK carbon account in each year is summarised in Figure 1.
5. The starting point is UK emissions for the year, using data from the annual statistical release of UK greenhouse gas emissions published as National Statistics in February annually³. These emissions comprise aggregate gross emissions from sources in the UK, including emissions from land use, land use change and forestry (LULUCF), which are then adjusted to take into account removals of emissions from the atmosphere by carbon sinks associated with LULUCF activity.
6. This gives net UK emissions, which are adjusted to account for:

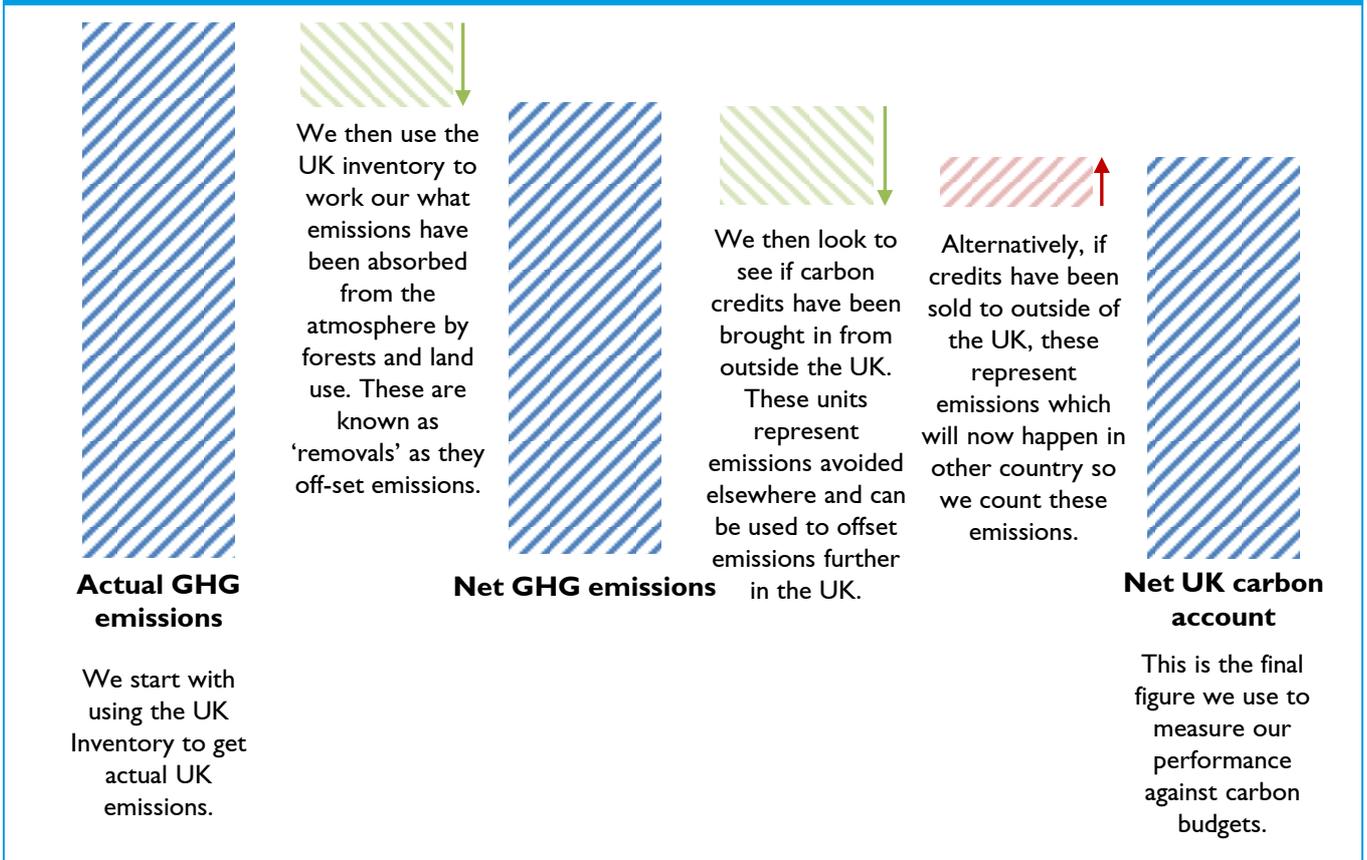
¹ <http://www.legislation.gov.uk/ukpga/2008/27/contents>.

² ‘The 1990 baseline’ is defined in the Climate Change Act 2008 as 1990 emissions of carbon dioxide, methane and nitrous oxide and 1995 emissions for the fluorinated gases.

³ The final 2014 estimates of UK greenhouse gas emissions were published on 2 February 2016. See: <https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-2014>

- a. carbon units which have been brought in from overseas by Government and others (e.g. installations covered by the EU ETS) to offset UK emissions (“credits”), thereby reducing the net UK carbon account; and
- b. UK carbon units which have been sold to a third party outside the UK or otherwise disposed of (“debits”), which increase the net UK carbon account as the recipient can use these units to offset their own emissions and it would lead to double counting if they were also used to offset UK emissions.

