Department of Energy & Climate Change

Annual Statement of Emissions for 2012

March 2014

Annual Statement of Emissions for 2012

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

March 2014

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Executive summary

This is the fifth 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 2012 – the final year of the first carbon budget. The net UK carbon account is what we compare against the carbon budgets to determine whether they are being met, and 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 sinks[1]). These are adjusted to account for any carbon units which have been brought in from overseas by Government and others to offset UK emissions, and UK carbon units which have been disposed of to a third party outside the UK. The detailed rules for these calculations are contained in the Carbon Accounting Regulations 2009 and the Carbon Accounting (Amendment) Regulations 2009.

This statement shows that, in 2012, net UK emissions (excluding the impact of trading within the EU ETS) were 573.5 million tonnes of carbon dioxide-equivalent ($MtCO_2e$). Taking into account the use of these carbon units, **the net UK carbon account in 2012 was 587.1 $MtCO_2e$**. The difference of 13.6 $MtCO_2e$ between the net UK emissions and the net UK carbon account, resulted from the sale of 14.5 $MtCO_2e$ worth of carbon units to companies in the UK operating under the EU Emissions Trading System (EU ETS), and 0.9 $MtCO_2e$ worth of carbon units being cancelled.[2] The National Statistics used to compile this statement show that UK emissions for the first carbon budget period were 2,982 $MtCO_2e$, **36 $MtCO_2e$ below the cap of 3,018 $MtCO_2e$ - confirming that the UK has met its first carbon budget**.

The 2012 net UK carbon account was 24.8% below base year[3] emissions, which were 780.3 $MtCO_2e$. However, the net UK carbon account increased by 8.2 $MtCO_2e$ (1.4 %) between 2011 and 2012. This increase resulted primarily from an increase in residential gas. Residential emissions are heavily influenced by external temperatures, and 2012 was a colder than average year.

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[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] At the end of Phase II of the EU ETS, the UK was required to cancel all allowances which have not been either issued or auctioned by that point. As a consequence, allowances totalling around 4.5 $MtCO_2e$ were cancelled in 2012. These cancelled allowances have the effect of reducing the overall cap for the whole of Phase II. For presentational purposes, this amount has been distributed evenly over the five years, effectively reducing the cap by 0.9 $MtCO_2e$ each year.

[3] 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.

Annual statements must be produced by 31 March each year, 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 2014 for the first carbon budget.

Introduction

1. The Climate Change Act 2008 introduced a legally binding target to reduce greenhouse gas emissions by at least 80% below the 1990 baseline[4] 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 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 budgetary period runs from 2008 to 2012 (3,018 $MtCO_2e$), and the next two budgets cover the periods 2013-2017(2,782 $MtCO_2e$), and 2018-2022 (2,544 $MtCO_2e$). 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 $MtCO_2e$, in line with the Committee on Climate Change's recommendation.

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. 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 – where they have been brought into the UK from overseas to offset UK emissions, or sold to a third party outside the UK. 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[5] 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.

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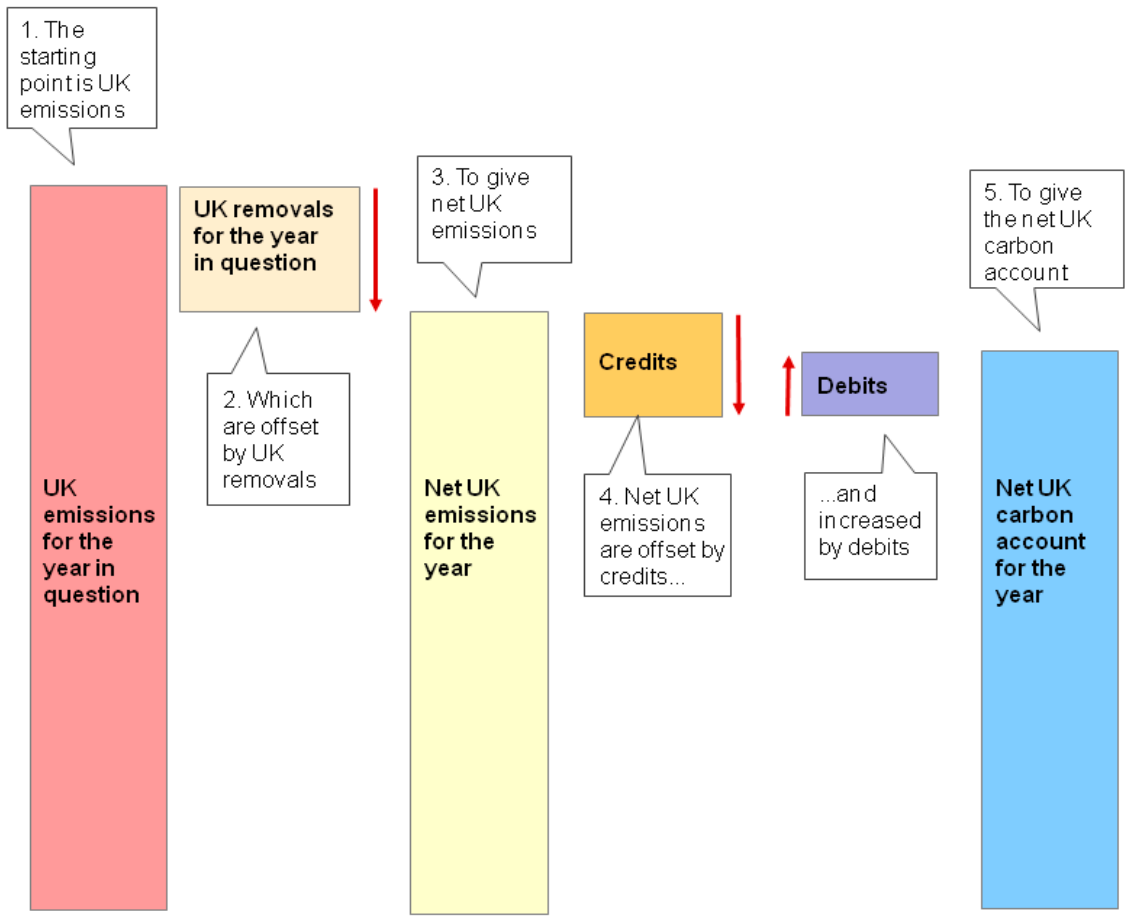
[4] 'The 1990 baseline' is defined in the Climate Change Act 2008 as 1990 emissions of carbon dioxide, methane and nitrous oxide and 1995 emissions for the fluorinated gases.
[5] http://www.legislation.gov.uk/ukpga/2008/27/contents.

