



Department
of Energy &
Climate Change

Annual Statement of Emissions for 2013

March 2015

Annual Statement of Emissions for 2013

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

March 2015



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Executive Summary

This is the sixth annual statement of emissions required under section 16 of the Climate Change Act 2008. It sets out the steps taken to calculate the “net UK carbon account” in respect of 2013 – the first year of the second carbon budget. The net UK carbon account is what we compare against the carbon budgets to determine whether they are being met, and it must not exceed the level of the carbon budget at the end of each budgetary period.

The net UK carbon account is calculated by first calculating net UK emissions (i.e. aggregate gross emissions from sources in the UK, adjusted to take into account removals of emissions from the atmosphere by UK carbon sinks¹). This gives net UK emissions, which are adjusted to take account of carbon units representing emissions reductions that have been brought in from overseas by Government and others (“credits”) or that have been debited or credited to reflect the operation of the EU ETS and domestic aviation emissions. The net UK carbon account must not exceed the carbon budget. This comparison is made at the end of the budgetary period, but the Act also requires annual calculations of the net carbon account.

This statement shows that, in 2013, net UK emissions (excluding the impact of trading within the EU ETS) were 566.5 million tonnes of carbon dioxide-equivalent (MtCO₂e). Taking into account the use of these carbon units, **the net UK carbon account in 2013 was 522.7 MtCO₂e**. The difference of 43.8 MtCO₂e between the net UK emissions and the net UK carbon account, resulted from a greater quantity of emissions in the UK traded sector than the estimated UK share for 2013 as part of the EU Emissions Trading System (EU ETS), assuming that where in-scope companies in the UK exceed the cap they will purchase equivalent units from overseas to cover these emissions or use credits banked from previous years (see section 2.1.2). These units therefore create a credit, reducing the overall net UK carbon account. The 2013 net UK carbon account was 35.6% below base year² emissions, which were 811.4 MtCO₂e.

Annual statements must be produced by 31 March in the second year following that to which it relates, and final statements for each budgetary period – which will combine the results of each annual statement for the budgetary period to determine whether the budget has been met – must be produced by 31 May in the second year following the end of the budgetary period, which is 2019 for the second carbon budget.

¹ The United Nations Framework Convention on Climate Change defines a carbon sink as “any process, activity or mechanism which removes a greenhouse gas, an aerosol or a precursor of a greenhouse gas from the atmosphere.”

² 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: hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride). To ensure consistency with our international obligations, the same base year for each greenhouse gas is used under the Climate Change Act.

Introduction

1. The Climate Change Act 2008 introduced a legally binding target to reduce greenhouse gas emissions by at least 80% below the 1990 baseline³ in 2050, with an interim target to reduce emissions by at least 34% in the budgetary period including 2020. The Act also introduced 'carbon budgets', which set the trajectory to ensure the targets in the Act are met. These budgets represent legally-binding limits on the total amount of greenhouse gases that can be emitted in the UK for a given five-year period.
2. The first carbon budget ran from 2008 to 2012. The National Statistics published in February 2014, which cover greenhouse gas (GHG) emissions for 2012, confirmed that the UK had met the first carbon budget, with emissions 36 MtCO₂e below the cap of 3,018 MtCO₂e over the first carbon budget period.
3. We are now in the second budgetary period, which runs from 2013 to 2017 with a cap of 2,782 MtCO₂e. The third budget will cover the period 2018-2022 (2,544 MtCO₂e). The level of these budgets, which took account of the advice of the independent Committee on Climate Change, were announced in April 2009 and subsequently approved by Parliament and entered into force in May 2009. The level of the fourth carbon budget was set in law, following approval by Parliament, at the end of June 2011 as required under the Act. The level is set at 1,950 MtCO₂e, in line with the Committee on Climate Change's recommendation.
4. 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 UK emissions. This must provide information on our progress towards meeting carbon budgets in a clear and transparent way. 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. We can then state "the net UK carbon account" for each year, in accordance with the requirements in the Act.

³ '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.

