



## Chapter 6: Budget recommendation

1. Level of the fifth carbon budget
2. Inclusion of international aviation and shipping in carbon budgets
3. Role for purchase of offset credits
4. Costs and benefits of meeting the budget
5. Maintaining the integrity of the carbon budgets
6. Delivering the budget
7. Next steps



---

We recommend that the fifth carbon budget is set at 1,765 MtCO<sub>2</sub>e, including emissions from international shipping, over the period 2028-2032. That would limit annual emissions to an average of 57% below 1990 levels, consistent with the cost-effective path to the 2050 target in the Climate Change Act. This balances the range of factors the Committee must consider and requires that the UK continues its historical rate of emissions reduction.

The Climate Change Act sets out how the Committee is legally required to advise on, and how the Government must set, carbon budgets. In particular the budgets:

- “must be set with a view to meeting ... the target for 2050”; and
- must take into account
  - “scientific knowledge about climate change;
  - technology relevant to climate change;
  - economic circumstances, and in particular the likely impact of the decision on the economy and the competitiveness of particular sectors of the economy;
  - fiscal circumstances, and in particular the likely impact of the decision on taxation, public spending and public borrowing;
  - social circumstances, and in particular the likely impact of the decision on fuel poverty;
  - energy policy, and in particular the likely impact of the decision on energy supplies and the carbon and energy intensity of the economy;
  - differences in circumstances between England, Wales, Scotland and Northern Ireland;
  - circumstances at European and international level;
  - the estimated amount of reportable emissions from international aviation and international shipping for the budgetary period or periods in question”.
- whilst “complying with the European and international obligations of the United Kingdom”.

The preceding chapters have covered the relevant considerations: science and international circumstances (Chapter 2), technology and economics (Chapter 3); competitiveness, social circumstances (including fuel poverty and wider impacts on health), security of energy supplies and fiscal circumstances (Chapter 4); and the differences in circumstances between the devolved administrations (Chapter 5).

In this chapter, we bring those assessments together to recommend the level of the fifth carbon budget. The recommended budget is based on our best estimates of the UK’s share of the cap in the EU Emissions Trading System (EU ETS), and the cost-effective path to 2050 for those sectors outside the EU ETS. On the current basis of carbon budget accounting (excluding international shipping) this leads to a budget recommendation of 1,725 MtCO<sub>2</sub>e.

In addition to recommending the level of the carbon budget, the Committee also has duties under the Act to advise on:

- “the consequences of treating emissions of targeted greenhouse gases from international aviation, and international shipping, as emissions from sources in the United Kingdom” (i.e. inclusion of international aviation and shipping in carbon budgets);

- 
- the “limit on the net amount of carbon units that may be credited” (i.e. the role of offset credits) in meeting the carbon budget.

We cover those in sections 2 and 3 respectively. We recommend that international shipping emissions are added into the budget (which would then increase from 1,725 to 1,765 MtCO<sub>2</sub>e). International aviation should continue to be allowed for in the size of the budget for other sectors, but not formally included. We recommend that the budget should be met without recourse to carbon units (i.e. credits).

We set out the costs and benefits of meeting the budget in section 4. The budget is on the lowest-cost path to meeting the 2050 target. It implies a small cost increment compared to the legislated fourth carbon budget and a continuing cost of up to 1% of GDP in 2030 versus a hypothetical scenario with no action to tackle climate change (though we note that this is not an option given the requirements under the Climate Change Act, the international response to climate change and the UK’s existing commitments to play a role in that international response).

In section 6 we outline the implications for policy required to meet the budget and the 2050 target. Existing policies mostly come to an end in 2020. They must be extended and built on if the proposed fifth carbon budget and the statutory 2050 target are to be met.

## 1. Level of the fifth carbon budget

There is a cost to tackling climate change. New low-carbon options currently cost more than their existing high-carbon alternatives, in part because the existing technologies and approaches do not face the full costs of their emissions.

The role of the Committee, as set out in the Climate Change Act, is to find a budget that keeps costs as low as possible now *and* into the future, balancing the range of factors set out above (competitiveness, fiscal circumstances, fuel poverty, international action, energy policy and technological progress).

We are therefore recommending a budget that balances effort to 2032 with effort required beyond 2032, that is on the path to meet the UK’s statutory target for 2050 and that would position the UK to meet stronger international action that might be required in future.

***Recommendation: On the current scope of carbon budgets (i.e. without formally including emissions from international aviation and shipping), we recommend a fifth carbon budget level of 1,725 MtCO<sub>2</sub>e, implying emissions in 2030 57% below those in 1990.***

This is the sum of our estimates for the appropriate limits for the traded and non-traded sectors (Table 6.1):

- **The ‘traded’ sector** refers to those sectors of the economy covered by the EU ETS, primarily electricity generation and energy-intensive industry. Emissions from these sectors have reduced by 44% since 1990, and are projected to be 60% below 1990 levels by 2020. Under the accounting rules of the Climate Change Act (Box 6.1), the contribution of those sectors to the carbon budget will be determined by the emissions allowances allocated to the UK in the EU ETS, which is currently uncertain. Our proposed budget is based on our current best estimate of 590 MtCO<sub>2</sub>e for the fifth budget period, an average of 66% below 1990.<sup>1</sup>

---

<sup>1</sup> This estimate for the traded sector is an update from the estimate we published in our October report on the scientific and international context for the fifth carbon budget. That change reflects the latest information on uncertain inputs, including the eligibility of UK installations for free permits allocated under the EU ETS. As when previous budgets have been set, we will continue to work with Government officials in the coming months to ensure that when the budget is legislated it reflects any further significant developments in the evidence.