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 annually.[6] 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:
   a. carbon units which have been brought in from overseas by Government and others 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



[6] The final 2012 estimates of UK greenhouse gas emissions were published on 4 February 2014. See: https://www.gov.uk/government/publications/final-uk-emissions-estimates.

Domestic aviation

7. The Net Carbon Account has different approaches for emissions from sectors which are covered by the EU ETS ("the traded sector"), and emissions which are not ("the non-traded sector").

8. Under existing Regulations, emissions from domestic aviation are recorded in the non-traded sector of the UK's carbon budgets.

9. 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).

10. For the purpose of carbon budget accounting, these emissions therefore need to move from the non-traded sector to the traded sector. Annex A details the proposed methodology by which domestic aviation emissions will be accounted for in the traded sector.

11. Government intends to update the Carbon Accounting Regulations to reflect this change. The Regulations will also be updated to incorporate changes to the way the EU ETS is accounted for in carbon budgets, and to reflect structural changes made to the EU ETS for Phase III (2013-2020). Government intends to update the Regulations ahead of the production of the Annual Statement of Emissions for 2013, which will be released in March 2015, and will be the first emissions statement for the second carbon budget period.

12. For the 2012 Annual Statement of Emissions, we have treated aviation emissions in two ways:
    a. In the full statement, these emissions are shown in the non-traded sector (which reflects the current Regulations);
    b. Annex A reflects the inclusion of these emissions in the traded sector (which reflects Government intention for future Regulations reflecting that these emissions are now covered by the EU ETS).

Structure of the report

13. This report contains two sections:
    - **Part 1** provides UK greenhouse gas emissions statistics for 2012, covering emissions, removals and net emissions of each of the six 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 2012. The calculations in this part of the report are based on the methodologies established by the Carbon Accounting Regulations 2009 and the Carbon Accounting (Amendment) Regulations 2009.[7]

[7] SI 2009 No. 1257 and SI 2009 No. 3146, respectively, available from: www.opsi.gov.uk/si/si2009/uksi_20091257_en_1 and www.opsi.gov.uk/si/si2009/uksi_20093146_en_1.

Part 1 – UK greenhouse gas emissions

14. The information contained in this part of the statement is derived from the UK greenhouse gas emissions statistics for 2012, which were published on 4 February 2014.[6] Emissions coverage under the Climate Change Act 2008 comprises UK territory only (i.e. England, Wales, Scotland and Northern Ireland).[8]

15. Unless otherwise stated, all figures in this section are stated in tonnes of carbon dioxide-equivalent (tCO_2e). 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.

1.1 Base year emissions by gas

Section 16(8) of the Climate Change Act

16. 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 1990-2012 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 SF_6 - sulphur hexafluoride). To ensure consistency with our international obligations, the same base year for each greenhouse gas is used under the Climate Change Act.

17. It should be noted that the base year figures differ from those in the Annual Statement of Emissions for 2011. This is owing to changes in the historical time series of emissions data back to 1990 in the most recent greenhouse gas statistics[6] (February 2014). See section 1.4 for more details.

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

Table 1: Base year emissions for each greenhouse gas, tCO_2e		
Greenhouse gas	**Base year**	**Net base year emissions**
Carbon dioxide CO_2	1990	589,607,403
Methane CH_4		103,984,654
Nitrous oxide N_2O		69,747,157
Hydrofluorocarbons HFCs	1995	15,316,131
Perfluorocarbons PFCs		461,669
Sulphur hexafluoride SF_6		1,200,934
	TOTAL[9]	**780,317,947**

1.2 2012 emissions by gas

Section 16(2) of the Climate Change Act

18. Tables 2 to 7 provide data for each of the six greenhouse gases covered by the Climate Change Act and carbon budgets framework. As required by the Act, this includes details of:
    - the amount for 2012 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.