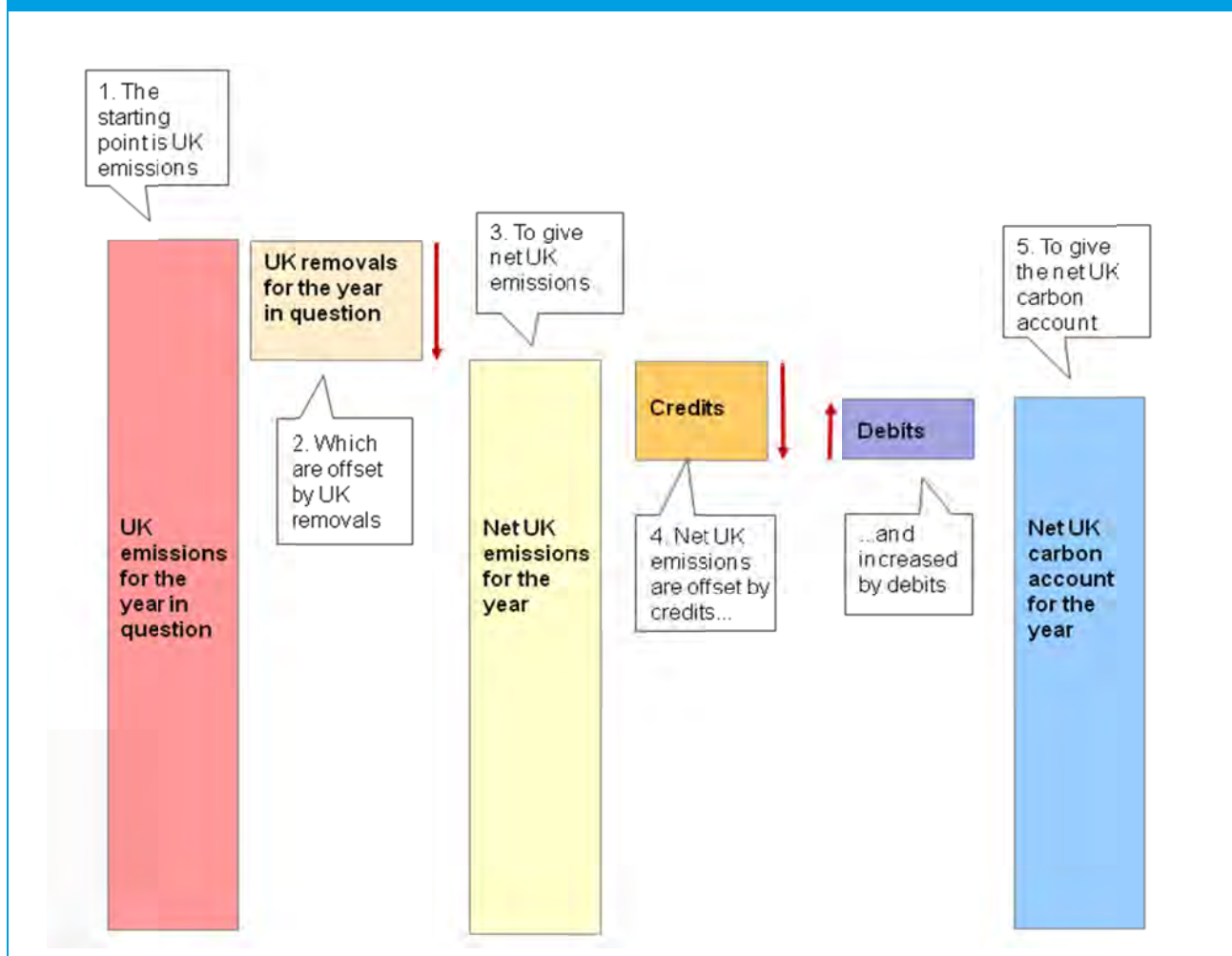
Calculating the net UK carbon account

5. Section 27 of the Climate Change Act⁴ 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.
6. 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 annually.⁵ 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.
7. This gives net UK emissions, which are then adjusted to account for:
 - a. carbon units which have been brought into the UK from other countries or others to offset UK emissions, or that have been brought in as part of the operation of the EU ETS, are treated as “credits”, thereby reducing the net UK carbon account; and
 - b. UK carbon units which have been disposed of as part of the operation of EU ETS, including domestic aviation, where applicable. These are treated as “debits” that increase the net UK carbon account.
8. The net carbon account is the number produced once these adjustments to net emissions have taken place.

⁴ <http://www.legislation.gov.uk/ukpga/2008/27/contents>.

⁵ The final 2013 estimates of UK greenhouse gas emissions were published on 3 February 2015. See: <https://www.gov.uk/government/publications/final-uk-emissions-estimates>.

Figure 1: Calculating the net UK carbon account



Domestic aviation emissions

9. The net carbon account has different approaches for emissions from sectors which are covered by the EU Emissions Trading Scheme (EEU ETS - “the traded sector”), and emissions which are not (“the non-traded sector”).
10. Previously, emissions from domestic aviation were recorded in the non-traded sector of the UK’s carbon budgets.
11. Since 1 January 2012 aviation has been included in the EU ETS through the Aviation Greenhouse Gas Emissions Trading Scheme Regulations 2010. These were replaced from 1 January 2013 by the Greenhouse Gas Emissions Trading Scheme Regulations 2012. These Regulations (as amended) implement the provisions of Directive 2003/87/EC.

12. For the purpose of carbon budget accounting, the domestic aviation CO₂ emissions will now be counted within the traded sector⁶, as opposed to the non-traded sector as was the case in statements for previous years. Details regarding this calculation are laid out later in this report (see 2.1.5).

Effort Sharing Decision

13. 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.

14. While the ESD began operation in 2013, due to delays in the international reporting system to verify performance of the ESD it would not be sensible to include ESD units in the calculation of the net carbon account for 2013. The Government will review this decision for future years of the budgetary period. A separate statistical release provides an update on UK compliance under the ESD⁷.