Figure 1: Calculating the net UK carbon account



Effort Sharing Decision

7. The EU Effort Sharing Decision (ESD) establishes binding annual greenhouse gas emission targets for Member States for the period 2013–2020 and creates a new carbon unit to measure member state compliance. The ESD covers emissions from most sectors not included in the EU ETS, such as transport (except aviation and international maritime shipping), buildings, agriculture and waste but excludes emissions from LULUCF.
8. While the ESD began operation in 2013, due to delays in the international reporting system in 2013 we have not yet completed a full review and compliance process of any year of ESD reporting. It would not therefore be sensible to include ESD units in the calculation of the net carbon account for 2014. A separate statistical release provides an update on UK compliance under the ESD⁵. The Government will review this decision once we have completed the review and compliance process for the first year of the ESD.

Structure of the report

9. This report contains two sections:
 - **Part 1** provides UK greenhouse gas emissions statistics for 2014, covering emissions, removals and net emissions of each of the greenhouse gases covered by carbon budgets, individually and collectively.
 - **Part 2** sets out the amount of units which were credited to and debited from the net UK carbon account in 2014. The calculations in this part of the report are based on the methodologies established by the Carbon Accounting Regulations 2009 and the Carbon Accounting (2013-2017 Budgetary Period) Regulations 2015⁴.

⁴ SI 2009 No. 1257 is available from: www.opsi.gov.uk/si/si2009/uksi_20091257_en_1. Carbon Accounting (2013-2017 Budgetary Period)) Regulations 2015 are accessible via the government website: <http://www.legislation.gov.uk/uksi/2015/775/contents/made>

Part 1 – UK greenhouse gas emissions

10. The information contained in this part of the statement is derived from the UK greenhouse gas emissions statistics for 2014, which were published on 2 February 2016. Emissions coverage under the Climate Change Act 2008 comprises UK territory only (i.e. England, Wales, Scotland and Northern Ireland)⁵.
11. Unless otherwise stated, all figures in this section are stated in tonnes of carbon dioxide-equivalent (tCO₂e). This is the usual way of reporting greenhouse gases to account for the different global warming potentials of each gas. The global warming potential (GWP) of a gas is a measure of its impact on global warming relative to carbon dioxide, and is agreed at international level. Carbon dioxide equivalent figures are therefore produced by multiplying the emissions of a greenhouse gas by its GWP. This means the emissions and removals figures for different greenhouse gases in this part of the report are directly comparable.
12. The global warming potentials (GWPs) used for each gas in the UK inventory are based on those published in the IPCC's 4th Assessment Report⁶.

1.1 Base year emissions by gas

Section 16(8) of the Climate Change Act

13. Table 1 sets out the base year figures – the emissions in the year against which progress is measured – for each greenhouse gas covered by the Act, on the basis of the methodology in the UK's 1990-2014 National Greenhouse Gas Emissions Inventory. Under the Kyoto Protocol, the UK uses 1990 as the base year for carbon dioxide, methane and nitrous oxide emissions, and 1995 as the base year for the fluorinated gases (or F-gases: HFCs - hydrofluorocarbons, PFCs - perfluorocarbons and SF₆ - sulphur hexafluoride). To ensure consistency with our international obligations, the same base year for each greenhouse gas is used under the Climate Change Act.
14. It should be noted that the base year figures differ from those in previous publications of the Annual Statement of Emissions. This is owing to changes in the historical time series of emissions data back to 1990 in the most recent greenhouse gas statistics³ (February 2016). See section 1.4 for more details.

⁵ Section 89 of the Climate Change Act specifies that this includes UK coastal waters and the UK sector of the continental shelf.

⁶ IPCC's 4th Assessment Report, <http://www.ipcc.ch/report/ar4/>

1.2 2014 emissions by gas

Table 1: Base year emissions for each greenhouse gas, tCO₂e

Greenhouse gas	Base year	Net base year emissions
Carbon dioxide CO ₂	1990	592,832,777
Methane CH ₄		137,047,316
Nitrous oxide N ₂ O		49,437,417
Hydrofluorocarbons HFCs	1995	19,088,085
Perfluorocarbons PFCs		596,760
Sulphur hexafluoride SF ₆		1,264,370
TOTAL⁷		800,266,724

Section 16(2) of the Climate Change Act

15. Tables 2 to 7 provide data for each of the greenhouse gases covered by the Climate Change Act and carbon budgets framework. As required by the Act, this includes details of:

- The amount for 2014 of UK emissions, UK removals and net UK emissions of each gas
- Whether any of those amounts represent an increase or decrease compared to the equivalent amount for the previous year.

16. It should be noted that the emissions estimates for 2013 reported in this statement differ from last year's statement owing to changes in the historical time series of emissions data back to 1990 in the most recent greenhouse gas emissions statistics³ (published in February 2016). See section 1.4 for more details.

17. Section 16 also requires that the annual statement includes details of the methods used to measure or calculate those amounts, and this is set out in section 1.4.

⁷ Figures may not sum due to rounding.