19. It should be noted that the emissions estimates for 2011 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 statistics[6] (published in February 2014). See section 1.4 for more details.

[9] Figures may not sum due to rounding.

20. 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 paragraph 27.

Table 2: Carbon dioxide (CO_2) emissions, tCO_2	
2012 UK CO_2 emissions excluding net emissions/removals from LULUCF (A)	**480,183,764**
2011 UK CO_2 emissions excluding net emissions/removals from LULUCF (B)	460,760,395
Increase or decrease on previous year (A – B)	Increase of 19,423,369 tCO_2 on previous year
2012 UK CO_2 emissions/removals from LULUCF[10] (C)	**7,721,732**
2011 UK CO_2 emissions/removals from LULUCF[10] (D)	8,210,552
Increase or decrease on previous year (C – D)	Decrease of 488,820 tCO_2 on previous year
2012 UK CO_2 emissions including net emissions/removals from LULUCF (E = A – C)	**472,462,032**
2011 UK CO_2 emissions including net emissions/removals from LULUCF (F = B – D)	452,549,843
Increase or decrease on previous year (E – F)	Increase of 19,912,189 tCO_2 on previous year

[10] 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 (CH_4) emissions, tCO_2e	
2012 UK CH_4 emissions excluding net emissions/removals from LULUCF (A)	**50,429,813**
2011 UK CH_4 emissions excluding net emissions/removals from LULUCF (B)	51,509,556
Increase or decrease on previous year (A – B)	Decrease of 1,079,744 tCO_2e on previous year
2012 net UK CH_4 emissions/removals from LULUCF[10] (C)	**-64,627**
2011 net UK CH_4 emissions/removals from LULUCF[10] (D)	-43,181
Increase or decrease on previous year (C – D)	Decrease of 21,446 tCO_2e on previous year
2012 UK CH_4 emissions including net emissions/removals from LULUCF (E = A – C)	**50,494,440**
2011 UK CH_4 emissions including net emissions/removals from LULUCF (F = B – D)	51,552,737
Increase or decrease on previous year (E – F)	Decrease of 1,058,297 tCO_2e on previous year

Table 4: Nitrous oxide (N_2O) emissions, tCO_2e	
2012 UK N_2O emissions excluding net emissions/removals from LULUCF (A)	**35,271,154**
2011 UK N_2O emissions excluding net emissions/removals from LULUCF (B)	35,570,853
Increase or decrease on previous year (A – B)	Decrease of 299,699 tCO_2e on previous year
2012 net UK N_2O emissions/removals from LULUCF[10] (C)	**-666,893**
2011 net UK N_2O emissions/removals from LULUCF[10] (D)	-671,536
Increase or decrease on previous year (C – D)	Increase of 4,643 tCO_2e on previous year
2012 UK N_2O emissions including net emissions/removals from LULUCF (E = A – C)	**35,938,047**
2011 UK N_2O emissions including net emissions/removals from LULUCF (F = B – D)	36,242,389
Increase or decrease on previous year (E – F)	Decrease of 304,343 tCO_2e on previous year

Table 5: Hydrofluorocarbon (HFC) emissions, tCO_2e	
2012 UK HFC emissions excluding net emissions/removals from LULUCF (A)	**13,877,145**
2011 UK HFC emissions excluding net emissions/removals from LULUCF (B)	13,713,514
Increase or decrease on previous year (A – B)	Increase of 163,631 tCO_2e on previous year
2012 net UK HFC emissions/removals from LULUCF[11] (C)	**0**
2011 net UK HFC emissions/removals from LULUCF[11] (D)	0
Increase or decrease on previous year (C – D)	n/a
2012 UK HFC emissions including net emissions/removals from LULUCF (E = A – C)	**13,877,145**
2011 UK HFC emissions including net emissions/removals from LULUCF (F = B – D)	13,713,514
Increase or decrease on previous year (E – F)	Increase of 163,631 tCO_2e on previous year

[11] Removals of greenhouse gas from the atmosphere do not apply to HFCs, PFCs or SF_6.

Table 6: Perfluorocarbon (PFC) emissions, tCO_2e	
2012 UK PFC emissions excluding net emissions/removals from LULUCF (A)	**207,919**
2011 UK PFC emissions excluding net emissions/removals from LULUCF (B)	325,308
Increase or decrease on previous year (A – B)	Decrease of 117,389 tCO_2e on previous year
2012 net UK PFC emissions/removals from LULUCF[11] (C)	**0**
2011 net UK PFC emissions/removals from LULUCF[11] (D)	0
Increase or decrease on previous year (C – D)	n/a
2012 UK PFC emissions including net emissions/removals from LULUCF (E = A – C)	**207,919**
2011 UK PFC emissions including net emissions/removals from LULUCF (F = B – D)	325,308
Increase or decrease on previous year (E – F)	Decrease of 117,389 tCO_2e on previous year