- **The ‘non-traded’ sector** covers all emissions outside the EU ETS, including transport, heating in buildings, agriculture, waste and some industry. Emissions from these sectors have reduced by 29% since 1990, and are projected to be 35% below 1990 by 2020. For these sectors, performance against the budget is judged on actual emissions. Our proposed budget is based on our best estimate of the cost-effective path for emissions from today to the 2050 target in the Act. This implies emissions of 1,135 MtCO<sub>2</sub>e for the non-traded sector over the fifth budget period, an average of 51% below 1990.

The recommended budget is on a path for emissions that is consistent with progress to date and the effort required between the legislated fourth carbon budget – which remains in line with our estimated share of the EU ETS cap and the cost-effective path for the non-traded sector – and the 2050 target (Figure 6.1).

Whilst the recommended budget reflects our current best estimate of the cost-effective path for emissions, it does not automatically follow that a change to any of the individual inputs to that estimate (e.g. projected emissions in the absence of effort) would imply a different budget level. Other factors have to be considered in making our recommendation (e.g. the overall rate of emission reduction and the costs and opportunities for abatement).

**Table 6.1: Budget recommendation**

MtCO <sub>2</sub> e	2030	The fifth budget period (2028-2032)
<b>Non-traded sector</b>	<b>227</b>	<b>1,135</b>
Traded sector (gross emissions)	87	450
Adjustment for the UK share of the EU ETS cap	+31	+140
<b>Traded sector portion of net carbon account</b>	<b>118</b>	<b>590</b>
<b>Recommended budget</b>		<b>1,725</b>

**Notes:** Adjustment for the UK share of the EU ETS cap is the difference between gross UK emissions and the UK share of the EU ETS cap. This adjustment essentially reflects net trading in the EU ETS, with the positive number reflecting net sales of allowances given that the share of the ETS cap is above our assessment of the traded sector cost-effective path. However, this difference could also reflect differences in the time profile of emissions within the EU ETS (e.g. companies holding onto allowances to use for future periods, use of previously retained allowances or the operation of the Market Stability Reserve). The 2030 level of gross traded sector emissions is not equal to the average emissions over 2028-32, due to the shape of the emissions trajectory in our Central scenario.

**Box 6.1: Accounting rules in the Climate Change Act**

Under the Climate Change Act, performance against carbon budgets is measured by the net UK carbon account. In practice, this means that the part of the budget for the power sector and energy-intensive industry, which is covered by the EU Emissions Trading System (EU ETS), is based on the UK’s share of the EU ETS cap rather than the actual emissions in those sectors.

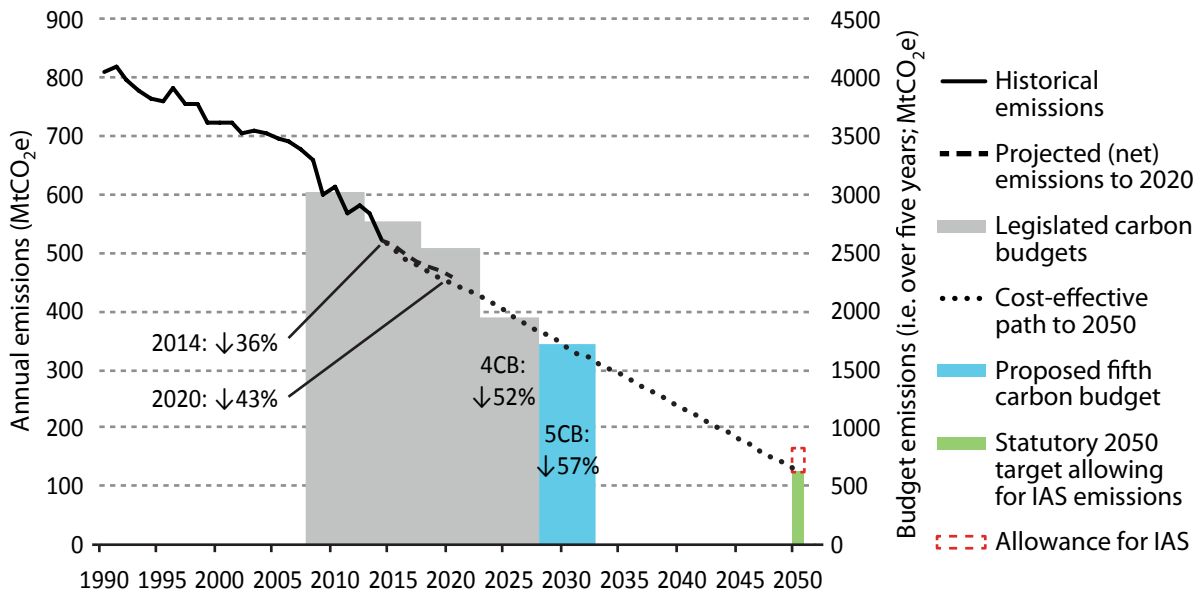
It is clear that in order to stay on track to the 2050 target in the Act, actual emissions must be reduced. The accounting rules should not be used to mask the real progress to the UK’s legal commitment.

Our proposed budget implies a 57% reduction in emissions from 1990 to 2030 on the accounting basis in the Act. We also identify the cost-effective path for actual emissions across the UK economy (ignoring the allocation of emissions allowances in the EU ETS). For actual emissions the recommended budget requires a 61% reduction from 1990 to 2030. The larger reduction in actual emissions reflects our scenarios for the power sector. Under the cost-effective path the power sector should reach a carbon intensity of below 100 gCO<sub>2</sub>/kWh in 2030. This would result in emissions in the traded sector of 450 MtCO<sub>2</sub>e across the fifth carbon budget period (a 75% reduction in 1990 levels), lower than the Committee’s current best estimate of the allocation of emissions allowances to the UK.