Table 2: Carbon dioxide (CO₂) emissions, tCO₂

2014 UK CO₂ emissions excluding net emissions/removals from LULUCF (A)	431,678,813
2013 UK CO ₂ emissions excluding net emissions/removals from LULUCF (B)	472,642,875
Increase or decrease on previous year (A – B)	Decrease of 40,964,061 tCO ₂ e on previous year
2014 UK CO₂ emissions/removals from LULUCF⁸ (C)	9,710,353
2013 UK CO ₂ emissions/removals from LULUCF (D)	9,376,345
Increase or decrease on previous year (C – D)	Increase of 334,008 tCO ₂ e on previous year
2014 UK CO₂ emissions including net emissions/removals from LULUCF⁹ (E = A – C)	421,968,461
2013 UK CO ₂ emissions including net emissions/removals from LULUCF (F = B – D)	463,266,529
Increase or decrease on previous year (E – F)	Decrease of 41,298,069 tCO ₂ e on previous year

⁸ A positive amount means the net effect is the removal of emissions from the atmosphere from these carbon sinks, while a negative figure means the net effect is emissions to the atmosphere from the carbon sink.

⁹ Removals of greenhouse gas from the atmosphere do not apply to HFCs, PFCs or SF₆

Table 3: Methane (CH₄) emissions, tCO₂e

2014 UK CH₄ emissions excluding net emissions/removals from LULUCF (A)	53,448,078
2013 UK CH ₄ emissions excluding net emissions/removals from LULUCF (B)	55,747,654
Increase or decrease on previous year (A – B)	Decrease of 2,299,576 tCO ₂ e on previous year
2014 net UK CH₄ emissions/removals from LULUCF⁸ (C)	-31,492
2013 net UK CH ₄ emissions/removals from LULUCF (D)	-25,862
Increase or decrease on previous year (C – D)	Decrease of 5,630 tCO ₂ e on previous year
2014 UK CH₄ emissions including net emissions/removals from LULUCF⁹ (E = A – C)	53,479,570
2013 UK CH ₄ emissions including net emissions/removals from LULUCF (F = B – D)	55,773,516
Increase or decrease on previous year (E – F)	Decrease of 2,293,946 tCO ₂ e on previous year

Table 4: Nitrous oxide (N₂O) emissions, tCO₂e

2014 UK N₂O emissions excluding net emissions/removals from LULUCF (A)	21,221,445
2013 UK N ₂ O emissions excluding net emissions/removals from LULUCF (B)	20,651,323
Increase or decrease on previous year (A – B)	Increase of 570,122 tCO ₂ e on previous year
2014 net UK N₂O emissions/removals from LULUCF⁸ (C)	-722,353
2013 net UK N ₂ O emissions/removals from LULUCF ⁹ (D)	-726,098
Increase or decrease on previous year (C – D)	Increase of 3,745 tCO ₂ e on previous year
2014 UK N₂O emissions including net emissions/removals from LULUCF⁹ (E = A – C)	21,943,798
2013 UK N ₂ O emissions including net emissions/removals from LULUCF (F = B – D)	21,377,421
Increase or decrease on previous year (E – F)	Increase of 566,376 tCO ₂ e on previous year

Table 5: Hydrofluorocarbon (HFC) emissions, tCO₂e

2014 UK HFC emissions excluding net emissions/removals from LULUCF (A)	16,285,114
2013 UK HFC emissions excluding net emissions/removals from LULUCF (B)	16,041,934
Increase or decrease on previous year (A – B)	Increase of 243,180 tCO ₂ e on previous year
2014 net UK HFC emissions/removals from LULUCF⁸ (C)	0
2013 net UK HFC emissions/removals from LULUCF (D)	0
Increase or decrease on previous year (C – D)	n/a
2014 UK HFC emissions including net emissions/removals from LULUCF⁹ (E = A – C)	16,285,114
2013 UK HFC emissions including net emissions/removals from LULUCF (F = B – D)	16,041,934
Increase or decrease on previous year (E – F)	Increase of 243,180 tCO ₂ e on previous year

Table 6: Perfluorocarbon (PFC) emissions, tCO₂e

2014 UK PFC emissions excluding net emissions/removals from LULUCF (A)	278,315
2013 UK PFC emissions excluding net emissions/removals from LULUCF (B)	318,714
Increase or decrease on previous year (A – B)	Decrease of 40,399 tCO ₂ e on previous year
2014 net UK PFC emissions/removals from LULUCF⁸ (C)	0
2013 net UK PFC emissions/removals from LULUCF (D)	0
Increase or decrease on previous year (C – D)	n/a
2014 UK PFC emissions including net emissions/removals from LULUCF⁹ (E = A – C)	278,315
2013 UK PFC emissions including net emissions/removals from LULUCF (F = B – D)	318,714
Increase or decrease on previous year (E – F)	Decrease of 40,399 tCO ₂ e on previous year

Table 7: Sulphur hexafluoride (SF₆) emissions, tCO₂e

2014 UK SF₆ emissions excluding net emissions/removals from LULUCF (A)	468,162
2013 UK SF ₆ emissions excluding net emissions/removals from LULUCF (B)	481,196
Increase or decrease on previous year (A – B)	Decrease of 13,033 tCO ₂ e on previous year
2014 net UK SF₆ emissions/removals from LULUCF⁸ (B)	0
2013 net UK SF ₆ emissions/removals from LULUCF (D)	0
Increase or decrease on previous year (C – D)	n/a
2014 UK SF₆ emissions including net emissions/removals from LULUCF⁹ (C = A – B)	468,162
2013 UK SF ₆ emissions including net emissions/removals from LULUCF (F = B – D)	481,196
Increase or decrease on previous year (E – F)	Decrease of 13,033 tCO ₂ e on previous year