Table 7: Sulphur hexafluoride (SF6) emissions, tCO_2e	
2012 UK SF_6 emissions excluding net emissions/removals from LULUCF (A)	**542,161**
2011 UK SF_6 emissions excluding net emissions/removals from LULUCF (B)	559,261
Increase or decrease on previous year (A – B)	Decrease of 17,100 tCO_2e on previous year
2012 net UK SF_6 emissions/removals from LULUCF[11] (B)	**0**
2011 net UK SF_6 emissions/removals from LULUCF[11] (D)	0
Increase or decrease on previous year (C – D)	n/a
2012 UK SF_6 emissions including net emissions/removals from LULUCF (C = A – B)	**542,161**
2011 UK SF_6 emissions including net emissions/removals from LULUCF (F = B – D)	559,261
Increase or decrease on previous year (E – F)	Decrease of 17,100 tCO_2e on previous year

21. The emissions and removals data included in tables 2 to 7 are taken from the greenhouse gas emissions data published on 4 February 2014, derived from the UK's 1990-2012 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.[12]

1.3 UK emissions totals

Section 16(3) of the Climate Change Act

22. Table 8 sets out the aggregate amount of UK emissions, UK removals and net UK emissions for each gas in 2012, taken from the tables above.

Table 8: Aggregate 2012 UK greenhouse gas emissions, removals and net UK emissions, tCO_2e

	UK emissions excluding net emissions/removals from LULUCF (A)	Net UK emissions/removals from LULUCF (B)[13]	UK emissions including net emissions/removals from LULUCF (A – B)
Carbon dioxide	480,183,764	7,721,732	472,462,032
Methane	50,429,813	-64,627	50,494,440
Nitrous oxide	35,271,154	-666,893	35,938,047
Hydrofluorocarbons	13,877,145	0	13,877,145
Perfluorocarbons	207,919	0	207,919
Sulphur hexafluoride	542,161	0	542,161
TOTAL[14]	**580,511,956**	**6,990,212**	**573,521,744**

[12] Further details on the methods used in specific sectors are set out in table 13 of the data tables published alongside the final 2012 emissions data, available from: https://www.gov.uk/government/publications/final-uk-emissions-estimates.

[13] 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.

[14] Figures may not sum due to rounding.

1.4 Change of method

Section 16(4) of the Climate Change Act

23. The UK's greenhouse gas inventory is compiled in line with international guidance from the International Panel on Climate Change[15] (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 CORINAIR[16], 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 Report[17] (NIR), which is submitted each year to the UNFCCC, provides details of the methods used to estimate emissions.

24. 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 factors[18], both of which are subject to uncertainty. The UK Greenhouse Gas Inventory assesses uncertainties according to internationally agreed good practice guidance[19], 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 (CO_2) is small, at approximately 2%, based on 2011 emissions data. The uncertainty associated with the emissions of the other five Kyoto gases is higher, and so uncertainty for the basket of Kyoto gases is roughly 17%.[20]

25. 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.

26. In preparing the 2012 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

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[15] Further details on IPCC guidance is available from: www.ipcc-nggip.iges.or.jp.
[16] 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-emission-inventory-guidebook-2009.
[17] 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.
[18] 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.
[19] Intergovernmental Panel on Climate Change guidelines, as adopted by the UNFCCC.
[20] Uncertainties relate to emissions for 2011 – uncertainties based on 2012 data are expected to be available towards the end of March 2014. For further information, see Annex 7: http://cdr.eionet.europa.eu/gb/eu/ghgmm/envtx_tmq/ukghgi-90-09_Annexes_issue1.docx/manage_document.

been introduced in accordance with international reporting guidelines and the findings of the annual UNFCCC review of the UK inventory in 2013, and the revised figures will be included in the UK's submission to the UNFCCC and the European Commission.

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

- The carbon balance model used to estimate emissions from the production and combustion of fuels derived from coal in coke ovens and steelworks has been improved. The country-specific carbon factors used in the model have been reviewed, and in some cases replaced with data from the EU Emissions Trading System (EU ETS). This has provided a much larger dataset to review and assess the time series consistency of data from individual sites and from the sector as a whole.

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

- In the latest inventory, the allocation of manure to various management systems has been revised. The volume of manure allocated to daily spread management has reduced and manure allocated to solid storage has been reallocated to deep litter. These changes have had the effect of increasing emissions across the time series. Emissions of methane arising from enteric fermentation in dairy cows have been revised to include a more accurate figure of the feed digestibility value currently used. The value itself has not changed, however it was rounded to the nearest integer when used to estimate emissions previously and now the full value is used.

- There has been a significant change to the methodology for modelling emissions from Forest Land. The changes result in an improved representation of UK forest areas in existence before 1920, and the distribution of tree species, growth rates and forest management practices.

- Changes have been made to the model for harvested wood products providing a separate estimate for long and short lived sawn timber, particleboard and paper.

