

# The UK's progress towards its carbon budgets

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## Introduction

This note summarises the UK's current and projected performance against its carbon budgets, using a range of published sources. The focus is on the first three carbon budgets to the end of 2022. Further proposals covering the fourth carbon budget period (to the end of 2027) are due to be published at the end of 2011.

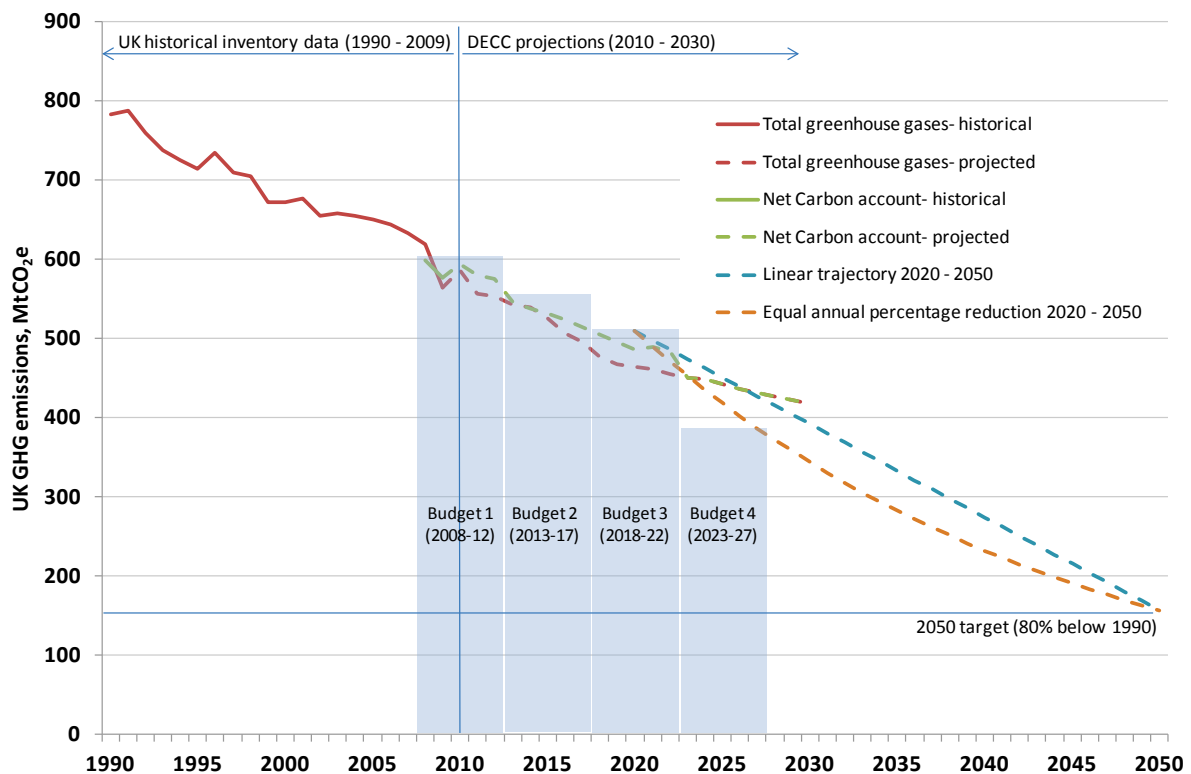
### Key messages:

- In 2009 the UK emitted 575 MtCO<sub>2e</sub> of greenhouse gases, compared to 783 MtCO<sub>2e</sub> in 1990, which represents an average annual fall of 1.4%. The UK's 2050 legislated target is 80% below 1990 levels (about 160 MtCO<sub>2e</sub>);
- Power generation is currently the single largest emitting sector, followed by transport and then industry. Together these three sectors account for over two-thirds of total UK GHG emissions;
- According to the Government's latest emissions projection central estimates (published in October 2011) the UK is on track to keep within its first three carbon budgets;
- The fourth budget was entered into UK legislation at the end of June 2011. However, the Government specified in its May 2011 announcement that in 2014 it will review the fourth budget in light of EU progress towards strengthening its 2020 target from a 20% to a 30% reduction on 1990 levels;
- The fourth carbon budget is rather more challenging compared to a linear emissions trajectory between the mid-point of the third carbon budget (in 2020) and 2050, and also more challenging than an equal annual percentage reduction trajectory (about 4% per annum) over this period;
- There will be an intense period of new policy activity across many sectors between now and 2014, by which time the third phase of the EU ETS, several of the initiatives in the Electricity Market Reform, the Renewable Heat Incentive and Green Deal will all be in place.

## UK total greenhouse gas emissions

Figure 1 shows the UK's greenhouse gas (GHG) emissions between 1990 and 2009, and projections from 2010. In 2009 the UK emitted 575 MtCO<sub>2</sub>e of GHGs, compared to 783 MtCO<sub>2</sub>e in 1990, which represents an average annual fall of 1.4%<sup>1</sup>. The UK's 2050 legislated target is 80% below 1990 levels (157 MtCO<sub>2</sub>e). Total 2009 emissions were made up of 562 MtCO<sub>2</sub>e emitted domestically (i.e. territorially), and a net sale of EU Emissions Trading System (EU ETS) allowances of 14 MtCO<sub>2</sub>e, giving organisations outside the UK the right to emit 14 MtCO<sub>2</sub>e<sup>1</sup>.

Domestic GHG emissions in 2009 were 9% below 2008 levels<sup>2</sup>, driven by a decline in GDP (down 4.9% on 2009) and in particular a 10% decline in manufacturing output as a result of the recession, and higher residential and industrial fuel prices<sup>3</sup>. Preliminary estimates for 2010 show emissions of 580 MtCO<sub>2</sub>e<sup>4</sup> emitted domestically, up 3% on 2009 levels, mainly as a result of a degree of economic recovery and increased heating in a colder-than-average winter<sup>5</sup>.



**Figure 1: UK historical GHG emissions to 2009 and projections from 2010<sup>2,6</sup>**

Notes: The green (net carbon account) line above the red (total greenhouse gases) line shows that the UK was a net seller of permits during 2009 (and will continue to be through most of the period to 2022). DECC's October 2011 projections do not include a comprehensive set of policies and proposals to meet the fourth carbon budget.

According to the Government's latest emissions projection central estimates (published in October 2011)<sup>6</sup> the UK is on track to keep within its first three carbon budgets. The third carbon budget is consistent with emissions of 35% below 1990 levels by 2020, and the UK's central estimates show

<sup>1</sup> The figures in this paragraph are on the UK carbon budgets accounting basis, and differ slightly (by less than 1%) from the National Communications basis, which also includes Crown Dependencies. The remainder of figures in this note follow the National Communications basis, for which detailed sectoral data is readily available.

emissions of 38% below 1990 levels by 2020, accounting for policies where funding is agreed or where design is sufficiently advanced to estimate emissions impact.

The UK's GHG emissions are divided into those emitted by sectors in the EU ETS (the "traded" sectors, primarily power generation and carbon-intensive industry) and those emitted by the "non-traded" sectors which fall outside of the EU ETS. As such, the cap for the traded sectors in the UK is in effect set by the EU, through the allowances designated to be available to these sectors either as freely allocated allowances, or as the UK Government's auctionable allowances. This EU-imposed cap on UK traded sector emissions forms a key consideration in the carbon budget-setting process.