18. The emissions and removals data included in tables 2 to 7 are taken from the greenhouse gas emissions data published on 2 February 2016, derived from the UK's 1990-2014 National Greenhouse Gas Emissions Inventory. The methodologies used to calculate and compile these data are in line with United Nations Framework Convention on Climate Change (UNFCCC) reporting guidelines on annual inventories. These methods include emissions factors (country specific, plant specific and the default emissions factors used under the international framework), as well as emissions and production data reported by operators and regulators, and modelling¹⁰.

19. As part of the update to the IPCC 2006 Reporting Guidelines for Inventories, nitrogen trifluoride (NF₃) was included for the first time in the UK GHG inventory in 2013. NF₃ is not a greenhouse gas covered by the Climate Change Act and so is excluded from carbon budgets reporting. Government will need to amend the Climate Change Act for NF₃ to be included as a targeted greenhouse gas.

¹⁰ Further details on the methods used in specific sectors are set out in table 13 of the data tables published alongside the final 2014 emissions data, available from: <https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-2014>

1.3 UK emissions totals

Section 16(3) of the Climate Change Act

20. Table 8 sets out the aggregate amount of UK emissions, UK removals and net UK emissions for each gas in 2014, taken from the tables above.

Table 8: Aggregate 2014 UK greenhouse gas emissions, removals and net UK emissions, tCO₂e			
	UK emissions excluding net emissions/removals from LULUCF (A)	Net UK emissions/removals from LULUCF (B)¹¹	UK emissions including net emissions/removals from LULUCF (A – B)
Carbon dioxide	431,678,813	9,710,353	421,968,461
Methane	53,448,078	-31,492	53,479,570
Nitrous oxide	21,221,445	-722,353	21,943,798
Hydrofluorocarbons	16,285,114	0	16,285,114
Perfluorocarbons	278,315	0	278,315
Sulphur hexafluoride	468,162	0	468,162
TOTAL¹²	523,379,929	8,956,508	514,423,421

¹¹ A positive amount means the net effect is the removal of emissions from the atmosphere from these carbon sinks, while a negative figure means the net effect is emissions to the atmosphere from the carbon sink.

¹² Figures may not sum due to rounding.

1.4 Change of method

Section 16(4) of the Climate Change Act

21. The UK's greenhouse gas inventory is compiled in line with international guidance from the International Panel on Climate Change¹³ (IPCC). Each year the inventory is updated to include the latest data available. Methodological changes are made to take account of new data sources, or new guidance from the IPCC, relevant work by CORINAIR¹⁴, and new research, sponsored by DECC or otherwise. Improvements to the methodology are backdated as necessary to ensure a consistent time series. The United Kingdom's National Inventory Report¹⁵ (NIR), which is submitted each year to the UNFCCC, provides details of the methods used to estimate emissions.
22. Emission inventories will always have some uncertainty. It is not possible to measure directly all the emissions from a country, so inventories are largely based on statistical activity data as well as on emission factors¹⁶, both of which are subject to uncertainty. The UK Greenhouse Gas Inventory assesses uncertainties according to internationally agreed good practice guidance¹⁷, and this uncertainty information helps prioritise efforts to improve the accuracy of inventories in the future and guide decisions on methodological choice. The uncertainty analysis provides us with a high confidence that UK emissions of greenhouse gases have declined since 1990. The uncertainty associated with estimates of emissions of carbon dioxide (CO₂) is small, at approximately 2%, based on 2013 emissions data. The uncertainty associated with the emissions of the other Kyoto gases is higher, and so uncertainty for the basket of Kyoto gases is roughly 4%¹⁸.
23. To ensure transparency and credibility in carbon budgets reporting, it is important that any methodological changes to greenhouse gas reporting – made in accordance with international practice - are clearly stated. Section 16(4) of the Climate Change Act requires that, where a change in methodology at the international level requires an adjustment in the emissions figures for an earlier year in the same budgetary period, the annual statement of emissions must specify the adjustment required and state the adjusted amount.
24. In preparing the 2014 emissions inventory, a number of revisions were made to the figures previously reported for earlier years, to take account of new methodologies which have been applied in respect of a number of specific sectors. These methodologies have been introduced in accordance with international reporting guidelines and the findings of the annual UNFCCC review of the UK inventory¹⁹, and the revised figures will be included in the UK's submission to the UNFCCC and the European Commission.

¹³ Further details on IPCC guidance is available from: www.ipcc-nggip.iges.or.jp.

¹⁴ The air pollutant emission inventory guidebook, which provides guidance on estimating emissions from both anthropogenic and natural emission sources, is available from: <http://www.eea.europa.eu/publications/emep-eea-guidebook-2013>.

¹⁵ The NIR is accessible from the UNFCCC website:

http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/8108.php
Alternatively, further details on how the UK's greenhouse gas inventory is compiled can be accessed from:
www.gov.uk/government/organisations/department-of-energy-climate-change/series/uk-greenhouse-gas-emissions.