### Box 6.1: Accounting rules in the Climate Change Act

To stay on track to the 2050 target and to support emissions reductions elsewhere in the economy, the power sector will need to reduce emissions at around the rate in our estimate of the cost-effective path. In line with our approach to date, the Committee will continue to assess progress towards carbon budgets and the 2050 target on the basis of both the net carbon account and actual emissions across the economy.

Figure 6.1: The first five carbon budgets on the path to meeting the 2050 target



Source: DECC (2015) *Final UK greenhouse gas emissions national statistics: 1990-2013*; DECC (2015) *Provisional UK greenhouse gas emissions national statistics*; DECC interim projections (October 2015) CCC analysis.

Notes: Historical emissions are on a 'gross' basis (i.e. actual emissions). Projections and carbon budgets are on the current budget accounting basis: net carbon account excluding international aviation and shipping (IAS), but allowing for IAS to be included in the 2050 target.

Our proposed budget:

- Continues steady progress from the legislated fourth carbon budget towards the 2050 target, avoiding a more expensive 'stop-start' approach to meeting our obligations.
- Is achievable based on known options that are realistically deployable with some strengthening of policies, mainly for the 2020s (see Chapter 3).
- Meets the UK's current obligations under the EU 2030 package, while setting a foundation for effort consistent with a global 2°C target (see Chapter 2).
- Can be met without adversely affecting the competitiveness of existing UK industries, while also creating opportunities for innovation and growth in UK firms (see Chapter 4).
- Can be met with a small incremental cost for household energy bills and with a manageable impact on the public finances (see Chapter 4).
- Implies specific domestic effort in both the 'traded' and 'non-traded' sectors (see section 6).
- Allows for emissions from international aviation and international shipping, whether or not the government decides to include them formally in carbon budgets (see section 2).

---

Furthermore, in considering these impacts, the Committee also took into account that there is time to put in place suitable remedies should evidence emerge of greater impacts (e.g. competitiveness impacts or affordability concerns).

The Committee considered the evidence for both a looser budget and a tighter budget.

A looser budget would imply a lower cost in 2030, but it would store up higher costs for the future. It may meet the UK's existing international and EU commitments, but would not prepare sufficiently for the 2050 target. It would not provide a competitiveness benefit for UK firms, indeed it could lead to missed opportunities and increased costs as confidence in the low-carbon transition is undermined:

- As set out in Chapter 2, our best estimate of the UK's existing commitment under the EU's 2030 climate package would imply UK emissions in the non-traded sector of over 260 MtCO<sub>2</sub>e in 2030, whereas our proposed budget requires a reduction to 227 Mt. This means that the UK could meet the lower ambition implied by the EU package without any deployment of ultra-low-emission vehicles or low-carbon heat in the 2020s (Figure 6.2). As set out in Chapter 3, these are an important part of preparing for the 2050 target in the UK.
- Furthermore, were the UK to adopt this best estimate of UK commitment under the EU package, non-traded emissions would be allowed to rise relative to the level under the UK's fourth carbon budget (250 MtCO<sub>2</sub>e in 2025)<sup>2</sup>, implying a stop-start approach that is likely to increase costs.
- The markets for low-carbon vehicles and heating are currently small and developing. Policy approaches, supply chains, infrastructure and consumer acceptance will all need to develop significantly before these become mass-market propositions. Those are challenges for the UK specifically, alongside the global challenge of developing technology (e.g. batteries for electric cars). Our proposed budget would clearly signal a commitment to meeting these challenges, increasing confidence for investors and thereby cutting risks and ultimately costs for consumers.
- We also note that the EU 2030 package appears at the low end of ambition on the EU's path to 2050 (see Chapter 2) and that the UK Government has argued for an increase in ambition at the EU level.

Considering all these factors, while the UK's commitments under the EU 2030 package represent the minimum level of effort under international obligations, this would not represent an appropriate basis for the UK carbon budget. It would be inconsistent with the Act's requirement to prepare for meeting the 2050 target, and would imply a stop-start approach to decarbonisation or a reneging on existing commitments.