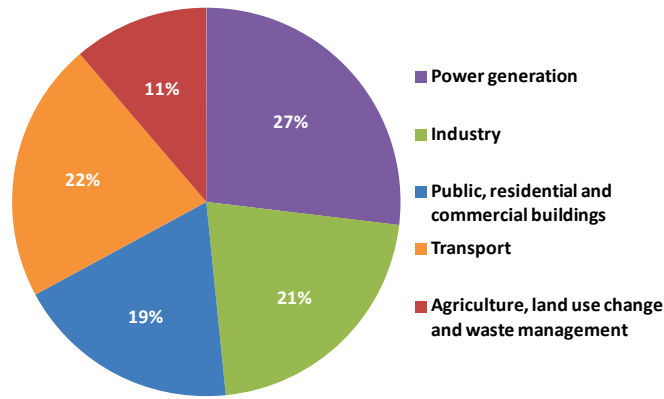
In its December 2010 report to Parliament<sup>7</sup>, the Committee on Climate Change (CCC) recommended a fourth carbon budget (2023-27) of 1950 MtCO<sub>2</sub>e, an average annual level of 390 MtCO<sub>2</sub>e, to be achieved without the use of overseas credits such as EU allowances purchased from other EU Member States. It also recommended that the second (2013-2017) and third (2018-2022) carbon budgets be revised downwards. In May 2011, the Government announced<sup>8</sup> its intention to set the fourth carbon budget limit at the recommended 1950 MtCO<sub>2</sub>e, but that it would retain flexibility to use overseas credits as appropriate. Moreover, it did not signal an intention to revise the second and third budgets downwards.

The fourth budget was entered into UK legislation at the end of June 2011. However, the Government specified in its May 2011 announcement that in 2014 it will review the fourth budget in light of EU progress towards strengthening its 2020 target from a 20% to a 30% reduction on 1990 levels. Specifically, if the EU ETS cap is not tightened such that it is in line with a 30% EU target by 2020, then the Government would loosen its fourth carbon budget so as to re-align the budget with the EU trajectory, since according to the current level of the fourth budget, the UK's traded sector emissions are set to fall at a faster rate than implied by the current rate of decline of EU ETS emissions.

The CCC's proposed fourth budget and its recommended revisions to the second and third budgets reflect its view that the speed of emissions reductions should increase in the short-term in order that the UK achieves its 2050 target without excessive costs. As can be seen from Figure 1, the fourth carbon budget is rather more challenging compared to a linear emissions trajectory between the mid-point of the third carbon budget in 2020 and 2050, and also more challenging than an equal annual percentage reduction trajectory (about 4% per annum) over this period.

## UK emissions by sector

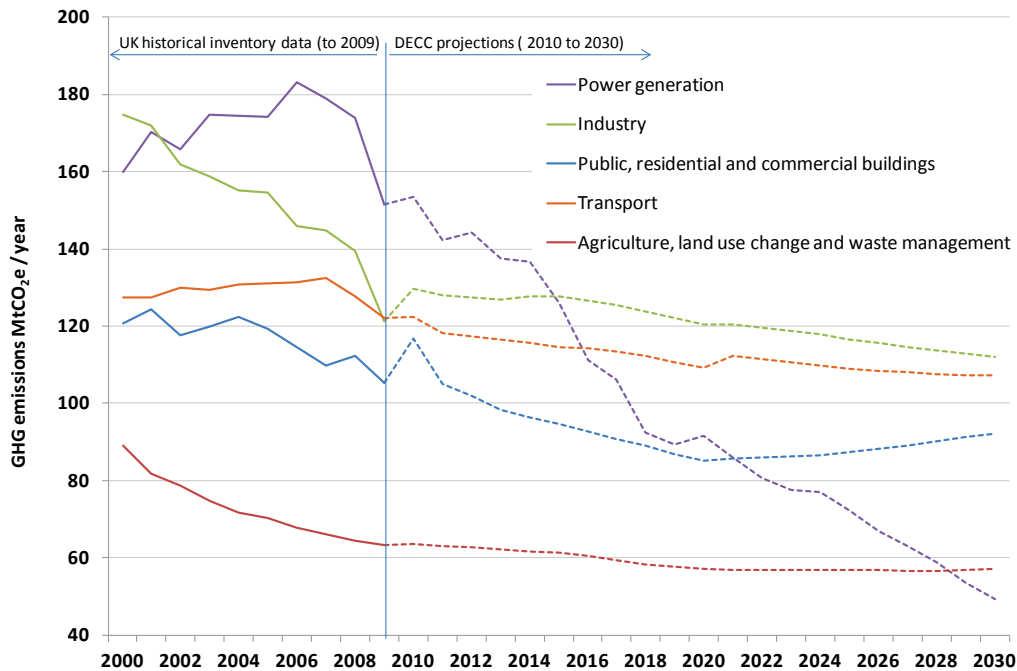
Figure 2 shows the latest (2009) verified emissions data by sector. Power generation is the single largest emitting sector, followed by transport and then industry. Together these three sectors account for over two-thirds of total UK GHG emissions.



**Figure 2: UK domestic GHG emissions share by sector, 2009<sup>2</sup>**

Note: Emissions from power generation are not allocated to sectors which use this power.

Figure 3 shows emissions for these sectors since 2000, as well as DECC's October 2011 projections to 2030. Projections do not yet include the full set of policies to reduce emissions in these sectors beyond 2020, in line with meeting the fourth carbon budget (2023-2027).