¹⁶ The emission factor is the emissions per unit of activity. Emission factors are typically derived from measurements on a number of representative sources and the resulting factor applied to all similar sources in the UK.

¹⁷ Intergovernmental Panel on Climate Change guidelines, as adopted by the UNFCCC.

¹⁸ Uncertainties are based on 2013 data. For further information, see Annex 2 page 679:

http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/8108.php

¹⁹ The latest annual review can be found on the UNFCCC website:

http://unfccc.int/national_reports/annex_i_ghg_inventories/inventory_review_reports/items/6947.php

25. The most significant of these revisions apply to the LULUCF and agriculture sectors. See list below for further details.

- **Emissions factors for urine and dung deposited by grazing animals.** Results from a Defra project has identified new country-specific emissions factors for direct nitrous oxide emissions from urine and dung deposited by grazing animals. This has decreased emissions by around 4 MtCO_{2e} in 1990 and by around 3 MtCO_{2e} in 2013.
- **Changes to estimates of emissions from grassland.** The emission factor used for grassland drainage on drained organic soils was corrected which decreases emissions across the whole time series; previously the Intergovernmental Panel on Climate Change (IPCC) 2006 emission factor for cultivated organic soils was used. A new variable for grassland has been reported for the first time in the 2016 Inventory, which increases emissions estimates in 1990 and 2013 due to the change between shrubby and non-shrubby grasslands. The methodology and emissions factors for calculating emissions from controlled burning following deforestation were updated to follow the IPCC 2006 guidelines. The 2014 British Geological Society (BGS) Directory of Mines and Quarries included peat sites in Northern Ireland for the first time which has allowed peat extraction areas in Northern Ireland to be assessed using Google Earth as for other administrations rather than relying on literature estimates. More minor updates include the correction of the land use change soils model and changes to carbon stock change estimates. Overall these changes to emissions from grassland have decreased emissions by around 3 MtCO_{2e} in both 1990 and 2013.
- **Emission factors for atmospheric deposition.** New country-specific emissions factors for indirect emissions from atmospheric deposition have been derived directly from the UK agriculture ammonia emissions inventory. This change harmonises the modelling in the UK nitrous oxide and ammonia emission inventories which was identified as an improvement in a previous independent review. These changes have decreased emissions by around 1 MtCO_{2e} in both 1990 and 2013.
- **Emissions factors for leaching and run-off from agricultural land.** Following a Defra project, new country-specific emissions factors for indirect emissions from leaching and run-off have replaced default values. The changes to these emissions factors have decreased emissions by around 1 MtCO_{2e} in both 1990 and 2013.
- **Landfill waste emissions methodology.** There was a minor update to the methodology estimating landfill waste emissions in order to bring the method in line with the IPCC 2006 Guidelines. This has increased emissions by a small amount in 1990 and decreased emissions in 2013.
- **Road Transport fuel consumption factors.** Methane and nitrous oxide emission factors in road transport and fuel consumption factors have been updated to as they are more relevant to current road vehicle emissions estimates. Additionally, the approach taken for normalising fuel consumption to Digest of UK Energy Statistics (DUKES) totals for petrol and diesel has been revised. These changes have increased transport emissions by a small amount in both 1990 and 2013.
- **Updates to models for Industrial Process sector.** Various models have been reviewed and updated from the Industrial Processes sector which provide more detail for reporting, better reflect the current market situation and take into account the 2014 EU F gas regulation.

The respective impacts of these changes on 2013 emissions and the base-year emissions are detailed in the table:

Table 9: Inventory revisions affecting 2013 emissions, reported from 2014 inventory, by sector

Sector	2013 emissions as reported in the 2014 inventory (tCO₂e)	2013 emissions as reported in the 2014 inventory (tCO₂e)	Change in emissions reported for 2013 (tCO₂e)
Agriculture	53,614,490	48,115,772	-5,498,718
Business	90,628,945	90,868,228	239,283
Energy Supply	189,336,411	189,465,566	129,155
Industrial Process	12,751,268	12,955,920	204,652
Land Use Change	-5,248,482	-8,624,386	-3,375,904
Public	9,520,466	9,458,619	-61,847
Residential	77,136,835	77,299,034	162,199
Transport	116,277,024	116,613,575	336,551
Waste Management	22,449,206	21,106,983	-1,342,223
Total	566,466,163	557,259,311	-9,206,853

Table 10: Inventory revisions affecting base year emissions, reported from 2014 inventory, by sector

Sector	Base year emissions as reported in the 2013 inventory (tCO₂e)	Base year emissions as reported in the 2014 inventory (tCO₂e)	Change in emissions reported for the base year (tCO₂e)
Agriculture	65,752,885	58,720,301	-7,032,584
Business	116,307,198	116,215,372	-91,826
Energy Supply	278,318,799	277,900,172	-418,627
Industrial Process	62,197,101	62,208,639	11,538
Land Use Change	3,989,029	268,108	-3,720,921
Public	13,515,657	13,497,002	-18,655
Residential	80,934,638	80,797,474	-137,164
Transport	121,220,943	121,869,285	648,342
Waste Management	69,146,686	68,790,371	-356,315
Total	811,382,936	800,266,724	-11,116,212

26. In line with the Climate Change Act, any adjustment to annual UK greenhouse gas emissions resulting from improved methodology from annual developments of the inventory is applied retrospectively to all preceding years at the end of the budgetary period. These will then be presented in the End of Budgetary Period Statement.