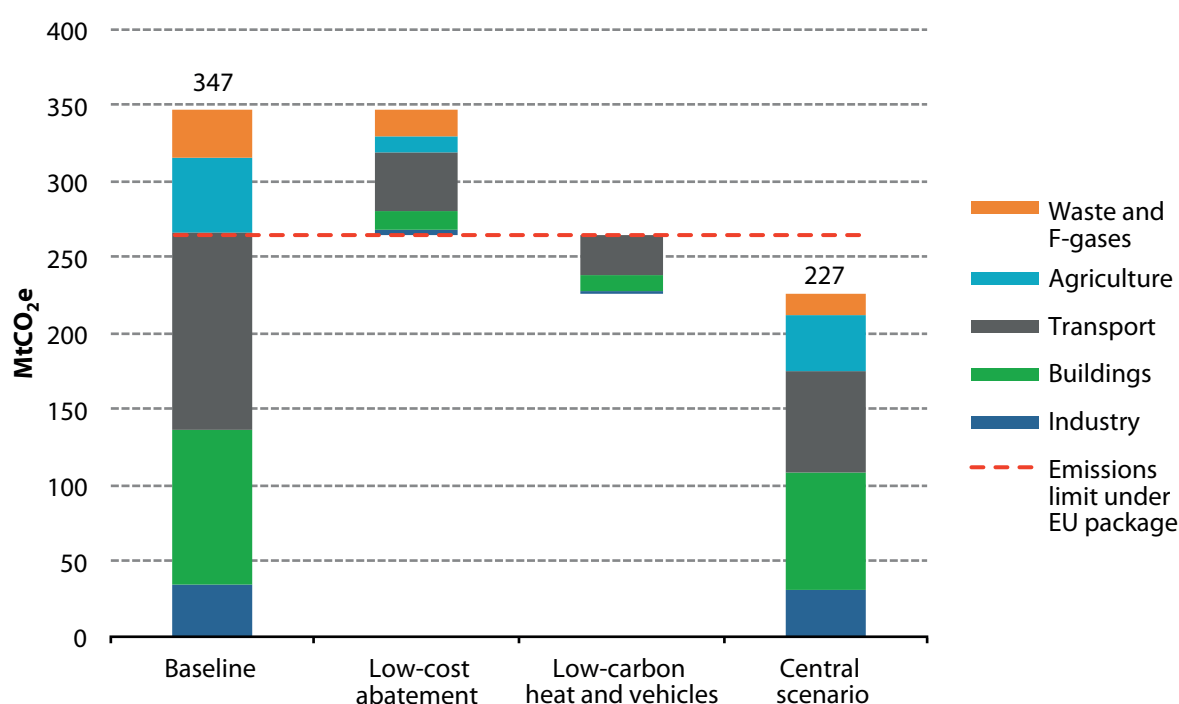
A tighter budget could reflect a greater UK contribution to an international 2°C target<sup>3</sup>, but would go beyond existing commitments in other comparable countries and beyond what is required to prepare sufficiently for the UK's 2050 target. A tighter budget could still be achieved in future if required through increased UK effort and/or the purchase of emissions credits – potentially as part of a ratcheting up process for global effort.

---

2 Our current estimate for allowed non-traded sector emissions under the fourth carbon budget is 1,245 MtCO<sub>2</sub>e, calculated as the legislated level of the budget minus our latest estimate for the UK share of the EU ETS cap across the budget period of 705 MtCO<sub>2</sub>e. This is very similar to allowed non-traded sector emissions when the budget was recommended (1,260 MtCO<sub>2</sub>e).

3 For a detailed discussion of different shares for the UK and EU in meeting an international 2°C target, see our recent report on *The scientific and international context for the fifth carbon budget*, available at <https://www.theccc.org.uk/publication/the-scientific-and-international-context-for-the-fifth-carbon-budget>

**Figure 6.2:** Emissions reductions on the cost-effective path vs. those required by EU commitments (2030)



Source: CCC analysis.

Notes: Abatement in CCC cost-effective path divided into two categories: 'Low-carbon heat and vehicles' comprises ultra-low-emission vehicles, heat pumps and district heating, with 'low-cost abatement' containing all other measures. It should be noted that some of the 'low-carbon heat and vehicles' measures are also cost-effective in or before the fifth budget period, and that the large majority of the 'low-cost abatement' measures are likely to be required before 2050 (although their timing may be flexible).

## 2. Inclusion of international aviation and shipping in carbon budgets

When recommending a carbon budget, the Climate Change Act requires the Committee to recommend whether international aviation and/or international shipping (IAS) emissions should be included in carbon budgets. As we have previously recommended, in principle, these sectors should be included in carbon budgets unless there are strong practical considerations which prevent this. Where they cannot be included, budgets must be set to allow for their emissions, such that the 2050 target in the Act can be met including these – that has been the approach to date and is continued in this report.

Currently, inclusion of international aviation remains impractical, given the design of the EU ETS for aviation and ongoing uncertainty about how this will be treated in future:

- Given that aviation is included in the EU ETS, accounting rules for carbon budgets state that emissions should be included on the basis of UK allowances rather than on a gross basis (e.g. bunker fuels). However, the current design of the EU ETS for aviation means that only emissions from flights within Europe are covered. Inclusion on this basis would be unfavourable: it would leave a proportion of emissions outside carbon budgets, and the exact amount of UK emissions to add to carbon budgets and report annually would be unclear given the EU ETS is administered on an airline, rather than Member State, basis.
- In addition, the International Civil Aviation Organisation (ICAO) is currently negotiating a global market-based measure for international aviation emissions. These negotiations are expected to conclude in autumn 2016. At that point the implications for carbon budgets should be assessed, including whether it is practical to include international aviation emissions in carbon budgets or more sensible to continue to formally exclude, whilst making allowance for, these emissions.

However, there is no reason to continue to exclude international shipping from carbon budgets and there would be no additional costs or competitiveness concerns associated with inclusion. If international shipping is included, an additional 40 MtCO<sub>2</sub>e should be added to the fifth carbon budget, reflecting projected emissions on a bunker fuel basis and under currently agreed international policies (Box 6.2):

- Emissions from international shipping are not currently included in the EU ETS. They can therefore be included on the basis of bunker fuels as reported in the UK's national emission inventory. Should an alternative methodology be agreed internationally then carbon budgets can be adjusted to reflect this.
- On a bunker fuel basis emissions from international shipping were 8.7 MtCO<sub>2</sub>e in 2013, which is broadly the same as their 1990 level.
- Our projection for international shipping emissions incorporates the International Maritime Organisation's agreed policy for reducing shipping emissions (i.e. the Energy Efficiency Design Index). It does not assume any unilateral UK policy action but does reflect the impact of our economy-wide fifth carbon budget scenarios on demand for internationally shipped goods, specifically fossil fuels. Overall, we estimate emissions would fall by 5% to 2030 compared to 2013 levels.
- Over the five years of the budget period this implies emissions of 40 MtCO<sub>2</sub>e from international shipping in addition to the emissions from the other sectors of the economy.
- This does not involve any additional costs beyond those already committed to, and does not imply a unilateral UK approach to reducing emissions nor the competitiveness risks that could result from such an approach.