Structure of the report

15. This report contains two sections:

- **Part 1** provides UK greenhouse gas emissions statistics for 2013, 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 2013. The calculations in this part of the report are based on the methodologies set out in the Carbon Accounting Regulations 2009 and the Carbon Accounting (2013-2017 Budgetary Period)) Regulations 2015.⁸

⁶ Domestic Aviation emissions from the remaining greenhouse gases covered by the Act continue to be counted within the non-traded sector

⁷ <https://www.gov.uk/government/statistics/final-uk-emissions-estimates>

⁸ 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: <https://www.gov.uk/government/policies/reducing-the-uk-s-greenhouse-gas-emissions-by-80-by-2050/supporting-pages/carbon-budgets>

Part 1 – UK greenhouse gas emissions

16. The information contained in this part of the statement is derived from the UK greenhouse gas emissions statistics for 2013, which were published on 3 February 2015⁵. Emissions coverage under the Climate Change Act 2008 comprises UK territory only (i.e. England, Wales, Scotland and Northern Ireland).⁹
17. 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.
18. The global warming potentials (GWPs) used for each gas in the UK inventory have now been updated to those published in the IPCC's 4th Assessment Report¹⁰. The effect of these changes mean that methane emissions expressed as CO₂ equivalent are higher than they previously were, and nitrous oxide emissions expressed as CO₂ equivalent are lower than they previously were. The largest impact of the GWP changes is on the agriculture and waste management sectors.

1.1 Base year emissions by gas

Section 16(8) of the Climate Change Act

19. 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 1990-2013 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.

⁹ Section 89 of the Climate Change Act specifies that this includes UK coastal waters and the UK sector of the continental shelf.

¹⁰ IPCC's 4th Assessment Report, <http://www.ipcc.ch/report/ar4/>

20. 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 statistics⁵ (February 2015). See section 1.4 for more details.

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

Greenhouse gas	Base year	Net base year emissions
Carbon dioxide CO ₂	1990	596,386,569
Methane CH ₄		136,594,172
Nitrous oxide N ₂ O		56,993,733
Hydrofluorocarbons HFCs	1995	19,547,331
Perfluorocarbons PFCs		596,760
Sulphur hexafluoride SF ₆		1,264,371
TOTAL¹¹		811,382,936

1.2 2013 emissions by gas

Section 16(2) of the Climate Change Act

21. 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 2013 of UK emissions, UK removals and net UK emissions of each gas; and
- whether any of those amounts represent an increase or decrease compared to the equivalent amount for the previous year.

¹¹ Figures may not sum due to rounding.

22. It should be noted that the emissions estimates for 2012 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 statistics⁵ (published in February 2015). See section 1.4 for more details.

23. 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.

Table 2: Carbon dioxide (CO₂) emissions, tCO₂

2013 UK CO₂ emissions excluding net emissions/removals from LULUCF (A)	471,916,430
2012 UK CO ₂ emissions excluding net emissions/removals from LULUCF (B)	480,441,147
Increase or decrease on previous year (A – B)	Decrease of 8,524,717 tCO ₂ on previous year
2013 UK CO₂ removals from LULUCF¹² (C)	5,987,906
2012 UK CO ₂ removals from LULUCF ¹² (D)	5,770,399
Increase or decrease on previous year (C – D)	Increase of 217,507 tCO ₂ on previous year
2013 UK CO₂ emissions including net removals from LULUCF (E = A – C)	465,928,524
2012 UK CO ₂ emissions including net removals from LULUCF (F = B – D)	474,670,747
Increase or decrease on previous year (E – F)	Decrease of 8,742,224 tCO ₂ on previous year

¹² 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.

Table 3: Methane (CH₄) emissions, tCO₂e

2013 UK CH₄ emissions excluding net emissions/removals from LULUCF (A)	55,946,487
2012 UK CH ₄ emissions excluding net emissions/removals from LULUCF (B)	60,930,031
Increase or decrease on previous year (A – B)	Decrease of 4,983,544 tCO ₂ e on previous year
2013 net UK CH₄ emissions from LULUCF¹² (C)	-35,634
2012 net UK CH ₄ emissions from LULUCF ¹² (D)	-68,013
Increase or decrease on previous year (C – D)	Increase of 32,379 tCO ₂ e on previous year
2013 UK CH₄ emissions including net emissions from LULUCF (E = A – C)	55,982,120
2012 UK CH ₄ emissions including net emissions from LULUCF (F = B – D)	60,998,044
Increase or decrease on previous year (E – F)	Decrease of 5,015,923 tCO ₂ e on previous year

Table 4: Nitrous oxide (N₂O) emissions, tCO₂e

2013 UK N₂O emissions excluding net emissions/removals from LULUCF (A)	26,857,694
2012 UK N ₂ O emissions excluding net emissions/removals from LULUCF (B)	26,858,422
Increase or decrease on previous year (A – B)	Decrease of 728 tCO ₂ e on previous year
2013 net UK N₂O emissions from LULUCF¹² (C)	-703,790
2012 net UK N ₂ O emissions from LULUCF ¹² (D)	-746,320
Increase or decrease on previous year (C – D)	Increase of 42,530 tCO ₂ e on previous year
2013 UK N₂O emissions including net emissions from LULUCF (E = A – C)	27,561,484
2012 UK N ₂ O emissions including net emissions from LULUCF (F = B – D)	27,604,742
Increase or decrease on previous year (E – F)	Decrease of 43,258 tCO ₂ e on previous year