27. This is intended to minimise any potential confusion caused by making retrospective adjustments to already published figures in respect of the net UK carbon account for an individual year, particularly as several changes could be required throughout the course of a budget period.

28. For information, the table below shows a revised level of the net UK carbon account for 2013 based on the 1990 to 2014 inventory, in comparison to the figure published in the Annual Statement of Emissions for 2013 which used the 1990 to 2013 inventory.

Table 11: Comparing 2013 net carbon account published in last Annual Statement of Emissions to revised estimate published based on 1990-2014 inventory

Sector	2013 emissions as reported in the 2013 inventory (tCO ₂ e)
2013 net UK carbon account as reported in 2013 Annual Statement	522,694,280
2013 net UK carbon account based on 1990-2014 GHG emissions inventory	513,465,396
Total	-9,228,884

1.5 International aviation and shipping

Section 16(5) of the Climate Change Act

29. Emissions from international aviation and international 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 the national greenhouse gas inventory. Table 12 below shows greenhouse gas emissions from these sources in 2014.

Table 12: Greenhouse gas emissions from UK-based international aviation and shipping bunkers in 2014, tCO₂e

International aviation total	32,945,651
Carbon dioxide	32,634,657
Methane	2,236
Nitrous oxide	308,759
International shipping total	7,565,514
Carbon dioxide	7,506,749
Methane	2,928
Nitrous oxide	55,837
TOTAL	40,511,165

Part 2 – the net UK carbon account

30. This part sets out the amount of units which are to be credited to and debited from the net UK carbon account in 2014. Government must follow the rules set out in the regulations when working out the net UK carbon account and so the calculations in this part of the statement are based on the methodologies established by the Carbon Accounting Regulations 2009 and the Carbon Accounting (2013-2017 Budgetary Period) Regulations 2015.
31. At the time the second carbon budget was set in 2009 the detailed rules and features for phase three of the EU ETS, which runs from 2013 to 2020, had not been fully agreed and so our estimates of the UK's allocation of allowances (i.e. which are relevant to the ETS cap calculation) were based on the rules for phase two. The accounting method used to work out the ETS cap now use reflects the actual rules of phase three. The impact of now knowing the detailed rules means that the traded sector cap used for calculation of the net carbon account is lower than was expected when the second carbon budget was set.

2.1 Total amount of units credited to and debited from the net UK carbon account

Section 16(6) of the Climate Change Act

32. The net UK carbon account for a given year is calculated by taking net UK emissions for that year, with an adjustment made to reflect the amount of units to be credited to, and debited from, the net UK account for that year. Carbon units that are counted as credits reduce the level of the net UK carbon account, while carbon units that are counted as debits increase the level of the net UK carbon account.
33. The amounts of units to be counted as credits and debits in respect of 2014 should be calculated based on three elements:
- amount of units in the credit account which have been declared as credits to the net UK carbon account in respect of 2014
 - effect of the EU ETS (including emissions arising from domestic aviation)
 - determining whether the Government disposed of any carbon units during the course of 2014.

2.1.1 Units in the credit account

34. The Government set up a “credit account” in the UK Registry in 2009 is the dedicated route through which carbon units can be credited voluntarily to the net UK carbon account. The Registry is the system set up in the UK to administer the carbon accounting system under the existing EU and UN frameworks, recording the issuance, transfer, cancellation, retirement and banking of carbon units.
35. To date no units have been declared as credits towards the net UK carbon account, which means that, in respect of 2014, **0 units are to be credited to the net UK carbon account under this mechanism.**

2.1.2 Accounting for the EU Emissions Trading System (EU ETS)

36. In order to determine whether units should be credited to or debited from the net UK carbon account each year, the net carbon account needs to reflect the operation of the EU ETS.
37. The EU ETS is a cap and trade system that sets a limit on the total amount of greenhouse gases that can be emitted by installations in the system²⁰. This cap is reduced over time so that emissions fall. If EU ETS participants in the UK collectively exceed the UK cap, the amount of emissions in excess of the cap must be considered as a 'credit', as operators must have bought units from other EU ETS participants to cover these emissions. If on the other hand EU ETS participants in the UK collectively reduce their emissions below the UK cap, then the difference between reported emissions from the EU ETS sector and the cap must be considered a 'debit', as operators must have sold or retained excess units which are not required to cover emissions in the UK.
38. This mechanism is reflected in the calculation of the net carbon account, by comparing the number of allowances surrendered against the UK ETS cap for the reporting year.
39. During the first carbon budget period, the ETS cap was calculated by taking the total amount of allowances to be allocated by the UK to in-scope installations in the period 2008–2012, whether for free, by auction/sale or via the new entrant reserve and dividing by five to give an annual figure for each year of the budget²¹.
40. From 2013, the EU ETS entered its third phase, which will end in 2020. This new phase brought about changes to the rules governing operation of the ETS, and Member States no longer receive a national cap as the ETS now operates at installation level.²² As the net carbon account calculation relies on a cap for the traded sector, for the second budgetary period a 'notional' cap will be estimated. This notional cap estimates the UK share of a given EU-wide cap, replicating the components of the previous cap as defined in EU regulations.