The recommended inclusion of international shipping does not affect the level of effort implied by the recommended budget. Whether or not it is included in budgets, our proposals are on a path to meeting the 2050 target with both international shipping and aviation included (Figure 6.1).

**Recommendation: International shipping emissions should be included in the fifth and subsequent carbon budgets. This would imply a fifth carbon budget level, including international shipping, of 1,765 MtCO<sub>2</sub>e (Table 6.2). On international aviation, we recommend that it is not included at this stage; we will provide further advice following decisions expected at ICAO in 2016, and recommend that the Government revisit inclusion at that point.**

<b>Table 6.2: Fifth carbon budget recommendation including international shipping</b>	
<b>MtCO<sub>2</sub>e</b>	<b>The fifth budget period (2028-2032)</b>
Non-traded sector	1,135
Traded sector portion of net carbon account	590
International shipping	40
<b>Recommended budget including international shipping</b>	<b>1,765</b>



## Box 6.2: Basis for inclusion of international shipping emissions in carbon budgets

In our 2012 statutory advice on inclusion of international aviation and shipping in carbon budgets<sup>4</sup> we recommended that international shipping emissions should be included on the basis that they are reported in the national emissions inventory (i.e. bunker fuel sales).

This approach remains the appropriate basis for inclusion. International shipping emissions should therefore be added to the fifth carbon budget at a level of 40 MtCO<sub>2</sub>e, reflecting projected emissions over the period. Uncertainties around the level of international shipping emissions are likely to be small relative to factors already accepted in legislated carbon budgets. There are no additional costs of inclusion beyond those already committed to, and no competitiveness risks.

- **Methodologies for inclusion of international shipping emissions.** In our 2012 advice we recommended that international shipping emissions be included in carbon budgets on the basis of bunker fuel sales. This is the convention used for reporting emissions to the UNFCCC and is used in the UK's emissions inventory. Alternative methods for measuring shipping emissions have been proposed (e.g. based on shipping activity) but have not yet been fully developed or agreed for annual reporting. Therefore inclusion should be initially on the basis of bunker fuels, moving to inclusion on an alternative approach once this is sufficiently developed and agreed internationally.
- **Uncertainty in international shipping emissions.** A potential concern is that changes in the agreed accounting methodology, or year-to-year fluctuations in reported bunker fuel sales, could imply unintended changes to the effort required from other sectors covered by carbon budgets. Our analysis suggests the impact of alternative methodologies and the uncertainty in bunker fuel estimates (both historical and projected) are small, particularly relative to factors already included in carbon budgets<sup>5</sup>. As a result, any consequences for carbon budget management would also be small and manageable under provisions set out in the Climate Change Act.
- **Projected international shipping emissions over the fifth carbon budget.** Our scenarios for international shipping emissions are based on current emissions as reported in the UK's emissions inventory, which we project forward using assumptions on future shipping demand and carbon intensity of ships (see our Technical Report<sup>6</sup>, Chapter 5). Our demand scenarios are consistent with the reduction in fossil fuel imports under our economy-wide emission scenarios. Our carbon intensity scenarios are based on the International Maritime Organisation's (IMO) agreed policy for reducing emissions (i.e. the Energy Efficiency Design Index, EEDI). Overall, we project international shipping emissions would fall by 5% to 8.3 MtCO<sub>2</sub>e in 2030, compared to 2013 levels of 8.7 Mt.
- **Costs and competitiveness.** Our projection for international shipping emissions reflects the currently agreed international policy for reducing shipping emissions (i.e. the EEDI), which the UK Government has agreed to through the IMO. It does not assume any unilateral UK policy action. There are therefore no additional costs beyond those already committed to, nor the competitiveness risks that could result from a unilateral UK approach.

There is therefore no reason to continue to exclude international shipping emissions from carbon budgets, and they should be added to the fifth carbon budget at a level of 40 MtCO<sub>2</sub>e.

4 CCC (2012) *Scope of carbon budgets – Statutory advice on inclusion of international aviation and shipping*, available at: <https://www.theccc.org.uk/publication/international-aviation-shipping-review/>

5 CCC (2012) *Scope of carbon budgets – Statutory advice on inclusion of international aviation and shipping*, p29-30

6 CCC (2015) *Sectoral scenarios for the fifth carbon budget*. Available at [www.theccc.org.uk](http://www.theccc.org.uk)

---

### 3. Role for purchase of offset credits

Given a suitable level of global ambition, trading enables emissions reductions to take place in parts of the world where these are lowest cost and easiest to deliver. Credit purchase and the accompanying financial flows to developing countries might be part of an international agreement to tackle climate change.

The Committee's scenarios in Chapter 3 put the UK in a position to meet the 2050 target through domestic action, allowing for emissions from international aviation and shipping. As we have noted in previous reports, uncertainty over the availability and cost of offset credits in 2050 makes this an appropriate planning assumption at this stage.

If delivered, the scenarios in Chapter 3 would meet the proposed fifth carbon budget through domestic action, without recourse to purchased credits, on central expectations.