Table 5: Hydrofluorocarbon (HFC) emissions, tCO₂e	
2013 UK HFC emissions excluding net emissions/removals from LULUCF (A)	16,139,129
2012 UK HFC emissions excluding net emissions/removals from LULUCF (B)	16,111,306
Increase or decrease on previous year (A – B)	Increase of 27,823 tCO ₂ e on previous year
2013 net UK HFC emissions/removals from LULUCF^{12,13} (C)	0
2012 net UK HFC emissions/removals from LULUCF ¹¹ (D)	0
Increase or decrease on previous year (C – D)	n/a
2013 UK HFC emissions including net emissions/removals from LULUCF (E = A – C)	16,139,129
2012 UK HFC emissions including net emissions/removals from LULUCF (F = B – D)	16,111,306
Increase or decrease on previous year (E – F)	Increase of 27,823 tCO ₂ e on previous year

¹³ Removals of greenhouse gas from the atmosphere do not apply to HFCs, PFCs or SF₆.

Table 6: Perfluorocarbon (PFC) emissions, tCO₂e	
2013 UK PFC emissions excluding net emissions/removals from LULUCF (A)	253,350
2012 UK PFC emissions excluding net emissions/removals from LULUCF (B)	258,783
Increase or decrease on previous year (A – B)	Decrease of 5,433 tCO ₂ e on previous year
2013 net UK PFC emissions/removals from LULUCF¹¹ (C)	0
2012 net UK PFC emissions/removals from LULUCF ¹¹ (D)	0
Increase or decrease on previous year (C – D)	n/a
2013 UK PFC emissions including net emissions/removals from LULUCF (E = A – C)	253,350
2012 UK PFC emissions including net emissions/removals from LULUCF (F = B – D)	258,783
Increase or decrease on previous year (E – F)	Decrease of 5,433 tCO ₂ e on previous year

Table 7: Sulphur hexafluoride (SF₆) emissions, tCO₂e	
2013 UK SF₆ emissions excluding net emissions/removals from LULUCF (A)	601,556
2012 UK SF ₆ emissions excluding net emissions/removals from LULUCF (B)	632,267
Increase or decrease on previous year (A – B)	Decrease of 30,711 tCO ₂ e on previous year
2013 net UK SF₆ emissions/removals from LULUCF¹¹ (B)	0
2012 net UK SF ₆ emissions/removals from LULUCF ¹¹ (D)	0
Increase or decrease on previous year (C – D)	n/a
2013 UK SF₆ emissions including net emissions/removals from LULUCF (C = A – B)	601,556
2012 UK SF ₆ emissions including net emissions/removals from LULUCF (F = B – D)	632,267
Increase or decrease on previous year (E – F)	Decrease of 30,711 tCO ₂ e on previous year

24. The emissions and removals data included in tables 2 to 7 are taken from the greenhouse gas emissions data published on 3 February 2015, derived from the UK's 1990-2013 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 modelling.¹⁴

¹⁴ Further details on the methods used in specific sectors are set out in table 13 of the data tables published alongside the final 2013 emissions data, available from: <https://www.gov.uk/government/publications/final-uk-emissions-estimates>.

25. 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.

1.3 UK emissions totals

Section 16(3) of the Climate Change Act

26. Table 8 sets out the aggregate amount of UK emissions, UK removals and net UK emissions for each gas in 2013, taken from the tables above.

Table 8: Aggregate 2013 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) ¹⁵	UK emissions including net emissions/removals from LULUCF (A – B)
Carbon dioxide	471,916,430	5,987,906	465,928,524
Methane	55,946,487	-35,634	55,982,120
Nitrous oxide	26,857,694	-703,790	27,561,484
Hydrofluorocarbons	16,139,129	0	16,139,129
Perfluorocarbons	253,350	0	253,350
Sulphur hexafluoride	601,556	0	601,556
TOTAL¹⁶	571,714,645	5,248,482	566,466,163

¹⁵ 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.

¹⁶ Figures may not sum due to rounding.

1.4 Change of method

27. The UK's greenhouse gas inventory is compiled in line with international guidance from the Intergovernmental Panel on Climate Change¹⁷ (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 CORINAIR¹⁸, 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 Report¹⁹ (NIR), which is submitted each year to the UNFCCC, provides details of the methods used to estimate emissions.
28. 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 factors²⁰, both of which are subject to uncertainty. The UK Greenhouse Gas Inventory assesses uncertainties according to internationally agreed good practice guidance²¹, 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 2012 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 5%.²²
29. 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.
30. In preparing the 2013 emissions inventory, a number of changes 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 inventory²³, and the revised figures will be included in the UK's submission to the UNFCCC and the European Commission.