2.1.3 EU ETS notional cap

41. The methodology for estimating the UK's notional share of the EU-wide cap is set out in tables 13 and 14. This approach (excluding the New Entrants Reserve) is consistent with the methodology applied when originally calculating the traded sector component when setting the second and third carbon budgets.
42. The notional cap is created by adding together the volume of EU allowances freely allocated to stationary UK operators, the volume of allowances in the EU-wide auction pot to be auctioned by the UK to stationary operators, and an estimated share of the New Entrants Reserve (NER).
43. The volume of EU allowances freely allocated to stationary UK operators, for the purposes of this calculation, is taken from the UK's finalised NIMs (National Implementation Measures). The NIMs are the installation level list of free EU ETS allocations to stationary UK operators²³.

²⁰ http://ec.europa.eu/clima/policies/ets/index_en.htm

²¹ Details of this calculation can be found in the end of budgetary statement found here: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/310648/final_statement_first_carbon_budget_period.pdf

²² Detailed guidance on Phase 3 of the ETS can be found here: <https://www.gov.uk/participating-in-the-eu-ets>

²³ The NIMs used can be found here: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48248/3846-uk-nat-imp-measures-phase3-euets.pdf

44. The volume of allowances in the EU-wide auction pot to be auctioned by the UK to stationary operators is estimated using the latest available estimates of the total volume of allowances to be auctioned by the EU in each year and the UK's percentage share of this total volume of allowances.
45. The NER is an additional amount of free allowances set aside for new installations that are covered by the scope of the ETS Directive, and installations that increase capacity, covering the whole of Phase III (years 2013-20).
46. The UK's share of NER allowances will only be known once these allowances have been allocated. This means that it is unknown how allowances will be allocated each year, and to which Member States. An indicative annual split of the NER allowances will be estimated for each year of the second carbon budget. The total NER represents 5% of the 2013-20 total fixed installation cap; therefore the annual split will reflect this proportion by taking 5% of the annual fixed installation cap for 2014. Further, an indicative estimate of the UK share of the NER for 2014 is arrived at by assuming that the UK share of the NER will mirror the UK share of free allowances. This method is demonstrated in table 13. Further guidance on participation in the EU ETS, including information on these various types of allowances, is published on the European Commission website²⁴.

²⁴ http://ec.europa.eu/clima/policies/ets/cap/index_en.htm

Table 13: UK Notional Allocation of New Entrants Reserve for 2014, tCO₂e

Total EU ETS cap for fixed installations in 2014 (A)	2,046,037,610
New Entrants Reserve 2014 as 5% of total cap [(A) x 0.05=(B)]	102,301,881
UK share of free allowances in 2014 (C)	7.80%
UK notional share of NER in 2014 [(C) x (B)=(D)]	7,984,076

Table 14: UK Notional EU ETS cap for 2014, tCO₂e

Amount of free allowances allocated to the UK in 2014 (E)	64,471,525
Amount of auctioned allowances allocated to the UK in 2014 (F)	66,220,000
Estimated amount of New Entrants Reserve for the UK in 2014 (D)*	7,984,076
UK Notional Cap for 2014 [(D)+(E)+(F)]	138,675,601

* See table 13

47. For 2014 the resulting UK notional cap will be 138.7 MtCO₂e. Table 15 sets out the number of units surrendered in 2014 by UK operators, thus showing the effect of the EU ETS on the net UK carbon account in 2014.

Table 15: The effect of the EU ETS on the net UK carbon account in 2014

Total amount of units surrendered by UK operators (A)	197,664,784
UK's EU ETS annual allocation for 2014 (B)	138,675,601
Difference between 2014 annual allocation and amount of units surrendered (A – B)	58,989,183

48. As the amount of units surrendered by UK operators was greater than the (notional) annual allocation for 2014, a corresponding amount of units must be counted as credits to the net carbon account. **This means 58,989,183 units are to be credited to the net UK carbon account in 2014** as a result of the EU ETS.