In recommending the fifth carbon budget, we are required by the Climate Change Act to recommend the appropriate role for international credits in meeting the budget. In doing so, it makes sense to treat the traded and non-traded sectors separately:

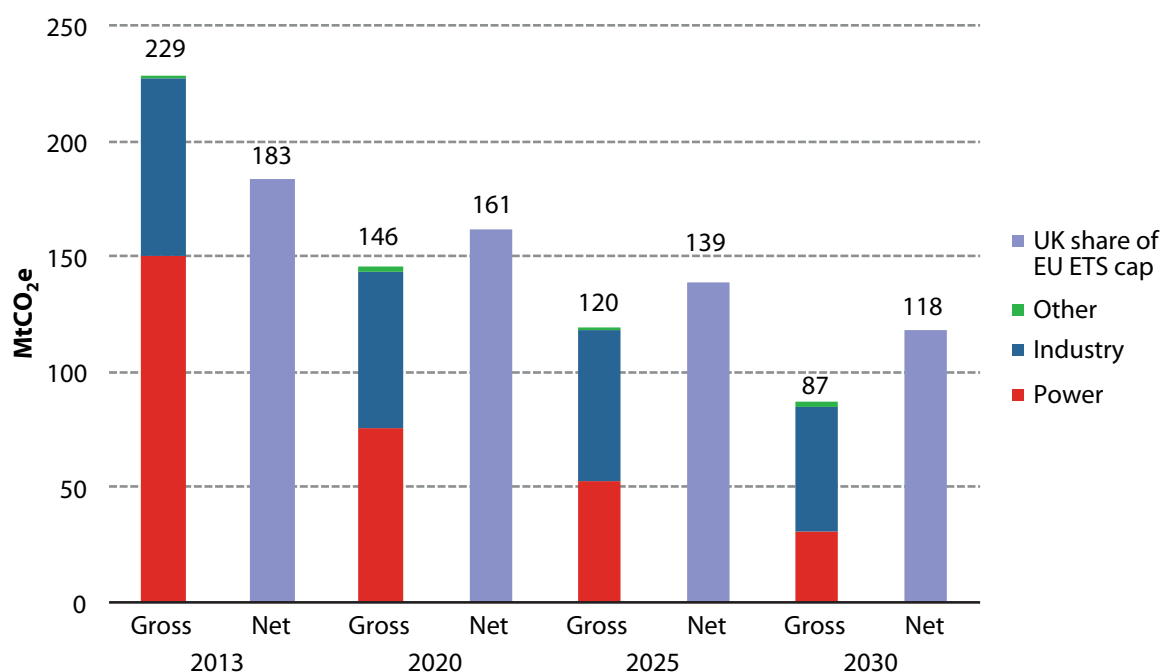
- **Traded sector.** Trading of EU Allowances (EUAs) under the EU ETS should not be limited, given the way that the traded sector is treated under carbon budget accounting. However, we note that the cost-effective path for the UK power sector means that we would expect actual traded sector emissions to be below the level of the UK share of the EU ETS cap (Figure 6.3).
- **Non-traded sector.** The part of the budget covering the non-traded sector has been recommended on the basis that it is our assessment of the set of measures that are cost-effective and/or required to prepare for meeting the 2050 target. The budget should therefore be met without the use of international carbon units (i.e. credits).

If unexpected circumstances mean the budget cannot be met cost-effectively without recourse to purchase of credits, the Committee would revisit this advice, including an assessment of the strength and validity of the credit market at that time.

As part of the potential ratcheting up of international effort beyond Paris there may be a role for international credits to support ambition globally. That should be additional to existing commitments and our proposed carbon budget for the UK. We would advise on this, as well as the appropriate level of the budget, should the EU commit to an increase in ambition.

***Recommendation: The budget should be met without the use of international carbon units (i.e. credits). Credits could be used to go beyond the proposed budget to support international action to reduce emissions.***

**Figure 6.3:** Cost-effective path for the traded sector (gross) and estimated UK share of the EU ETS cap (net) (2013-2030)



**Source:** CCC analysis; Tables 13 and 16 in DECC (2015) *Annual Statement of Emissions for 2013*.  
**Notes:** Category 'Other' includes traded emissions in buildings, transport, agriculture and waste.

## 4. Costs and benefits of meeting the budget

The proposed budget is our best assessment of the lowest cost path to the UK's 2050 target. Meeting it will ensure costs are kept as low as possible in the long term. However, there is a financial cost to climate action since low-carbon technologies currently have higher costs than high-carbon alternatives which, amongst other things, do not face the full cost of their emissions:

- We estimate that meeting the proposed fifth carbon budget will involve an annual cost in 2030 that is up to £3 billion (around 0.1% of expected GDP) more than the cost of meeting the fourth carbon budget that has already been legislated. Costs would be lower to the extent that reduced carbon emissions mean UK firms can purchase fewer emissions allowances in the EU ETS.
- The total annual cost of meeting the fifth carbon budget in 2030 is therefore similar to our estimate of the cost of meeting the fourth carbon budget in 2025: less than 1% of GDP.
- Offsetting some of these costs, there are wider benefits to climate action through reduced air pollution and other health benefits. Using government valuation methods, we have previously estimated the monetary value of these to be around 0.1-0.6% of GDP in 2030 (see Chapter 4).

We are recommending setting the budget at this level because it is on the lowest cost path to the legislated 2050 target. Even in the absence of this target, not acting to tackle climate change is not an option given the much higher costs of unmitigated climate change and the international commitments in place. If the world is to stay credibly on track to the internationally-agreed objective to limit global temperature increase to 2°C, then the UK's share of the necessary global emissions reduction is likely to be at least as large as that required by our proposed budget.

The budget is therefore a low-regret course to follow.