¹⁷ Further details on IPCC guidance is available from: www.ipcc-nggip.iges.or.jp.

¹⁸ 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>.

¹⁹ 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.

²⁰ 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.

²¹ Intergovernmental Panel on Climate Change guidelines, as adopted by the UNFCCC.

²² Uncertainties are based on 2012 data. For further information, see Annex 7:

http://cdr.eionet.europa.eu/gb/eu/ghgmm/envu01cw/ukghgi-90-12_Annexes_Issue1.pdf/manage_document

²³ 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

31. The most significant of these revisions are as follows.

- In line with new reporting guidance produced by the IPCC, the UK's greenhouse gas inventory now takes into account new sources, including nitrous oxide use in anaesthesia and emissions from UK composting. Some existing sources have also been updated with new methodologies and the global warming potentials (GWPs)²⁴ used for each gas have been updated to those set out in the IPCC's fourth assessment report¹⁰. The GWP for methane has increased from 21 to 25 (meaning that methane emissions expressed as CO₂ equivalent are higher than they previously were), and the GWP for nitrous oxide has decreased from 310 to 298 (meaning that nitrous oxide emissions expressed as CO₂ equivalent are lower than they previously were). The largest impact of the GWP changes is on the agriculture and waste management sectors.
- There have been several revisions to estimates of emissions from landfill sites. New information from the Environment Agency and the Scottish Environmental Protection Agency on the volumes of landfill gas flared at UK landfill sites has been used; previously these volumes had been estimated. New research from Defra has shown that the rate at which degradable waste is estimated to decay over time is slightly higher than previously thought, which increases emissions in the early part of the time series and decreases them after 2009. More minor updates included changes to assumptions of gas combustion engine efficiency and new data on waste composition. Overall these are estimated to increase emissions by around 11 MtCO_{2e} in 1990 and reduce them by around 2 MtCO_{2e} in 2012.
- There have been methodological changes made following new research from Defra, which has produced updated estimates of the average weights of dairy cattle and beef cattle. In addition new information on the manure management practices of UK farms has been included and the total area of organic soils in the UK has been updated. The latter issue is also described in the point below. These changes are estimated to increase emissions by around 3 MtCO_{2e} in both 1990 and 2012 (though overall emissions from the agriculture sector have decreased).
- There have been changes to the area of UK cropland on drained organic soils, impacting upon LULUCF activity. Defra have published revised UK land areas of cropland on organic soils which have been drained for agricultural purposes. Therefore emissions from this change of land use have been revised, causing an increase in emissions of around 4 MtCO_{2e} across the time series.
- Some allocations of fuel use have been changed in the Digest of UK Energy Statistics in response to conversations with the relevant industries. This has increased emissions as more fuel use has been allocated to activities which combust the fuel, and therefore release emissions.
- The EU Emissions Trading Scheme has increased its scope as of 2013, and more installations and processes have been included. This has provided new information for the inventory, for example chemical flaring at ethylene plant, which is included for the first time.

²⁴ GWPs allow each gas to be put in the same context. Carbon dioxide is used as the basis for comparison and is given a value of '1'.

- Emissions from fugitive emissions from gas and oil extraction in the UK have been revised to account for venting from the gas distribution network and better estimates of emissions from small coal mines.
- Emission factors for coal, anthracite and coke have been updated to the IPCC default values as a result of questions received during the international review process. This has increased emissions by a small amount.

The respective impacts of these changes on 2012 emissions and the base-year emissions are detailed in the table:

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

Sector	Base year emissions as reported in the 2012 inventory (tCO ₂ e)	Base year emissions as reported in the 2013 inventory (tCO ₂ e)	Change in emissions reported for the base year (tCO ₂ e)
Agriculture	70,915,124	65,752,885	-5,162,239
Business	117,013,990	116,307,198	-706,792
Energy Supply	271,859,268	278,318,799	6,459,531
Industrial Process	56,417,214	62,197,101	5,779,887
LULUCF ²⁵	1,893,779	3,989,029	2,095,250
Public	13,143,494	13,515,657	372,164
Residential	80,866,720	80,934,638	67,918
Transport	121,080,488	121,220,943	140,455
Waste Management	47,127,871	69,146,686	22,018,815
Total	780,317,947	811,382,936	31,064,990

²⁵ LULUCF refers to 'Land use, land use change and forestry'

Table 10: Inventory revisions affecting 2012 emissions, reported from 2013 inventory, by sector

Sector	2012 emissions as reported in the 2012 inventory (tCO ₂ e)	2012 emissions as reported in the 2013 inventory (tCO ₂ e)	Change in emissions reported for 2012 (tCO ₂ e)
Agriculture	56,453,086	53,823,422	-2,629,664
Business	86,356,122	88,093,710	1,737,588
Energy Supply	201,599,314	203,096,282	1,496,968
Industrial Process	9,804,138	10,453,222	649,085
LULUCF ₂₅	- 6,990,212	- 4,956,066	2,034,146
Public	10,148,744	9,283,386	-865,357
Residential	77,118,320	76,856,663	-261,657
Transport	117,453,058	117,470,677	17,619
Waste Management	21,579,175	26,154,593	4,575,418
Total	573,521,744	580,275,889	6,754,145

32. 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.