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

The respective impacts of these changes on 2011 emissions and the base-year emissions are detailed in the table:

Sector	2011 emissions as reported in the 2011 inventory (tCO_2e)	2011 emissions as reported in the 2012 inventory (tCO_2e)	Change in emissions reported for 2011 (tCO_2e)
Business other industrial combustion	21,797,343	17,555,856	-4,241,487
Public sector combustion	7,142,252	9,744,209	2,601,957
Agriculture livestock	19,356,723	24,789,647	5,432,924
Forest land remaining forest land	-7,611,740	-15,570,704	-7,958,965
Harvested wood	-3,400,408	-995,751	2,404,657
Landfill	14,094,670	19,489,591	5,394,921
Other sectors	497,685,803	499,930,205	2,244,402
Total emissions	549,064,644	554,943,053	5,878,409

Sector	Base year emissions as reported in the 2011 inventory (tCO_2e)	Base year emissions as reported in the 2012 inventory (tCO_2e)	Change in emissions reported for the base year (tCO_2e)
Business other industrial combustion	35,495,581	33,221,918	-2,273,663
Public sector combustion	13,130,331	13,143,494	13,162
Agriculture livestock	23,980,480	31,077,140	7,096,660
Forest land remaining forest land	-6,355,381	-11,047,514	-4,692,132
Harvested wood	-1,710,555	59,287	1,769,842
Landfill	42,927,367	42,816,983	-110,384
Other sectors	666,856,494	671,046,639	4,190,146
Total emissions	774,324,315	780,317,947	5,993,632

28. In the Government's response to the consultation *on carbon units, the net UK carbon account and carbon accounting*[21], we stated that any adjustment to annual UK greenhouse gas emissions resulting from improved methodology from annual developments of the inventory would be applied retrospectively to all preceding years at the end of the budgetary period. These would then be presented in the End of Budgetary Period Statement.

29. 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.

30. The table below shows a revised level of the net UK carbon account for 2011 based on the 1990 to 2012 inventory, in comparison to the figure published in the Annual Statement of Emissions for 2011 which used the 1990 to 2011 inventory.

	2011 (tCO_2e)
2011 net UK carbon account as reported in 2011 Annual Statement	573,919,760
2011 net UK carbon account based on the 2012 Emissions Inventory	578,951,993
Change	5,032,233

1.5 International aviation and shipping

Section 16(5) of the Climate Change Act

31. Emissions from international aviation and international shipping[22] 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 9 below shows greenhouse gas emissions from these sources in 2012.

21 http://webarchive.nationalarchives.gov.uk/20110508074721/http://www.decc.gov.uk/en/content/cms/consultations/carbon_account/carbon_account.aspx.

22 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 9: Greenhouse gas emissions from UK-based international aviation and shipping bunkers in 2012, tCO_2e	
International aviation total	**32,271,720**
Carbon dioxide	31,955,570
Methane	1,642
Nitrous oxide	314,508
International shipping total	**8,645,362**
Carbon dioxide	8,576,279
Methane	2,806
Nitrous oxide	66,277
TOTAL	**40,917,082**

Part 2 – The net UK carbon account

32. This part sets out the amount of units which are to be credited to and debited from the net UK carbon account in 2012. The calculations in this part of the statement are based on the methodologies established by the Carbon Accounting Regulations 2009 and the Carbon Accounting (Amendment) Regulations 2009.[23]

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

Section 16(6) of the Climate Change Act

33. 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.

34. The amounts of units to be counted as credits and debits in respect of 2012 are calculated based on the methodology set out in the Carbon Accounting Regulations 2009 and Carbon Accounting (Amendment) Regulations 2009. There are three elements to consider:

    The amount of units in the credit account which have been declared as credits to the net UK carbon account in respect of 2012 (*regulations 4 and 5*);
    The effect of the EU ETS (*regulation 6, as amended*); and
    Determining whether the Government disposed of any carbon units during the course of 2012 (*regulation 7*).

35. The types of units which may be counted as credits or debits are listed in regulation 3 of the Carbon Accounting Regulations 2009.

[23] The Carbon Accounting Regulations 2009 (SI 2009 No. 1257) were amended in December 2009 by the Carbon Accounting (Amendment) Regulations 2009 (SI 2009 No. 3146) to correct a minor error regarding the total amount of allowances allocated to UK installations under the EU Emissions Trading System. The original and amended regulations are available from www.opsi.gov.uk/si/si2009/uksi_20091257_en_1 and www.opsi.gov.uk/si/si2009/uksi_20093146_en_1 respectively. Guidance for stakeholders on the carbon accounting rules is available on the DECC website: http://tools.decc.gov.uk/assets/decc/consultations/carbon%20accounting/1_20091211101501_e_@@_guidancecarbonaccounting.pdf.

2.1.1 Units in the credit account

36. Regulations 4 and 5 of the Carbon Accounting Regulations 2009 establish the mechanism by which units may be counted as credits towards carbon budgets.

37. Regulation 4 requires the Government to open a "credit account" in the UK Registry. 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.

38. The credit account, which was created in the UK Registry in October 2009, is the dedicated route through which carbon units can be credited voluntarily to the net UK carbon account. Regulation 4 establishes a mechanism for returning carbon units which have been transferred into the credit account in error to the account from which they were originally transferred. Any other carbon units can only be removed from the credit account in order to be cancelled – this fulfils the requirement in Section 27(4) of the Act that units counted as credits cannot be used to offset any other emissions.