The precise costs and benefits of meeting the budget depend on a range of uncertain factors. These include the pace of innovation (e.g. the path of technology costs and performance), fossil fuel prices, wider economic performance, the level of demand and behaviour of consumers and the mix of measures used to meet the budget:

- Across a range of assumptions about how the budget is met, technology costs, the level of demand in the economy and fossil fuel prices, our estimates for the annual cost remain under 1% of GDP (Table 6.3).
- The costs and risks from climate change need to be addressed regardless of the cost of fossil fuels or the rate of GDP growth. While lower fossil fuel prices and higher GDP would make meeting the budget more expensive, in such cases consumers and businesses would be more able to bear the cost (as costs associated with these inputs would be lower or incomes overall would be higher). For example, while lower fossil fuel prices make decarbonisation look relatively more expensive, total energy bills are still lower compared to a situation with higher fossil fuel prices. Conversely, higher fossil fuel prices and lower GDP would be expected to mean a lower cost of meeting the budget, in more testing times economically.
- The estimated cost of meeting the budget is consistent with our earlier estimates that meeting the UK's 2050 target might cost 1-2% of GDP.<sup>7</sup>

Based on this cost, which was deemed acceptable when the Climate Change Act was passed, the manageable impacts set out in Chapter 4 and the further steps that the budget makes towards meeting the 2050 target, the proposed budget level best meets the requirements of the Climate Change Act.

**Table 6.3:** Estimated costs of meeting the fifth carbon budget under a range of assumptions

Costs as % GDP	Central estimate	High or low fossil fuel prices	Low or high technology costs
<b>Total costs</b>	<b>0.5%</b>	<b>0.1% to 0.8%</b>	<b>0.2% to 0.9%</b>
Of which:			
Power	0.5%	0.3% to 0.7%	0.4% to 0.7%
Industry	0.0%	0.0%	0.0%
Buildings	0.0%	-0.1% to 0.0%	-0.1% to 0.0%
Transport	0.1%	-0.1% to 0.2%	-0.1% to 0.2%
Agriculture, waste and F-gases	0.0%	0.0%	0.0%

**Source:** CCC analysis.  
**Notes:** The cost estimates presented are based on the resource costs of the measures in our scenarios to reduce emissions. They do not include quantified costs or benefits relating to changes in welfare (e.g. warmer homes or changes in demand for energy services), or impacts on health (e.g. due to improved air quality). We expect net abatement costs in agriculture to be negative; in these calculations we assume zero costs due to uncertainties around exact magnitudes. Numbers may not sum due to rounding.

<sup>7</sup> See CCC (2008) *Interim advice by the Committee on Climate Change*, <https://www.theccc.org.uk/publication/letter-interim-advice-from-the-committee-on-climate-change> and CCC (2008) *Building a low-carbon economy – the UK's contribution to tackling climate change*, <https://www.theccc.org.uk/publication/building-a-low-carbon-economy-the-uks-contribution-to-tackling-climate-change-2/>

---

## 5. Maintaining the integrity of the carbon budgets

The Climate Change Act requires a carbon budget to be set as a single number 12 years in advance: in the present case, the limit for total emissions over the five-year period from 2028 to 2032. Our recommendation reflects the best estimates available of some uncertain factors.

Carbon budgets do not address actual UK emissions in the parts of the economy covered by the EU ETS (the ‘traded sector’), but rather the UK share of the EU ETS cap. In recommending a budget, we make an estimate of the UK share of the EU ETS cap; however, it is not possible now to estimate what this share will be with complete accuracy – or indeed at any point in advance.

Under the Climate Change Act’s existing Carbon Accounting Regulations, any difference between the out-turn and the projected UK share of the EU ETS cap affects the level of emissions allowed in the non-traded sector, which is the residual from the total budget minus the share of the EU ETS cap. So far this has meant that carbon budgets require less action than originally envisaged, although in principle it is also possible for the approach set out in the Act to have the opposite effect.

Setting a clear level of ambition in the non-traded sector that is independent of changes in the UK share of the EU ETS cap provides a guide to policymakers and a signal to businesses and consumers.

***Recommendation: The Government should use the Carbon Accounting Regulations to fix the net carbon account for the traded sector at the assumed level (i.e. 590 MtCO<sub>2</sub>e over 2028-2032), and not adjust for the out-turn UK share of the EU ETS cap. This would ensure that the implications of the budget for the non-traded sector are clear, limiting emissions to 1,135 MtCO<sub>2</sub>e over 2028-2032, and requiring annual reductions of 2% (6 MtCO<sub>2</sub>e) through the 2020s.***

As a way of providing a clear signal to businesses and consumers in the non-traded sector, this solution is preferable to future revisions to the budget in order to adjust for new estimates of the UK share of the EU ETS cap. We received a clear message from business stakeholders as part of the Review of the Fourth Carbon Budget<sup>8</sup> and during the course of preparing this advice that budgets should not be changed if this can be avoided.

Applying this same approach to the existing carbon budgets could also deal with the issue of ‘phantom emissions’ raised by the previous Secretary of State.<sup>9</sup> The changes to estimates of the UK share of the EU ETS cap for already legislated budgets have been large, making the second and third budgets much easier to meet than originally envisaged:

- Latest estimates of the UK share of the EU ETS cap are now over 300 MtCO<sub>2</sub>e lower over the second and third carbon budget periods than estimates when the budgets were set.
- That means that the second and third budgets could be met with very little effort in the non-traded sector. Or, if near-term effort is preserved and excess emissions are carried forward to future budgets, the integrity of the fourth and fifth carbon budgets would likely be undermined.
- In our response to the Secretary of State earlier in 2015 we reiterated the importance that carbon budgets be met through UK action consistent with achieving the 2050 target and not through accounting loopholes.
- We suggested that a revision to the Carbon Accounting Regulations could be used to deal with this issue, and if that were not possible then the second and third budgets should be tightened.