33. 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.

34. As 2013 represents the first year of the second carbon budget period, there are no preceding years to consider in this statement. The final budgetary statement for the first carbon budget was published in May 2014²⁶.

1.5 International aviation and shipping

Section 16(5) of the Climate Change Act

35. Emissions from international aviation and international shipping²⁷ 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 11 below shows greenhouse gas emissions from these sources in 2013.

²⁶ <https://www.gov.uk/government/statistics/final-statement-for-the-first-carbon-budget-period>

²⁷ This differs slightly from the carbon budgets coverage as under the UNFCCC we report emissions from aviation and shipping bunkers in the UK, Jersey, Guernsey and the Isle of Man.

Table 11: Greenhouse gas emissions from UK-based international aviation and shipping bunkers in 2013, tCO_{2e}

International aviation total	32,219,624
Carbon dioxide	31,915,677
Methane	2,003
Nitrous oxide	301,945
International shipping total	8,745,305
Carbon dioxide	8,677,422
Methane	3,382
Nitrous oxide	64,501
TOTAL	40,964,929

Part 2 – the net UK carbon account

36. This part sets out the amount of units which are to be credited to and debited from the net UK carbon account in 2013. The calculations in this part of the statement are based on the methodologies set out in the Carbon Accounting Regulations 2009 and the Carbon Accounting (2013-2017 Budgetary Period) Regulations 2015.²⁸

Changes to the Carbon Accounting Regulations

37. Government has produced carbon accounting regulations which reflect the changes in the way the net UK carbon account is calculated during the second carbon budget. The new regulations incorporate changes to the way the EU ETS is accounted for in carbon budgets, and reflect structural changes made to the EU ETS for Phase III (2013-2020).

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

Section 16(6) of the Climate Change Act

38. As described above, 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.

39. The amounts of units to be counted as credits and debits in respect of 2013 should be calculated based on three elements:

- The amount of units in the credit account which have been declared as credits to the net UK carbon account in respect of 2013;
- The effect of the EU ETS (including emissions arising from domestic aviation)

40. The units to be credited and debited in 2013 are “allowances” as defined in Article 3(a) of the Emissions Trading Directive, but excluding “aviation allowances”²⁹³⁰.

²⁸ The Carbon Accounting Regulations 2009 (SI 2009 No. 1257) are 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: <https://www.gov.uk/government/policies/reducing-the-uk-s-greenhouse-gas-emissions-by-80-by-2050/supporting-pages/carbon-budgets>

²⁹ “Aviation allowances” are any allowances allocated in accordance with Article 3e or 3f of the Emissions Trading Directive or auctioned in accordance with Article 3d of that Directive: <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02003L0087-20140430&qid=1426760230299&from=EN>

2.1.1 Units in the credit account

41. The Government set up a “credit account” in the UK Registry in 2009 as 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.
42. To date no units have been declared as credits towards the net UK carbon account, which means that, in respect of 2013, **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)

43. 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.
44. 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 system³¹. 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 overseas to cover these emissions or used credits banked from previous years. 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.
45. 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.
46. 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 budget³².
47. 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

³⁰ Previous annual statements refer to “Carbon Units”, for the purpose of carbon accounting, as written in regulation 3 of the 2009 Regulations. These 2009 regulations refer to “European Union allowances”, however, this definition has now become outdated and will need to be reviewed.

³¹ http://ec.europa.eu/clima/policies/ets/index_en.htm

³² 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

installation level.³³ 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

48. The methodology for estimating the UK's notional share of the EU-wide cap is set out in tables 12 and 13. 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.
49. 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).
50. The volume of EU allowances freely allocated to stationary UK operators, for the purposes of this calculation, will be 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 operators³⁴.
51. The volume of allowances in the EU-wide auction pot to be auctioned by the UK to stationary operators will be 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.
52. 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).
53. The UK's share of NER allowances over the course of the second carbon budget will only be known once these allowances have been allocated. This means that it is unknown how allowances will be allocated over the course of the budget period, and to which Member States. An indicative annual split of the NER allowances will thus 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 2013. Further, an indicative estimate of the UK share of the NER for 2013 is arrived at by assuming that the UK share of the NER will mirror their share of free allowances for the year. This method is demonstrated in table 12. Further guidance on the EU ETS, including information on these various types of allowances, is published on the European Commission website³⁵.