39. Regulation 5 sets out the process by which carbon units may be counted as credits. In short, any person may transfer carbon units to the credit account but they will only be counted as credits towards the net UK carbon account if a UK Minister makes a declaration to that effect. Where a declaration is not made in respect of a unit in the credit account, the unit may not be counted as a credit.

40. To date no units have been declared as credits towards the net UK carbon account, which means that, in respect of 2012, **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)

41. The EU ETS operates as a cap and trade system, which means that operators of installations subject to the system are given an allocation of emissions allowances each year. The total amount of allowances issued caps the level of emissions allowed by installations across the EU. Each year, operators must surrender (i.e. give back) allowances equal to their emissions for that year. If their emissions are higher than their allocation for that year then they need to procure additional allowances to cover the higher emissions, either from other operators in the UK or EU who have a surplus of allowances, or by investing in projects which reduce emissions outside the EU under the Kyoto Protocol's Clean Development Mechanism (CDM) or Joint Implementation (JI).[24] If an operator's emissions are lower than their allocation for that year then they will be left with surplus allowances which they may sell to others or keep for use in future years.

42. Regulation 6, as amended by the Carbon Accounting (Amendment) Regulations 2009, establishes the mechanism to account for credits and debits as a result of the operation of

[24] Credits generated by CDM projects are known as Certified Emission Reductions (CERs), while those generated by JI projects are known as Emission Reduction Units (ERUs).

the EU ETS during the first budgetary period (which coincides with the second phase of the EU ETS). Under this mechanism, at the end of the first budget, the contribution of the EU ETS towards the net UK carbon account will correspond to the level of the UK's cap under the system.

43. During the budgetary period, if operators of EU ETS installations 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. If on the other hand operators 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 either sold excess units or retained them for use in future periods.

44. 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".

45. The starting point for calculating the annual allocation is the total amount of allowances to be allocated by the UK in the period 2008-2012, whether for free, by auction/sale or via the new entrant reserve (a total of 1,228,109,497 allowances), less those allowances relating to installations in Gibraltar, which are not covered by the Act (941,956 allowances). This gives 1,227,167,541 allowances as the total UK allocation for the first budgetary period, which is then divided between the years of the period as set out in Table 10.

Table 10: Annual allocation of EU ETS allowances, under section 6 of the Carbon Accounting (Amendment) Regulations 2009

Year	Annual allocation[25]
2008	245,991,207
2009	245,294,083
2010	245,294,083
2011	245,294,084
2012	245,294,084
TOTAL	**1,227,167,541**

[25] The annual allocation for 2008 is the same as the incorrect number contained in the original regulations, and higher than in subsequent years, because the regulations could not be amended with retrospective effect. The allocations for 2009 and 2010, and 2011 and 2012, are different (by one unit) because allocations must be a whole number and the total allocation for 2009 to 2012 is not divisible by four.

46. At the end of Phase II of the EU ETS, the UK is required to cancel all allowances which have not been either issued or auctioned by that point. As a consequence, allowances totalling around 4.5 $MtCO_2e$ were cancelled in 2012. As these cancelled allowances have the effect of reducing the overall cap for the whole of Phase II, the calculation of the units to be debited or credited as a result of the EU ETS needs also to be adjusted. The approach chosen to deal with the cancellation is to distribute around 4.5 $MtCO_2e$ of cancelled allowances over the five years of Phase II, effectively reducing the cap by approximately 0.9 $MtCO_2$ each year.

47. Table 11 sets out the effect of the EU ETS on the net UK carbon account in 2012.

Table 11: The effect of the EU ETS on the net UK carbon account in 2012

Total amount of units surrendered by UK operators (A)	**230,819,411**
Comprised of:	
EU allowances (EUAs)	186,960,564
Certified Emission Reductions (CERs)	24,987,379
Emission Reduction Units (ERUs)	18,871,468
UK's EU ETS annual allocation for 2012 (B)	**244,394,084**
annual allocation for 2012	245,294,084
less cancellation of units from the NER	891,060
Difference between 2012 annual allocation and amount of units surrendered (A – B)	**-13,583,613**

48. As the amount of units surrendered by UK operators was less than the annual allocation for 2012, a corresponding amount of units must be counted as debits. **This means -13,583,613 units are to be debited to the net UK carbon account in 2012** as a result of the EU ETS. This is made up of 13,583,613 ERUs.

2.1.3 Disposal of units

49. Regulation 7 of the Carbon Accounting Regulations 2009 establishes the mechanism for calculating whether an amount of units is to be debited in each year. Debits arise where Government disposes of carbon units, for example by selling them to another country or other third party. These units must be debited, and the net UK carbon account increased accordingly, as the recipient can use the units to offset their own emissions and it would lead to double counting if they were also available to offset UK emissions.

50. To ensure we are able to calculate in each year the amount of units which must be debited, regulation 7 requires that at the end of each year we compare "the UK holding of

carbon units" in that year with what "the UK holding of carbon units" was in the previous year.