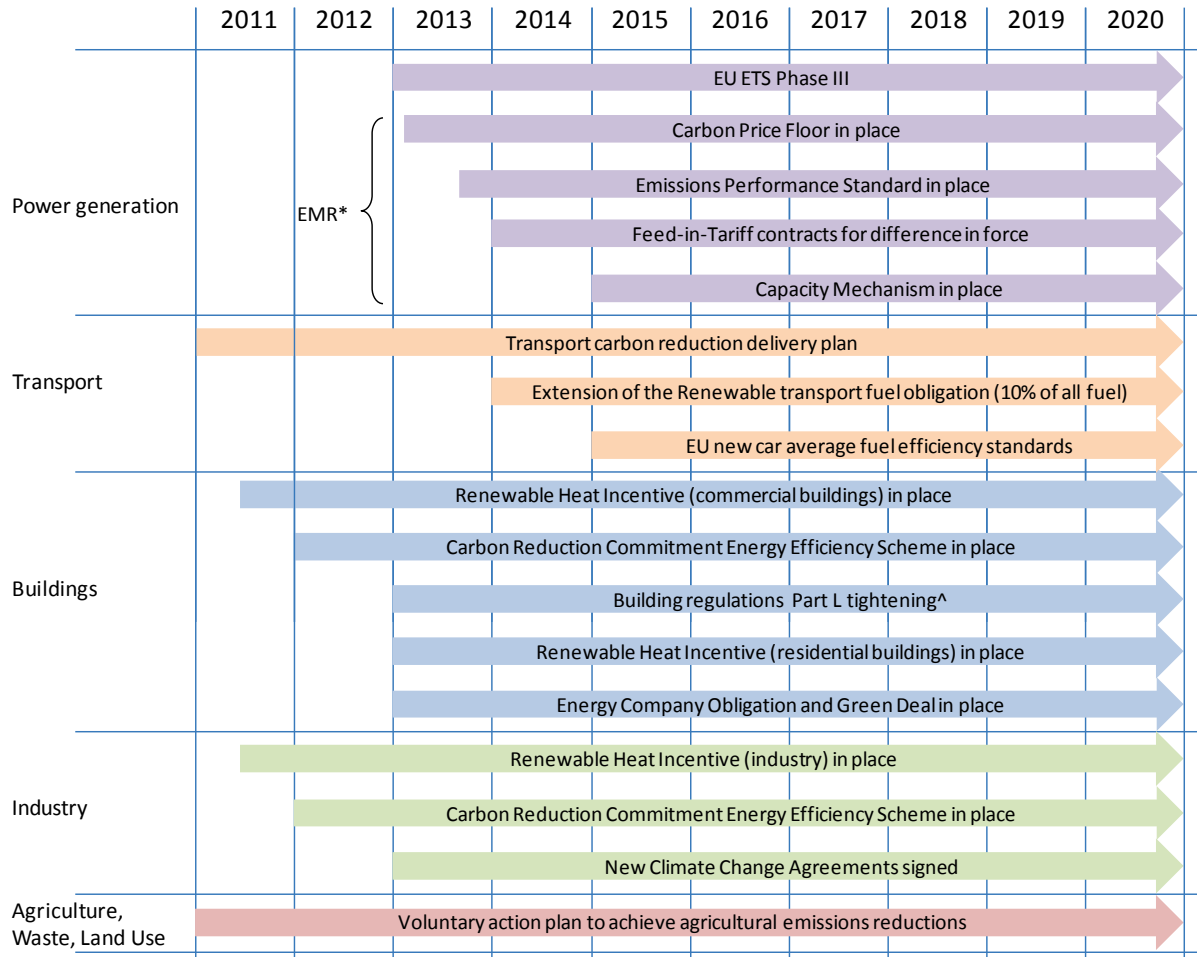


**Figure 3: Historical and projected UK emissions by sector<sup>2, 6</sup>**

Note: Historical data to 2009 is on an annual basis, using 2009 inventory data. Projected data to 2030 has been adapted from DECC's October 2011 projections into the sectors shown, based on communications with DECC analysts

## Summary of key policy milestones to 2020

Figure 4 below shows that there will be an intense period of new policy activity across many sectors between now and 2014, by which time the third phase of the EU ETS, several of the initiatives in the Electricity Market Reform, the Renewable Heat Incentive and Green Deal will all be in place. The publication of the Government’s latest carbon reduction policy plan, covering the fourth carbon budget (2023-2027) is likely to add further detailed policy proposals for a number of sectors.



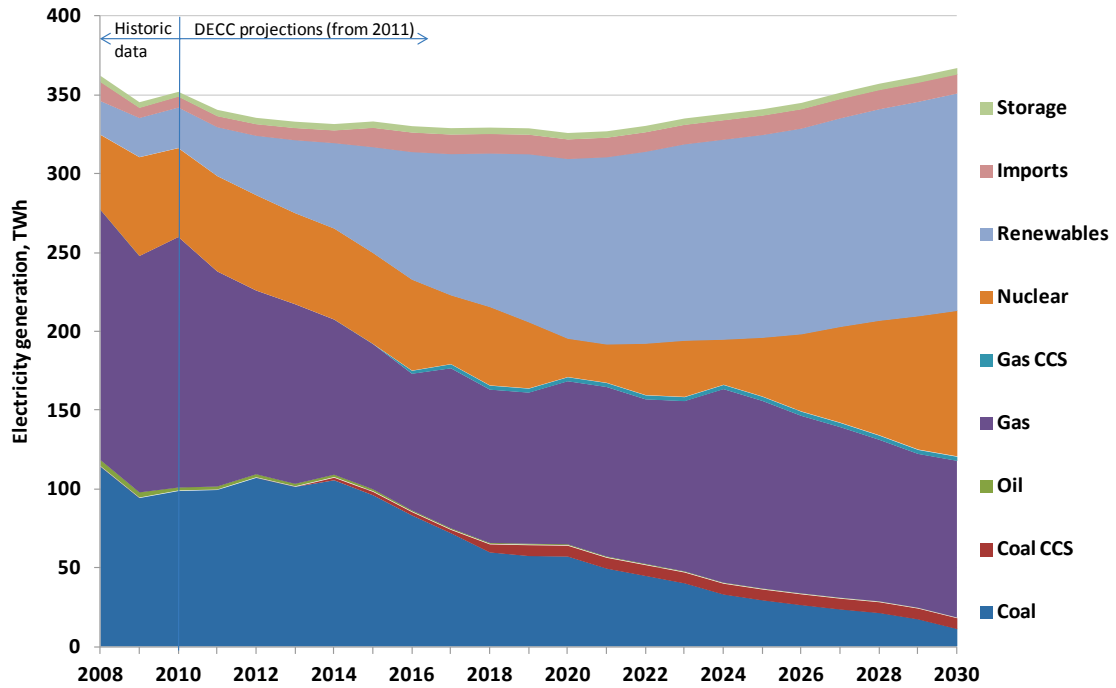
**Figure 4: Key policy milestones for each major sector in the UK, to 2020<sup>5, 9, 10</sup>**

Notes: \* EMR = Electricity Market Reform package of policies; ^Part L of the Building Regulations (conservation of fuel and power) specify the minimum energy efficiency requirements for new buildings and certain categories of work to existing buildings in England and Wales.