³³ Detailed guidance on Phase 3 of the ETS can be found here: <https://www.gov.uk/participating-in-the-eu-ets>

³⁴ The NIMs are available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/318902/uk_national_allocation_table_phase_iii_free_allocation.pdf

The aggregated UK total for 2013 and 2014 is available from:

http://ec.europa.eu/clima/policies/ets/cap/allocation/docs/process_overview_nat_2014_en.pdf

³⁵ http://ec.europa.eu/clima/policies/ets/cap/index_en.htm

Table 12: UK Notional Allocation of New Entrants Reserve for 2013, tCO₂e

Total EU ETS cap for fixed installations in 2013 (A)	2,084,301,856
New Entrants Reserve 2013 as 5% of total cap [(A)*0.05=(B)]	104,215,093
UK share of free allowances in 2013 (C)	7.81%
UK notional share of NER in 2013 [(C)*(B)=(D)]	8,137,232

Table 13: UK Notional EU ETS cap for 2013, tCO₂e

Amount of free allowances allocated to the UK in 2013 (E)	66,180,000
Amount of auctioned allowances allocated to the UK in 2013 (F)	107,356,000
Estimated amount of New Entrants Reserve for the UK in 2013 (D)*	8,137,232
UK Notional Cap for 2013 [(D)+(E)+(F)]	181,673,232

* See table 12

54. For 2013 the resulting UK notional cap will be 181.7 MtCO₂e. Table 14 sets out the number of units surrendered in 2013 by UK operators, thus showing the effect of the EU ETS on the net UK carbon account in 2013.

Table 14: The effect of the EU ETS on the net UK carbon account in 2013

Total amount surrendered by UK operators (A)	225,481,380
UK's EU ETS notional cap for 2013 (B)	181,673,232
Difference between 2013 annual allocation and amount of units surrendered (A – B)	43,808,148

55. As the amount of units surrendered by UK operators was greater than the notional cap for 2013, a corresponding amount of units must be counted as credits to the net carbon account. **This means 43,808,148 units are to be credited to the net UK carbon account in 2013** as a result of the EU ETS.

2.1.5 Domestic aviation emissions

56. 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 2016³⁶.
57. 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.
58. 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.
59. As a result of being included in the EU ETS, domestic aviation is now included in the “traded sector” of the budgets.
60. 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.
61. Therefore, the data on allowances surrendered do not distinguish between international and domestic purposes.
62. 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.
63. In order to determine whether units should be credited to or debited from the net UK carbon account in each year, the quantity of domestic aviation emissions is compared with a second notional UK share of the EU-wide domestic aviation emissions cap.

Methodology to calculate domestic aviation cap

64. Using civil aviation data from the UK greenhouse gas inventory submitted under the EEA, and published on the European Environment Agency website³⁷, the steps listed below are used to estimate a fixed cap against which we will report emissions from UK domestic aviation.

³⁶ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65686/7334-int-aviation-shipping-emissions-carb-budg.pdf

³⁷ <http://www.eea.europa.eu/data-and-maps/data/data-viewers/greenhouse-gases-viewer>

65. This approach uses a **baseline** of total European Economic Area (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.

66. 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 emissions³⁸ (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 year³⁸ (data for both are taken from the EU inventories as reported by the European Environment Agency). 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.

Methodology to assess performance against the cap

67. The UK's emissions of annual domestic aviation (performance) will continue to be taken from the UK inventory.

68. To assess the UK's performance against this cap, the following methodology will be 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 would be counted as a credit to the net UK carbon account.
- If emissions are below the cap then the difference would be counted as a debit to the net UK carbon account.

³⁸ 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.

Calculations

Table 15: Performance against the domestic aviation emissions cap, tCO₂e

Domestic aviation cap (A)	1,655,784
2013 domestic aviation emissions (B)	1,619,519
Difference between 2013 cap and performance (A – B)	36,265

Table 16: Estimate of 2013 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 share of 2004-06 emissions, based on the 2010 proportional share (C) = (A x B)	1,742,931
4	For 2013, the cap will be 95% of this annual average (C) x 0.95	1,655,784

69. The cap for domestic aviation for 2013 is estimated as 1.66 MtCO₂e. Emissions for domestic aviation (taken from the inventory) were 1.62 MtCO₂e.

70. As emissions from domestic aviation were less than the cap for 2013, under the new accounting rules, a corresponding amount of emissions will be counted as debits. This means that 0.04 MtCO₂e will be debited to the net UK carbon account in 2013.

Revisions to method

71. The method for calculation of the domestic aviation cap, as above, differs from that published in annual statement of emissions 2012 as it uses data from the European Environment Agency (EEA) rather than from the UNFCCC³⁹. The EEA data better corresponds to EU ETS coverage.

72. The cap is calculated using 1990-2012 inventory data. This is the latest data publicly available for inventories outside of the UK.

³⁹ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/296152/38238_Un_Act_DECC_web_accessible_v2.pdf

2.2 Net UK carbon account for the year

Section 16(7) of the Climate Change Act

73. 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.

74. The information in table 17 is taken from preceding tables in this report and provides an amount for the net UK carbon account in 2013.