2.1.4 Domestic aviation emissions

49. This section refers to CO₂ emissions generated from domestic aviation only, and not international aviation emissions. Domestic aviation and shipping emissions are included within the current Carbon Budgets framework, but due to uncertainties at the time the Climate Change Act was agreed, international aviation emissions, along with international shipping emissions were not included. The decision on whether to include international aviation and shipping emissions in carbon budgets has been deferred until the setting of the fifth carbon budget in 2016²⁵.
50. Under the Climate Change Act, the net carbon account must contain emissions generated by domestic aviation (flights between UK airports). Historically this has been reported in the “non-traded” sector of the UK’s emissions.
51. Since 1 January 2012 aviation has been included in the EU ETS through the Aviation Greenhouse Gas Emissions Trading Scheme Regulations 2010, which were replaced from 1 January 2013 by the Greenhouse Gas Emissions Trading Scheme Regulations 2012; these implement the provisions of Directive 2003/87/EC (as amended by Directive 2008/101/EC).
52. As a result of being included in the EU ETS, domestic aviation is now included in the “traded sector” of the budgets. Ideally this data would be drawn from information on the number of aviation allowances surrendered. This has not been possible, because although the EU ETS provides an EU-wide cap for aviation emissions it does not provide a cap for UK only domestic aviation emissions.
53. Therefore, the data on allowances surrendered do not distinguish between international and domestic purposes.
54. This means that we are in a position where we know estimated emissions for UK domestic aviation (using the inventory) but we do not have a cap within the ETS against which to assess and account for performance. The methodology below therefore seeks to estimate a cap for UK domestic aviation, based on the methodology that was used to calculate the total EU aviation cap. The approach, along with the methodology used to assess our performance against the cap are set out and illustrated below.
55. In order to determine whether units should be credited to or debited from the net UK carbon account in each year, the number of allowances surrendered is compared with “the annual allocation”, i.e. the domestic aviation emissions cap.

2.1.4.1 Methodology to calculate domestic aviation cap

56. Using civil aviation data from the UK greenhouse gas inventory submitted under the EEA, and published on the EEA website²⁶, the steps listed below set out how we estimate a fixed cap against which we report emissions from UK domestic aviation.
57. This approach uses a **baseline** of total EEA domestic flights (i.e. total flights within individual EU countries plus Norway, Liechtenstein and Iceland), and an estimate of what **share of this total** can be attributed to the UK. The cap declines through time (by 95% in 2013-2020), reflecting the ambition to reduce emissions from aviation.

²⁵ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65686/7334-int-aviation-shipping-emissions-carb-budg.pdf

²⁶ <http://www.eea.europa.eu/data-and-maps/data/data-viewers/greenhouse-gases-viewer>

58. There are three steps to the calculation

1. Calculate a baseline of total EU domestic aviation

The baseline is the average of 2004-06 EEA domestic aviation emissions²⁷ (flights within individual EEA countries). 2004-06 is used as this is a common baseline used for EU environmental targets.

2. Calculate UK share and apply to the baseline

The UK's share of EEA domestic emissions is taken from 2010. The UK's domestic aviation emissions are compared to total EEA domestic aviation emissions in this year²⁷ (data for both is taken from the EU inventories as reported by EEA). 2010 is used because this was the benchmarking year for the allocation of free allowances to aircraft operators. This UK share of EEA domestic aviation is then applied to the 2004-06 EEA average.

3. Set a declining trajectory in line with ambitions to reduce emissions

For 2013-20, the cap will be 95% of this annual average.

2.1.4.2 Methodology to assess performance against the cap

59. The UK's emissions of annual domestic aviation (performance) are taken from the UK inventory.

60. To assess the UK's performance against this cap, the following methodology is used:

- Compare the national inventory figure for annual UK domestic aviation emissions with the domestic aviation cap, then
- If emissions exceed the cap then the difference is counted as a credit to the net UK carbon account.
- If emissions are below the cap then the difference is counted as a debit to the net UK carbon account.

2.1.4.3 Calculations

Domestic aviation cap (A)	1,655,784
2014 domestic aviation emissions (B)	1,527,070
Difference between 2014 cap and performance (A – B)	128,714

²⁷ The total EEA figure will differ slightly from that published on the EEA website due to the removal of emissions attributable to UK flights to and from Gibraltar, which are included in the UK submission for the EU inventory, but which are not applicable to UK domestic aviation emissions under the Climate Change Act. This ensures that the UK figures used within the cap are calculated on an equivalent basis to that used for the 2013 UK domestic aviation emissions used to assess performance.

Table 17: Estimate of 2014 domestic aviation emissions cap, tCO₂e

1	Average 2004-06 EEA domestic aviation emissions (A)	19,751,381
2	UK's share of 2010 EEA domestic emissions (B)	8.82%
3	UK emissions as a proportion of the 2004-06 EEA average (C) = (A x B)	1,742,931
4	For 2014, the cap will be 95% of this annual average (C) x 0.95	1,655,784

61. The cap for domestic aviation for 2014 is estimated as 1.66 MtCO₂e. Emissions for domestic aviation (taken from the inventory) were 1.53 MtCO₂e.
62. As emissions from domestic aviation were less than the cap for 2014, a corresponding amount of emissions will be counted as debits. This means that 0.13 MtCO₂e will be debited from the net UK carbon account in 2014.

2.2 Net UK carbon account for the year

Section 16(7) of the Climate Change Act

63. As described above, the net UK carbon account is calculated by taking net UK emissions, which are then adjusted to account for the amount of units to be debited from and credited to the net UK carbon account.
64. The information in table 18 is taken from preceding tables in this report and provides an amount for the net UK carbon account in 2014.

Table 18: Summary of how the net UK carbon account for 2014 is calculated

2014 net UK emissions – see table 8 (A)	514,423,421
Amount of units to be credited (B)	58,989,183
EU ETS Fixed Installations	58,989,183
EU ETS Domestic Aviation	0
Amount of units to be debited (C)	128,714
EU ETS Fixed Installations	0
EU ETS Domestic Aviation	128,714
2014 Net UK carbon account, tCO₂e ((A – B) + C)	455,562,951

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