## Annex – sectoral analysis to 2020

### Power generation

2009 emissions <sup>2</sup>	<ul style="list-style-type: none"> <li>152 MtCO<sub>2</sub>e, 27% of total UK GHG emissions in 2009 (the largest emitting sector).</li> </ul>
Change on 2008 emissions <sup>2, 3</sup>	<ul style="list-style-type: none"> <li>Down 13% on 2008 emissions, as a result of the recession and the return of some nuclear capacity that was previously offline.</li> </ul>
2010 emissions (preliminary data only) <sup>4, 5</sup>	<ul style="list-style-type: none"> <li>2010 emissions increased by 4% on 2009 levels, driven by a recovery from the recession for the commercial sector and additional winter heating for the residential sector, and slightly increased generation intensity of CO<sub>2</sub>, following some nuclear outages.</li> </ul>
Change on 1990 emissions <sup>2, 3, 5</sup>	<ul style="list-style-type: none"> <li>Emissions from the power sector were over 200 MtCO<sub>2</sub>e in 1990, but fell to around 150 MtCO<sub>2</sub>e by 1999, despite sustained economic growth during much of the 1990s. This was primarily a result of the “dash for gas” following a decline in wholesale gas prices, a trend that was reversed in the early part of the 2000s.</li> </ul>
Emissions projections to 2020 <sup>6</sup>	<ul style="list-style-type: none"> <li>DECC projects emissions will be 91 MtCO<sub>2</sub>e by 2020, 20% of total GHG emissions (the third largest emitting sector, after Industry and Transport);</li> <li>As shown in Figure 5. Major power producers (MPP)’s generation is expected to decline modestly until 2020, due to energy efficiency programmes and increasing electricity prices, but economic growth is expected to outweigh these effects by 2020 and increase the MPP’s generation level (assuming no new policies are implemented and without taking into account the effect of the Electricity Market Reform-EMR);</li> <li>DECC projects that by 2020, about 30% of total electricity generation will be from renewables, about 35% from gas and just under 20% from coal (without CCS). The remainder is projected to be made up of nuclear, imports and storage. Renewables generation is projected to increasingly displace coal generation over the next decade.</li> </ul>
Key emissions reduction policies to 2020 <sup>10</sup>	<ul style="list-style-type: none"> <li>The most important policies to decarbonise the power generation sector are (at present) the EU Emissions Trading System (EU ETS) and the Renewables Obligation (RO). The Electricity Market Reform (EMR) has not yet been finalised but will see the phasing out of the RO and the introduction of Feed-in Tariffs for nuclear and renewable electricity generation;</li> <li>Compared to baseline projections (made in 2009), the power sector is projected to save 27.5 MtCO<sub>2</sub>e from the build-out of renewable power generation technologies (as part of the Renewable Energy Strategy), and 4.6 MtCO<sub>2</sub>e from the CCS demonstration programme.</li> </ul>
Key indicators <sup>3, 5</sup>	<ul style="list-style-type: none"> <li><b>Wind:</b> By the end of 2010, 4 GW onshore and 1.3 GW offshore wind were installed and operational – on track against the CCC’s indicator framework, despite some concern over the speed of approval and planning of new wind projects. Onshore capacity annual additions must increase from below 0.5 GW in 2010 to 1.5 GW by 2020, and offshore from below 0.5 GW in 2010 to 1.7 GW in 2020;</li> <li><b>CCS:</b> £1 billion of Government funding committed to the first CCS demonstration was deemed insufficient by partners and the project had to be cancelled (October 2011). There has also been some delay for the second set of projects (three further demonstrations), mainly to align with the timetable for EU funding, where selected projects are due to be announced by the end of 2012;</li> <li><b>Nuclear:</b> Following the publication of a National Policy Statement on nuclear (July 2011)<sup>11</sup>, the Weightman review (September 2011)<sup>12</sup> found no fundamental weakness in the safety of UK reactors but identified several improvement areas. Developers have announced plans to build 16 GW of new nuclear capacity in the UK, with the first reactor scheduled to become operational in 2018;</li> <li><b>Transmission:</b> New transmission for wind will require regulatory approval and the agreement of a transmission access regime. This is broadly on track but needs close monitoring.</li> </ul>
Key policy milestones <sup>3, 5</sup>	<ul style="list-style-type: none"> <li>The Government published in July 2011 a White paper on new policies for the electricity market reform (EMR)<sup>9</sup>, including a carbon price floor and long-term feed-in tariffs to support investment in low-carbon electricity generation, an emissions performance standard to prevent further investment in coal-fired power stations without CCS, and a capacity mechanism to ensure there is sufficient generation capacity to meet electricity demand. The Government aims to put most of these policies in place by 2013.</li> </ul>
Resource Costs (i.e. not including policy costs) <sup>13</sup>	<ul style="list-style-type: none"> <li>The present value cost to the UK to meet the EU ETS emissions cap to 2020 is £3.5 billion (2009 prices). It is not clear how this is split between costs to the power generation sector and costs to other industrial emitters in the EU ETS. Furthermore, the Government has not published analysis on the costs of the EU ETS to the UK in light of the 2008-9 economic downturn, and this cost does not include the renewable electricity targets or CCS demonstration (see bullet point directly below).</li> <li>The CCS demonstration programme lifetime net present value cost is £5.3-9.2 billion (to be reviewed following demonstration project’s cancellation), and the renewable electricity build-out approximately £40 billion.</li> </ul>



**Figure 5: Historical and projected UK total electricity generation by generation source<sup>6</sup>**

Notes: Historical data is to 2010 (inclusive). Emissions projections are based on DECC's central fossil fuel and carbon price projections. Carbon prices assumed are £31/tCO<sub>2</sub>e for the electricity supply sector (with a carbon price floor). The projections scenario shown achieves a 31% share of renewable electricity generation by 2020, broadly in line with DECC's lead scenario in its 2009 Renewable Energy Strategy<sup>14</sup>. Projections beyond 2022 (the final year of the third carbon budget) are for illustrative purposes only and do not include new policies such as the Electricity Market Reform measures.