51. "The UK holding of carbon units" is defined as the amount of units held in the following UK Registry accounts:
    the Party Holding Account in the UK Registry where the UK's Assigned Amount Units (AAUs) issued under the Kyoto Protocol were initially issued; and
    the UK's national retirement account, where the UK retires AAUs annually in accordance with Kyoto Protocol obligations.

52. The holding is also deemed to include the total UK allocation under the EU ETS, regardless of where these are held at the time, as these units are simply UK AAUs which have been converted into EU allowances (EUAs), the EU ETS "currency".

53. If the UK holding of carbon units is less than it was at the end of the previous year, and if it is also below the original allocation of units given to the UK under the Kyoto Protocol (less an amount representing the allocation to the UK's Crown Dependencies and Overseas Territories, which are not covered by the Act)[26], this means we must have disposed of units in the meantime. The units will be debited from the net UK carbon account to reflect this.

54. In 2012, the UK's holding of carbon units was greater than the relevant share of the UK assigned amount, which means there is no requirement to debit an amount of carbon units from the net UK carbon account. This calculation is set out in table 12.

Table 12: Calculation for determining whether an amount of units must be debited in respect of 2012

UK holding of carbon units on 31 December 2012	**3,391,504,667**
Comprised of:	
Units in issuance account	2,183,971,133
Units in surrender account	955,137,463
Total UK EU ETS allocation (less allowances that have been issued in previous years and units from the New Entrant Reserve which have been cancelled)	252,396,071
Relevant share of the UK assigned[27]	**3,391,499,202**

[26] The original allocation of units given to the UK under the Kyoto Protocol, less an amount representing the allocation to the UK's Crown Dependencies and Overseas Territories, is defined as "the relevant share of the UK assigned amount".

[27] The UK relevant share is lower than previous years as a result of the cancelation of EUAs from the New Entrance Reserve. As EU ETS units are linked to AAUs issued under the KP, the cancellation of EUAs also reduces the overall number of units available to the UK for compliance with the Kyoto Protocol.

55. As the UK holding of carbon units in 2012 is greater than the relevant share of the UK assigned amount, **0 units are to be debited from the net UK carbon account as a result of the disposal of carbon units**.

2.2 Net UK carbon account for the year

Section 16(7) of the Climate Change Act

56. 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.

57. The information in table 13 is taken from preceding tables in this report and provides an amount for the net UK carbon account in 2012.

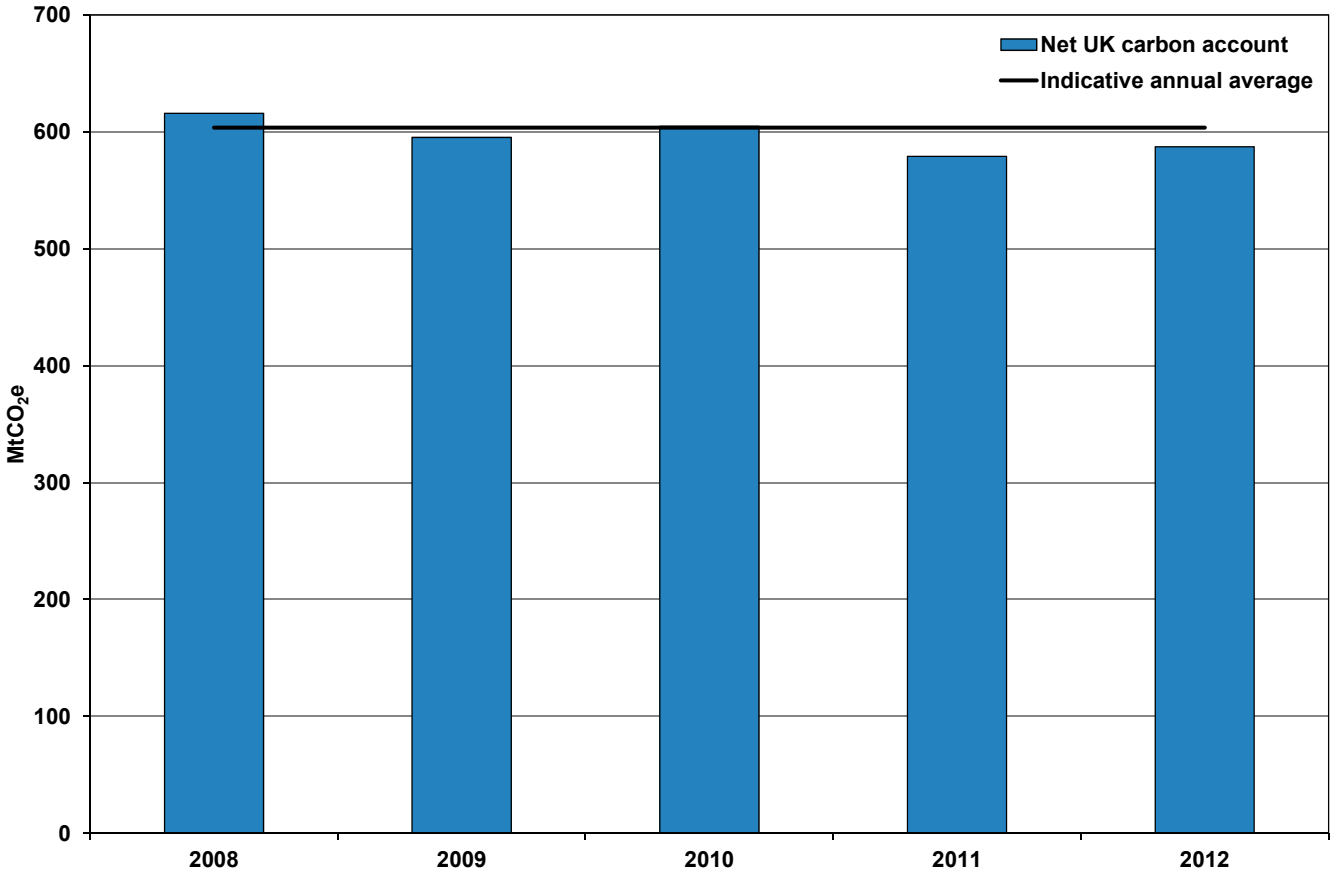
Table 13: Summary of how the net UK carbon account for 2012 is calculated