Table 17: Summary of how the net UK carbon account for 2013 is calculated	
2013 net UK emissions – see table 8 (A)	566,466,163
Amount of units to be credited (B)	48,808,148
EU ETS Fixed Installations	43,808,148
EU ETS Domestic Aviation	0
Amount of units to be debited (C)	36,265
EU ETS Fixed Installations	0
EU ETS Domestic Aviation	36,265
2013 Net UK carbon account, tCO₂e ((A – B) + C)	522,694,280

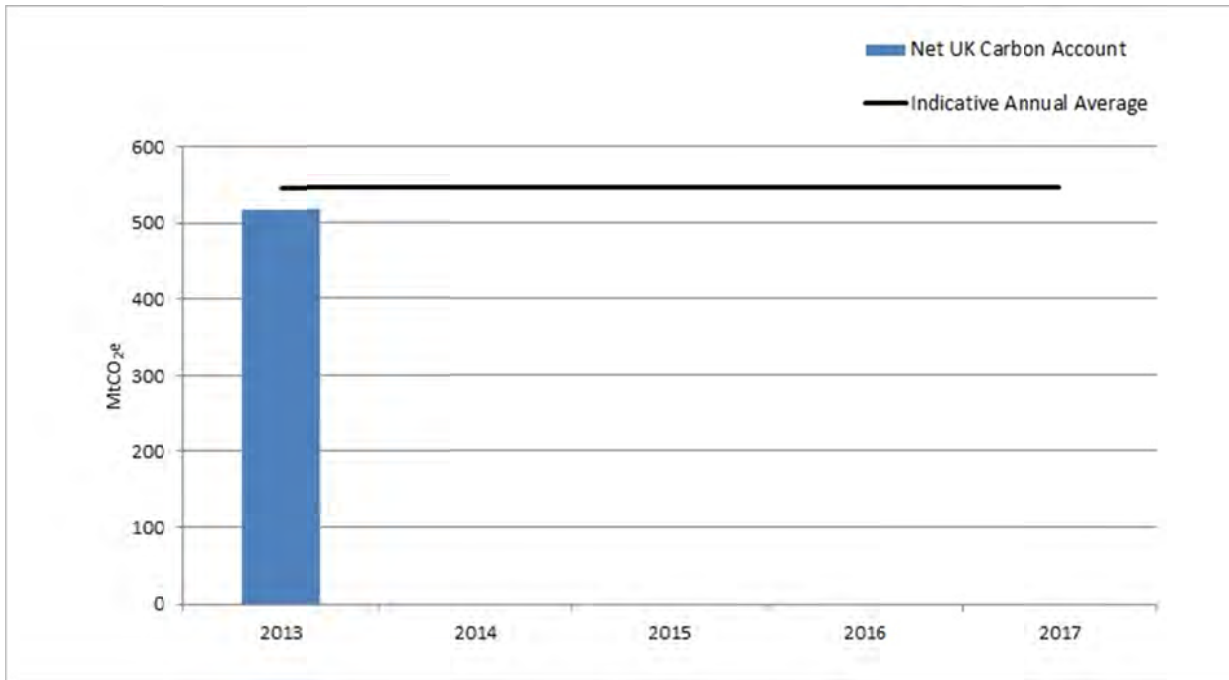
2.3 Progress against the second carbon budget

75. 2013 represents the first year of the second carbon budget. The first carbon budget ran from 2008 to 2012. The National Statistics published in February 2014, which cover greenhouse gas (GHG) emissions for 2012, confirmed that the UK had met the first carbon budget, with emissions 36 MtCO_{2e} below the cap of 3,018 MtCO_{2e} over the first carbon budget period.
76. Under the Climate Change Act, the Government is required to meet carbon budgets over the respective five year period, and there is no requirement to meet specific emissions levels in a given year⁴⁰. This allows for unexpected changes in emissions due to reasons outside of Government control. However, the Government is required, under section 12 of the Act, to publish indicative annual ranges showing where it expects the net UK carbon account to fall in each year of the budgetary period.
77. Indicative annual ranges for the first three carbon budgets were published in Annex B to the Carbon Plan⁴¹. This showed the indicative annual range for the net UK carbon account in 2013 is 530 MtCO_{2e} to 565 MtCO_{2e}. The net UK carbon account for 2013 (522.7 MtCO_{2e}) therefore falls below the indicative annual range for the year, resulting from a greater quantity of emissions in the UK traded sector than the estimated UK allocation for 2013 as part of the EU Emissions Trading System (EU ETS), assuming that where in-scope companies in the UK exceed the cap they will purchase equivalent units from overseas to cover these emissions (see section 2.1.2). These units therefore create a credit reducing the overall net UK carbon account.
78. The chart below summarises the UK's current performance against the second carbon budget. The budget provides a limit for total emissions over a five year period. To show progress at annual level, this limit is presented as an indicative annual average. In reality the UK might exceed this indicative level in certain years within the budgetary period and still meet the total carbon budget.

⁴⁰ With the exception that the “annual equivalent” of the carbon budget covering the year 2020 must be at least 34% lower than the 1990 baseline and the “annual equivalent of the carbon budget” for the carbon budget covering the year 2050 is no more than the level specified in section 1 compared with the 1990 baseline (80% below 1990 levels, unless amended under section 2);

³⁰ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/47613/3702-the-carbon-plan-delivering-our-low-carbon-future.pdf

Performance towards the second carbon budget



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