## Transport

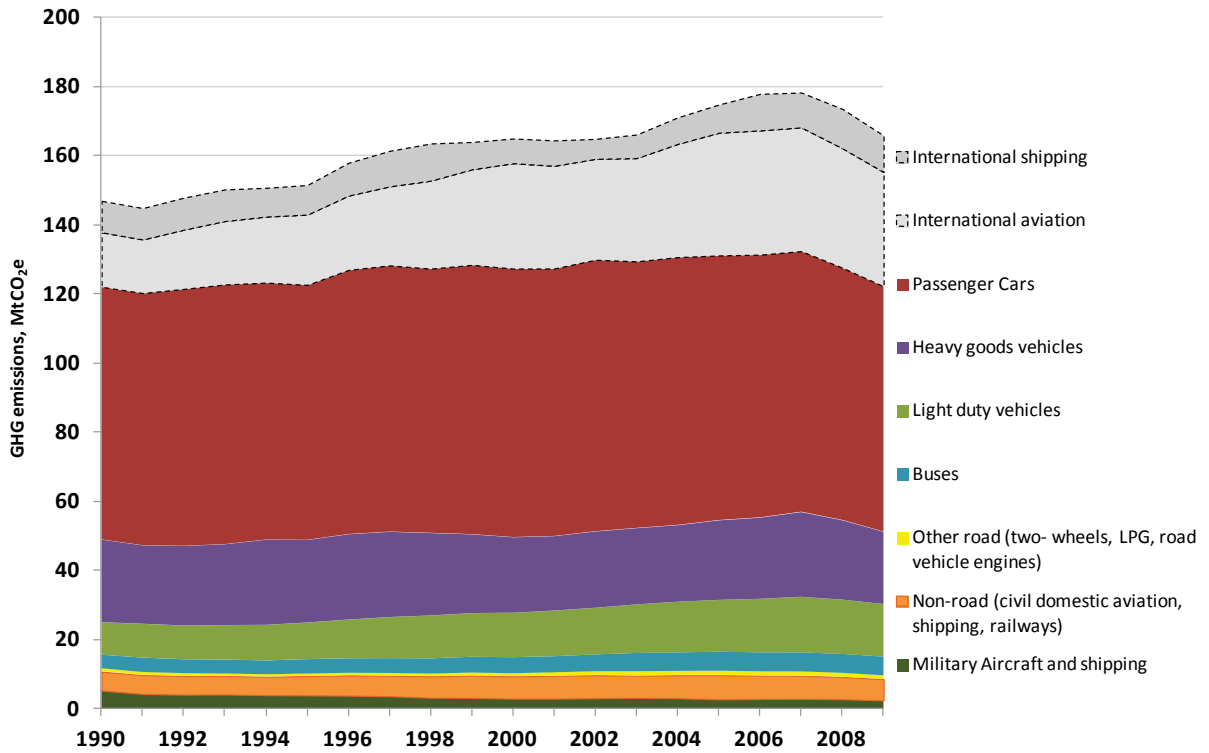
2009 emissions <sup>2, 15</sup>	<ul style="list-style-type: none"> <li>• 122 MtCO<sub>2</sub>e, 22% of total UK GHG emissions, in 2009;</li> <li>• More than 90% of these emissions arose from road transport (within which cars made up almost 60%, with heavy goods vehicles and vans a further 30%);</li> <li>• These emissions do not include those from <b>international aviation and shipping</b>, amounting to 43.6 MtCO<sub>2</sub>e in 2009, as they are not currently included in the UK carbon budgets. However, the Climate Change Act requires the Government to consider whether an appropriate share of international aviation and shipping emissions should be included in the UK net carbon account by the end of 2012;</li> <li>• All emissions associated with flights into or out of the UK are set to be covered by the EU ETS from 2012. There is currently no international policy framework for international shipping emissions, but the International Maritime Organisation (IMO) is considering different policy measures. The EU has committed to including these emissions in its Climate and Energy Package by 2013 if the IMO has not achieved an international agreement by the end of 2011<sup>ii</sup>.</li> </ul>
Change on 2008 emissions <sup>2, 3, 5</sup>	<ul style="list-style-type: none"> <li>• 4% down on 2008 levels. Factors such as purchase of more efficient vehicles, reduced miles and fuel consumption, and an increased share of biofuels, contributed to this fall.</li> </ul>
2010 emissions (preliminary data only) <sup>5</sup>	<ul style="list-style-type: none"> <li>• CO<sub>2</sub> emissions from surface transport (including road and rail) were down 0.2% on 2009 levels.</li> </ul>
Change on 1990 emissions <sup>2, 3, 5</sup>	<ul style="list-style-type: none"> <li>• As shown in Figure 6, transport emissions rose steadily from 1990, where they were 122 MtCO<sub>2</sub>e (the same as in 2009), until their peak in 2007 (132 MtCO<sub>2</sub>e), and then fell in 2008/9 as a result of increased penetration of biofuels, purchase of more efficient vehicles, and reduced vehicle miles.</li> </ul>
Emissions projections to 2020 <sup>6</sup>	<ul style="list-style-type: none"> <li>• DECC projects that transport emissions will fall to 109 MtCO<sub>2</sub>e in 2020, when they would represent 23.5% of the UK total.</li> </ul>
Key emissions reduction policies to 2020 <sup>10</sup>	<ul style="list-style-type: none"> <li>• An extension of the Renewable Transport Fuel Obligation (so that biofuels make up 10% of transport fuel by energy by 2020) is projected to deliver almost 7 MtCO<sub>2</sub>e of savings by 2020; the current obligation (increasing to 5% by volume by 2013) is included in the UK baseline emissions;</li> <li>• EU voluntary standards for new car emissions of 130 gCO<sub>2</sub>/km by 2015 are projected to deliver about 4 MtCO<sub>2</sub>e of savings by 2020, and the additional savings from an EU new car average fuel efficiency target of 95 gCO<sub>2</sub>/km by 2020 would be about 4 MtCO<sub>2</sub>e.</li> <li>• Potential EU new van CO<sub>2</sub> regulation could save a further 2 MtCO<sub>2</sub>e by 2020.</li> </ul>
Key indicators <sup>5</sup>	<ul style="list-style-type: none"> <li>• Average <b>new car emissions</b> fell from 150 gCO<sub>2</sub>/km in 2009 to 144 gCO<sub>2</sub>/km in 2010, compared to the CCC's indicator of 156 gCO<sub>2</sub>/km by 2010. This improvement in carbon intensity is a result of purchase behaviour change towards more fuel-efficient models driven by the recession, and the car scrappage scheme;</li> <li>• Progress on <b>behaviour change</b> has been mixed, with further progress to be made on eco-driving training, land-use planning, enforcement of speed limits, and a Smarter Choices programme to reduce car use through greater awareness and planning around alternative modes of transport.</li> </ul>
Key policy milestones <sup>5</sup>	<ul style="list-style-type: none"> <li>• The Government's Transport Carbon Reduction Delivery Plan (March 2010) sets out a number of planned investments and initiatives to support low carbon transport, but the CCC has stated that it needs to go further in terms of setting out firmer commitments on a new passenger vehicles emissions level of 95 gCO<sub>2</sub>/km by 2020, a level of around 1.7 million electric (plug in and hybrid) vehicles on the road by 2020, and a range of new policy approaches, for example regarding land-use and transport planning;</li> <li>• In January 2011, the Government announced support (£5000) for purchase of <b>electric vehicles</b>, as well as announcing a number of "plugged-in places" pilots and an intention to mandate a national electric vehicle charging infrastructure.</li> </ul>
Resource Costs (i.e. not including policy costs) <sup>13</sup>	<ul style="list-style-type: none"> <li>• Total net present value lifetime costs in the transport sector (£6.3 billion) are dominated by the extension of biofuel usage to 10% by energy by 2020 (£3.1 billion) and the new car EU vehicle efficiency targets of 95 gCO<sub>2</sub>/km (£3.6bn). Some measures have projected cost savings (e.g. average new car emissions of 130 g/km by 2015 would save almost £0.5 billion).</li> </ul>

<sup>ii</sup> Further details of international aviation and shipping emissions is available at the CCC's website:

<http://www.theccc.org.uk/topics/international-action-on-climate-change/international-shipping>

<http://www.theccc.org.uk/topics/international-action-on-climate-change/international-aviation>