2012 net UK emissions – see table 8 (A)	573,521,744
Amount of units to be credited (B)	0
Amount of units to be debited (C)	13,583,613
2011 Net UK carbon account, tCO_2e ((A – B) + C)	**587,105,357**

2.3 Progress against the first carbon budget

58. The chart below summarises the UK's performance against the first carbon budget. The total net UK carbon account over this period is 2,982 $MtCO_2e$, 36 $MtCO_2e$ below the cap of 3,018 $MtCO_2e$ - confirming that the UK is compliant with the first carbon budget.

Performance against the first carbon budget



Annex A - Accounting for domestic aviation in the traded sector

1. This annex refers to 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 2016.

2. Under the Climate Change Act, the net carbon account used for compliance against carbon budgets must contain emissions generated by domestic aviation (aviation between UK airports). Historically this has been reported in the "non-traded" sector of the UK's emissions.

3. 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).
4. As a result of being included in the EU ETS, domestic aviation should be included in the "traded sector" of the budgets.
5. 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 doesn't provide a cap for UK only domestic aviation emissions, which is needed to report progress towards meeting the carbon budgets.
6. This is because the data on allowances surrendered:
    - do not distinguish between international and domestic purposes; and
    - are allocated to aircraft operators and consequently are not surrendered where the flight occurs, but to the Member State where the operator is based.
7. This means that we are in a position where we know estimated emissions for UK domestic aviation (using the inventory) but we don't 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 data[1] used

[1] http://unfccc.int/di/DetailedByParty.do.

in both calculating the cap and assessing the UK's performance is free and easily accessible.

8. The approach, along with the methodology used to assess our performance against the cap are set out and illustrated below.

Methodology to calculate domestic aviation cap

9. Using civil aviation data from the UK greenhouse gas inventory submitted under the UNFCCC, and published on the UNFCCC website, the steps listed below are proposed to estimate a fixed cap which we will report emissions from UK domestic aviation against.

10. This approach uses **a baseline** of total EU domestic flights (i.e. total flights within individual EU countries), and an estimate of what **share of this total** can be attributed to the UK. The cap declines through time (from 97% in 2012 and 95% in 2013-2020), reflecting the ambition to reduce emissions from aviation.

11. There are three steps to the calculation

1. Calculate a baseline of total EU domestic aviation

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

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

For 2012, the cap will be 97% of this annual average. For 2013-2020, the cap will be 95% of this annual average.

Methodology to assess performance against the cap

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

13. To assess the UK's performance against this cap, the following methodology will be used:

- compare the national inventory figure for annual 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.

Calculations

Performance against the cap	
Domestic aviation cap ($MtCO_2e$) (A)	**2.18**
2012 domestic aviation emissions ($MtCO_2e$) (B)	**1.48**
Difference between 2012 cap and performance ($MtCO_2e$) (A – B)	**0.70**

Estimate of 2012 cap		
1.	Average 2004-06 EU domestic aviation emissions ($MtCO_2e$) (A)	19.5
2.	UK's share of 2010 EU domestic emissions (B)	11.5%
3.	UK emissions as a proportion of the 2004-06 EU average ($MtCO_2e$) (C) = (A x B)	2.25
4.	For 2012, the cap will be 97% of this annual average ($MtCO_2e$) (C) x 0.97	2.18

14. The cap for domestic aviation for 2012 is estimated as 2.18 $MtCO_2e$. Emissions for domestic aviation (taken from the inventory) were 1.48 $MtCO_2e$.

15. As emissions from domestic aviation were less than the cap for 2012, under the new accounting rules, a corresponding amount of emissions would be counted as debits. This means that 0.70 $MtCO_2e$ would have been debited to the net UK carbon account in 2012. On this basis the net UK carbon account would have been 587,803,477 tCO_2e.

Department of Energy & Climate Change
3 Whitehall Place
London SW1A 2AW
www.gov.uk/decc
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