---

<sup>8</sup> CCC (2013) *Fourth Carbon Budget Review – part 2: The cost-effective path to the 2050 target*, page 14. Available at: <https://www.theccc.org.uk/publication/fourth-carbon-budget-review>

<sup>9</sup> Letter from DECC Secretary of State Ed Davey to Lord Deben, March 2015. Available at: <https://www.theccc.org.uk/publication/letter-preserving-the-integrity-of-the-uks-climate-change-regime/>

**Recommendation: The recommended change to Carbon Accounting Regulations should also apply to the second, third and fourth carbon budgets, with the traded sector accounted for at the level estimated when the original budgets were set (Table 6.4).**

**Table 6.4:** Levels of traded sector emissions assumed in the carbon budgets

	<b>Budget 2 (2013-2017)</b>	<b>Budget 3 (2018-2022)</b>	<b>Budget 4 (2023-2027)</b>	<b>Budget 5 (2028-2032)</b>
Assumed level of traded sector emissions across the budget	1,078	985	690	590
<p><b>Source:</b> HM Government (2009) <i>Building a low-carbon economy: implementing the Climate Change Act 2008</i>, Table 3.B: Proposed carbon budget levels p18-19; CCC (2010) <i>The Fourth Carbon Budget – reducing emissions through the 2020s</i>, <a href="https://www.theccc.org.uk/publication/the-fourth-carbon-budget-reducing-emissions-through-the-2020s-2/">https://www.theccc.org.uk/publication/the-fourth-carbon-budget-reducing-emissions-through-the-2020s-2/</a></p> <p><b>Notes:</b> Estimates of the UK share of the EU ETS cap for the second and third carbon budgets were adjusted slightly between the budgets being recommended by the CCC and being legislated by the Government.</p>				

Finally, we note that an amendment was recently passed in the House of Lords<sup>10</sup> that would affect accounting for the fifth carbon budget and those that follow. The amendment would effectively mean that the budget covers actual emissions in the traded sector as well as the non-traded sector. Should the basis of emissions accounting for the fifth carbon budget be changed in law, we would need to return to our recommendation to advise on the appropriate budget level. Our estimate of the cost-effective path in the traded sector is significantly below our estimate for the UK share of the EU ETS, implying that a tighter ‘gross’ budget would be required.

## 6. Delivering the budget

Our Central scenario sets out our current assessment of the cost-effective path on the way to meeting the 2050 target. However, this is indicative and only one way to meet the budget. Chapter 3 and our Technical Report on *Sectoral scenarios for the fifth carbon budget*<sup>11</sup> set out a range of scenarios for how the budget can be met, and outline the flexibilities available.

Meeting the carbon budgets will require Government leadership. The Climate Change Act requires the Government, as soon as is reasonably practicable after setting the budget, to set out proposals and policies for meeting it.

Policies are largely in place to continue reducing emissions to 2020. Policies will need to be extended and developed after 2020 to meet both the fourth and the fifth carbon budgets. This process should start now given the lead-time from policy development to actions which will reduce emissions: changes in behaviour, low-carbon investment decisions, technology innovation and development of markets for low-carbon products. The Government has recognised the need for policy development and committed to providing more detail on how this will be done once the fifth budget is set.

Particular priorities for policy development are:

- **Power.** Ensuring the power sector can invest with a 10-year lead-time by committing funding to 2025 consistent with reducing sector carbon intensity to below 100 gCO<sub>2</sub>/kWh in 2030 and clarifying future plans for offering low-carbon contracts.

<sup>10</sup> <http://www.publications.parliament.uk/pa/bills/cbill/2015-2016/0092/15092.pdf>

<sup>11</sup> Available from our website, [www.theccc.org.uk](http://www.theccc.org.uk).

- **CCS.** Continuing commercialisation of carbon capture and storage. This needs a strategic approach to transport and storage infrastructure, a joined-up approach across power and industry, completion of the two proposed projects and contracts offered for at least two follow-on projects this Parliament.
- **Heat.** Putting in place measures to increase uptake of low-carbon heat (heat pumps and low-carbon heat networks supplying businesses and households) alongside energy efficiency improvement.
- **Buildings.** Setting out how energy efficiency improvements will be delivered and financed, following the end of the Green Deal and forthcoming end of the Energy Company Obligation in 2017; delivering an effective simplified package for improving energy efficiency in non-residential buildings.
- **Transport.** Pushing for clear, stretching 2030 targets at the EU level to reduce CO<sub>2</sub> from new vehicles, combined with robust testing approaches. Alongside stretching targets, early-stage support for the emerging electric vehicle market and funding for supporting infrastructure should continue.
- **Other sectors.** Policies will also be needed in other sectors, including agriculture, where it is likely that policy will need to go beyond the existing voluntary approach.

We will return to the policy challenges around delivering the emissions reduction to meet the fourth and fifth carbon budgets in our annual progress report to Parliament in June 2016.

## 7. Next steps

The Climate Change Act sets statutory deadlines that mean the Committee is giving its advice before the 21<sup>st</sup> Conference of the Parties (COP21) to the UNFCCC takes place in Paris in December 2015. The COP21 negotiations are due to end on 11 December 2015 and could produce significant new developments. The Committee will write to the Secretary of State for Energy and Climate Change in early 2016 to set out if and how the outcomes of Paris, or other significant changes, affect our published advice.

The Government must legislate the fifth carbon budget by the end of June 2016. If the level that is proposed to Parliament does not accord with the Committee's advice, the Climate Change Act requires the Secretary of State to explain why not.

As soon as is reasonably practicable after the budget is legislated, the Act requires the Government to set out proposals and policies for meeting the budget, and those preceding it. In their response to the Committee's June 2015 Progress Report the Government stated: *"After we set the fifth carbon budget (by the end of June 2016), we will be able to set out more detail about our expectation for how we intend to meet the targets. Our new emissions reduction plan towards the end of 2016 will set out our proposals in full."*

We will monitor progress developing the policy framework and provide advice in our annual report to Parliament on what this should cover.