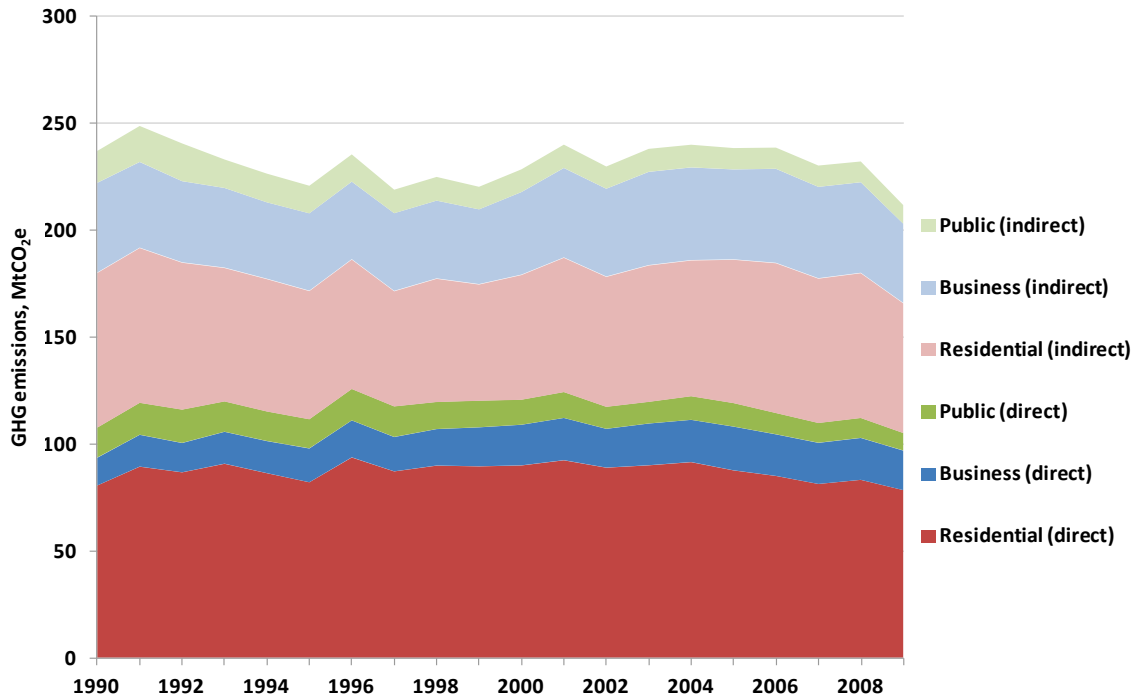


**Figure 6: Historical evolution of transport emissions since 1990 by source<sup>2,15</sup>**

Notes: Emissions from international aviation and shipping are not included in the UK carbon budgets, but they have together shown the largest historical increase of all transport modes. International aviation demand in the UK increased by around 130% since 1990 (short and long-haul), mainly due to increased leisure travel<sup>16</sup>.

## Public, residential and commercial buildings

2009 emissions <sup>2, 5</sup>	<ul style="list-style-type: none"> <li>• Direct emissions (mainly related to on-site combustion of fuel for heating) were 105 MtCO<sub>2</sub>e in 2009, 19% of total UK GHG emissions. The majority of these emissions (75%) were from residential buildings;</li> <li>• These emissions do not account for emissions from electricity used for heating, lighting and appliances (indirect emissions), which in 2009 were about the same as direct emissions. Thus buildings accounted for almost 40% of total GHG emissions in 2009.</li> </ul>
Change on 2008 <sup>2, 5</sup>	<ul style="list-style-type: none"> <li>• Down 6% on 2008 emissions, with rising fuel prices and the recession a major factor for residential buildings.</li> </ul>
2010 emissions (preliminary data only) <sup>5</sup>	<ul style="list-style-type: none"> <li>• Total (direct and indirect) buildings emissions increased by about 7% compared to 2009 levels, mainly driven by increases in direct emissions, resulting from increased heating in the colder-than-average winter.</li> </ul>
Change on 1990 emissions <sup>2, 5</sup>	<ul style="list-style-type: none"> <li>• Direct emissions down 1% on 1990 levels. This masks a rise in over 40% of business building emissions, a fall of more than 40% of public sector buildings emissions, and a fall of 3% of residential buildings, as shown in Figure 7;</li> <li>• Indirect emissions fell by 42% in public, 12% in commercial and 16% in residential buildings over this period.</li> </ul>
Emissions projections to 2020 <sup>6</sup>	<ul style="list-style-type: none"> <li>• Direct emissions from buildings are projected by DECC to fall to 85 MtCO<sub>2</sub>e by 2020, accounting for 18% of total UK GHG emissions in 2020.</li> </ul>
Key emissions reduction policies to 2020 <sup>10</sup>	<ul style="list-style-type: none"> <li>• In the residential buildings sector, the Carbon Emissions Reduction Commitment (CERT) and its successor energy company obligation (ECO) for suppliers to meet targets to install energy efficiency and renewable heat measures in households are projected to contribute about 10 MtCO<sub>2</sub>e in the non-traded sector and a further 7.5 MtCO<sub>2</sub>e of traded-sector (electricity) savings, by 2020. A renewable heat incentive (RHI) is projected to deliver 3.6 MtCO<sub>2</sub>e of (non-traded sector) savings by 2020. Further savings in the traded sector are projected from product policy, i.e. appliances (4.3 MtCO<sub>2</sub>e), Zero Carbon Homes (3 MtCO<sub>2</sub>e) and Smart Metering (1.2 MtCO<sub>2</sub>e);</li> <li>• In the non-residential buildings sector, the Carbon Reduction Commitment (CRC) energy efficiency scheme (putting a carbon price on large business and public sector organisations' energy use) is projected to deliver about 2.5 MtCO<sub>2</sub>e of savings by 2020, about two-thirds from the traded sector and one-third non-traded. The RHI is projected to deliver about 5 MtCO<sub>2</sub>e of non-traded sector emissions. Products policy is projected to save about 3 MtCO<sub>2</sub>e in the traded sector by 2020;</li> <li>• These policies do not include those already factored into UK baseline emissions, e.g. the Climate Change Agreements (CCAs) which set businesses targets for reduced energy usage, or building regulations.</li> </ul>
Key indicators <sup>5</sup>	<ul style="list-style-type: none"> <li>• <b>Residential building insulation</b> measures: In 2010 professional loft installations and cavity wall insulations both fell by 30% on 2009 levels. Even though DIY loft installations significantly increased, this raises concerns over meeting the CCC's indicator that all cavity walls and lofts are insulated by 2015. In 2010 the number of solid walls insulated under the Carbon Emissions Reduction Target (CERT) scheme fell by 15%, raising concerns over meeting the CCC's target of 2.3 million solid walls insulated by 2022;</li> <li>• <b>Residential boilers and appliances</b>: In 2010 1.3 million new (energy efficient) boilers were installed, outperforming the CCC's indicator of 1 million. Uptake of A++ (or better) cold appliances and A+ wet appliances was lower than targeted for 2010;</li> <li>• <b>Non-residential building Display Energy Certificates (DECs) and Energy Performance Certificates (EPCs)</b>: There is currently no Government commitment to ensure all non-residential buildings have EPCs by 2017, and F or higher EPC ratings by 2020, as recommended by the CCC. The Government is however developing options for extending DECs to commercial buildings – the CCC recommends these should be rolled out by 2017.</li> </ul>
Key policy milestones <sup>5</sup>	<ul style="list-style-type: none"> <li>• The new Green Deal will provide private sector finance for investments in cost-saving energy efficiency without upfront costs to the householder, to be charged to the property and repaid through energy bill savings;</li> <li>• A new Energy Company Obligation (ECO) will replace CERT (which ends in 2012) and will require energy companies to deliver energy efficiency improvements for fuel poor households. It will also subsidise high cost measures under the Green Deal (e.g. solid wall insulation), with funding costs to be passed on to all consumers through energy bills;</li> <li>• The Green Deal and ECO should be in force by late 2012;</li> <li>• The Green Deal provisions will also apply to non-residential buildings. In addition, many such buildings will be covered by the Carbon Reduction Commitment (CRC) Energy Efficiency Scheme;</li> <li>• A new Renewable Heat Incentive (RHI) will offer long-term tariff support to non-residential building users from summer 2011, and the residential sector at the end of 2012.</li> </ul>
Resource Costs (i.e. not including policy costs) <sup>13</sup>	<ul style="list-style-type: none"> <li>• Most buildings policies are projected to be cost-saving, with estimated NPV savings of over £40 billion. Zero carbon homes, however, are estimated to have an NPV cost of £4.5 billion, and the renewable heat incentive (for buildings and industry) £11.7 billion.</li> </ul>

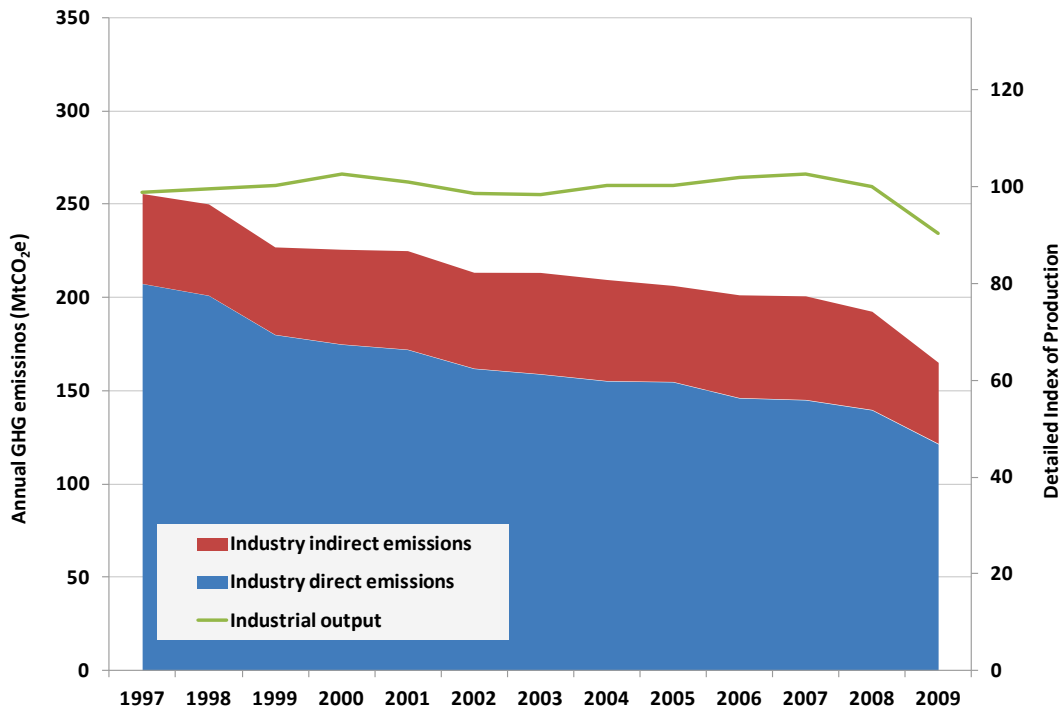


**Figure 7: Historical evolution of buildings emissions since 1990<sup>2</sup>**

Notes: Indirect refers to emissions from the generation of electricity used in buildings. Indirect buildings emissions data from the UK GHG Inventory.

## Industry (Industrial processes and combustion and other energy supply)

2009 emissions <sup>2, 5</sup>	<ul style="list-style-type: none"> <li>Direct industry emissions totalled 121 MtCO<sub>2</sub>e in 2009 (21% of total 2009 UK GHG emissions);</li> <li>These emissions do not account for electricity usage in industry (indirect emissions), which was responsible for about 44 MtCO<sub>2</sub>e in 2009.</li> </ul>
Change on 2008 emissions <sup>2, 3, 5</sup>	<ul style="list-style-type: none"> <li>Direct emissions were down 13% on 2008 emissions. This significant fall is in large part due to the recession, with certain sectors such as steel and cement seeing output reductions of some 20-30%.</li> </ul>
2010 emissions (preliminary data only) <sup>5</sup>	<ul style="list-style-type: none"> <li>Total (direct and indirect) industry emissions increased by about 2% compared to 2009 levels, as a result of a 4% increase in industrial output following a bounce back from the recession. However there is evidence that emissions did not increase in line with output, suggesting some switching to less carbon-intensive fuels.</li> </ul>
Change on 1990 emissions <sup>2, 5</sup>	<ul style="list-style-type: none"> <li>Direct emissions have almost halved since 1990, reflecting industrial restructuring and fuel switching;</li> <li>Total (direct and indirect) emissions fell at a greater rate than manufacturing output over the period 1997 to 2009, as shown in Figure 8.</li> </ul>
Emissions projections to 2020 <sup>6</sup>	<ul style="list-style-type: none"> <li>Direct emissions from industrial processes and combustion and other energy supply are projected to increase following a recovery from the recession (since 2008 emissions were 140 MtCO<sub>2</sub>e) before decreasing towards their 2009 levels (120 MtCO<sub>2</sub>e) by 2020. This decrease excludes any emissions savings that could be gained from reduced indirect (i.e. electricity) emissions.</li> </ul>
Key emissions reduction policies to 2020 <sup>10</sup>	<ul style="list-style-type: none"> <li>Energy intensive industry sectors are covered by the EU ETS. The key policy to achieve traded sector industry savings is the Renewable Heat Incentive (RHI), with a projected saving of 4.7 MtCO<sub>2</sub>e by 2020, as well as 1.5 MtCO<sub>2</sub>e in the non-traded sector. In addition, the CRC is projected to save 1.2 MtCO<sub>2</sub>e in the traded sector (and 0.2 MtCO<sub>2</sub>e in the non-traded sector) by 2020;</li> <li>These savings do not include those already factored into UK baseline emissions, notably the Climate Change Agreements (CCA).</li> </ul>
Key indicators <sup>5</sup>	<ul style="list-style-type: none"> <li>Headline indicators for industry show that in 2010, against the CCC's recommended trajectory of a 12% reduction in direct CO<sub>2</sub> and 16% reduction in indirect CO<sub>2</sub> emissions on 2007 levels, direct CO<sub>2</sub> was down 15% and indirect down 18%. However, non-electricity consumption fell by only 10% against a CCC trajectory of 17%, whilst total electricity consumption (including auto-generation) fell by 10% compared to the CCC's trajectory of 14%.</li> </ul>
Key policy milestones <sup>5</sup>	<ul style="list-style-type: none"> <li>Industry sectors are covered by a combination of the RHI, CRC energy efficiency scheme, Climate Change Agreements (CCAs) and the EU ETS;</li> <li>The RHI will be offered to industries on a voluntary uptake basis from 2011;</li> <li>New CCAs will be negotiated for industry in 2013, and CCAs will run until 2023. From April 2013, the current 65% discount on the Climate Change Levy (CCL) on electricity use received by those industrial firms with CCAs exposed to international competition will be increased to an 80% discount;</li> <li>The next Phase (III) of the EU ETS will begin in 2013, with all firms subject to full auctioning. However, many energy-intensive industries subject to international competition will receive free allowances covering their output according to an EU-level sectoral benchmark of carbon intensity.</li> </ul>
Resource Costs (i.e. not including policy costs) <sup>13</sup>	<ul style="list-style-type: none"> <li>The RHI across all buildings and industry is estimated to have a net present value lifetime cost of £11.7 billion, though no breakdown between buildings and industry is given.</li> <li>The CRC is estimated to be cost-saving (as presumably are CCAs – though since these are in DECC's current baseline, no cost estimate is given).</li> </ul>

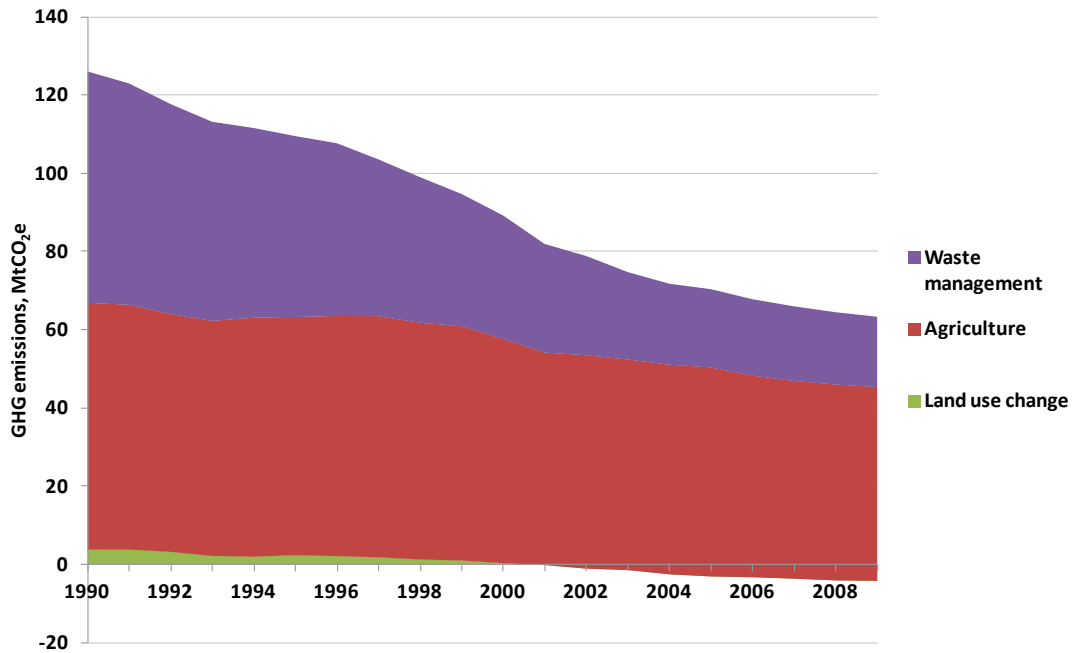


**Figure 8: Historical evolution of industrial emissions and output<sup>2</sup>**

Notes: The detailed index of production used is for manufacturing only, calculated by the Office for National Statistics (Seasonally adjusted output for the production industries, July 2011) using 2008 as a base year (2008 output=100). Indirect refers to emissions from the generation of electricity used in industry. Indirect industry emissions data are from the UK GHG Inventory.

## Agriculture, land use change and waste management

2009 emissions <sup>2</sup>	<ul style="list-style-type: none"> <li>Total emissions were 63 MtCO<sub>2</sub>e in 2009 (11% of total UK GHG emissions), made up of 49 MtCO<sub>2</sub>e from agriculture, 18 MtCO<sub>2</sub>e from waste management, and sinks of about 4 MtCO<sub>2</sub>e from land use change.</li> </ul>
Change on 2008 emissions <sup>2, 3, 5</sup>	<ul style="list-style-type: none"> <li>2009 emissions were 2% down on 2008 levels, as a result of a 2% reduction in agriculture emissions and a 3% reduction in land use and waste management emissions. The majority (56%) of agriculture emissions are from N<sub>2</sub>O, used in fertilisers, which declined as a result of reduced agricultural output in 2009.</li> </ul>
2010 emissions (preliminary data only) <sup>6</sup>	<ul style="list-style-type: none"> <li>Not available - DECC's projection is 64 MtCO<sub>2</sub>e, similar to 2009 outturn levels.</li> </ul>
Change on 1990 emissions <sup>2, 3, 5</sup>	<ul style="list-style-type: none"> <li>Emissions for this combined category fell by 50% between 1990 and 2009, as shown in Figure 9. Whilst the falls in agriculture (down about 20% over this period) have been moderate and resulting from reduced output, waste management emissions (the majority of which are methane emissions from landfill) have reduced by 70% in this period – from 59 MtCO<sub>2</sub>e in 1990 to 18 MtCO<sub>2</sub>e in 2009. This is primarily the result of reduced use of landfill sites and increased capture of waste gases from these sites. Land use change emissions, moderately positive in 1990 at 3.9 MtCO<sub>2</sub>e, became negative in 2001, indicating that this sector has been a net carbon sink since this time.</li> </ul>
Emissions projections to 2020 <sup>6</sup>	<ul style="list-style-type: none"> <li>There is much more uncertainty in emissions from agriculture and land use compared to other sectors (as these depend on for example specific farming practices, soil usage, and local climatic conditions). DECC projects overall emissions from this category to decline to 57 MtCO<sub>2</sub>e by 2020, principally as a result of an improvement in waste management practices (-26% GHG emissions between 2010 and 2020).</li> </ul>
Key emissions reduction policies to 2020 <sup>10</sup>	<ul style="list-style-type: none"> <li>The landfill tax escalator is projected to deliver 0.3 MtCO<sub>2</sub>e of annual savings by 2020.</li> <li>Further measures (under development) to reduce waste and capture methane from landfill sites could save 0.6 MtCO<sub>2</sub>e annually by 2020.</li> <li>Further measures (under development) to encourage farmers to reduce fertiliser and livestock emissions are intended to achieve 3 MtCO<sub>2</sub>e of savings by 2020.</li> </ul>
Key indicators <sup>5</sup>	<ul style="list-style-type: none"> <li>In agriculture, 2009 GHG emissions fell (relative to 2007 levels) at a faster rate than the CCC's indicative trajectory: N<sub>2</sub>O at 0.8% against a trajectory of 0.6%; and CH<sub>4</sub> at 4.0% against a trajectory of 2.3%.</li> </ul>
Key policy milestones <sup>5</sup>	<ul style="list-style-type: none"> <li>Key milestones around delivering the 3 MtCO<sub>2</sub>e voluntary savings in agriculture (in England) by 2020 include establishing key activities by 2012, promotion of improved farming practices by 2015, and promotion of the most cost-effective emissions reduction measures by 2020;</li> <li>A number of other policies could impact on emissions from agriculture, such as amendments to the Common Agricultural Policy to link payments to GHG emissions reductions from agriculture.</li> </ul>
Resource Costs (i.e. not including policy costs) <sup>13</sup>	<ul style="list-style-type: none"> <li>The measures around agriculture are likely to be zero-cost or negative, whereas the total net present value lifetime costs of waste measures to 2020 are projected to be £0.1 billion.</li> </ul>



**Figure 9: Historical emissions split by agriculture, land use change and waste<sup>2</sup>**

Note: Land use change emissions were negative, indicating this sector became a net sink, from 2001.

### Note on Annex

This Annex focuses on projected emissions savings to 2020 from policies – and costs for those policies – from the Low Carbon Transition Plan (2009)<sup>10, 13</sup>. In many cases the Government has since updated policy savings estimates in line with DECC's October 2011 emissions projections, but these do not yet include updated policy costs.

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## Acknowledgements

The authors would like to thank: David Wilson (DECC) and Nina Meddings (CCC secretariat) for helpful additional analysis and data; Professor Brian Hoskins (Grantham Institute), Professor Jim Skea (UKERC), and Dr Simon Buckle (Grantham Institute) for comments on final drafts; Neil Hirst, Dr Tamaryn Brown, Sarah Lester and Dr Simon Bailey (all at the Grantham Institute) for help with content and design.

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