

The Fifth Carbon Budget - Call for Evidence

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Question and Response form

When responding please provide answers that are as specific and evidence-based as possible, providing data and references to the extent possible. Please limit your response to a maximum of 400 words per question.

Questions for consideration:

A. Climate Science and International Circumstances

Climate science and international circumstances are important criteria in setting carbon budgets.

- The science indicates the impacts associated with different levels of climate change and the limit on emissions globally if these risks are to be contained.
- International circumstances inform the prospects of future action to reduce emissions globally, potential requirements of the UK to contribute to those actions, and prospects for low-carbon technology development and carbon pricing.
- The EU places obligations on Member States to reduce emissions to contribute to reductions in the bloc as a whole. These imply a minimum level of effort for the UK's carbon budgets.

The Committee intends to draw primarily on the work of the IPCC, as published in the Fifth Assessment Report, in assessing the implications of climate science for the budget advice

The Committee's advice is based on a climate objective to limit central estimates of temperature rise to as close to 2°C as possible, with a very low chance of exceeding 4°C by 2100 (henceforth referred to as "the climate objective"). This is broadly similar to the UNFCCC climate objective, and that of the EU.

In order to achieve this objective, global emissions would have to peak around 2020, before decreasing to roughly half of recent levels by 2050 and falling further thereafter.

The UNFCCC is working toward a global deal consistent with such reductions. Individual parties are submitting pledges for effort beyond 2020, with the details of the agreement to be discussed in Paris late in 2015.

The EU has agreed a package that requires a reduction in emissions of at least 40% on 1990 levels by 2030, on the way to an 80-95% reduction by 2050. The UK Government supported this package, while arguing for an increase to 50% in the context of a global deal.

The US and China have jointly made pledges for the period beyond 2020. The US has pledged a reduction of 26-28% by 2025 versus 2005, requiring a doubling of the rate of carbon reduction compared to 2005-2020 and on a trajectory to economy-wide cuts of the order of 80% by 2050. China has pledged to peak CO₂ emissions around 2030, and to make best efforts to do so earlier.

Question 1 The IPCC's Fifth Assessment Report will form the basis of the Committee's assessment of climate risks and global emissions pathways consistent with climate objectives. What further evidence should the Committee consider in this area?

ANSWER:

In drawing on the IPCC's AR5 report, the CCC should be mindful that the carbon budgets outlined in the various AR5 reports are confusing to understand on a number of levels, such as : significant variations in historical emissions to 2010, and estimates after this point (e.g. Fig 1.6); a lack of clarity as to exactly what probabilities of avoiding 2°C refer (e.g. proportions of model runs - Tables 2.2 and 3.1 - http://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf)

Thus the CCC needs to engage in an open dialogue with the relevant IPCC authors to clarify the budgets and develop a coherent synthesis table with accompanying notes, in lieu of Table 2.2 (http://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf); which is hard to unpack even for many with expertise in this area.

The CCC's global analysis must take account of GHGs emitted since the start of 2011, which are in the region of 150GtCO₂, as opposed to the year 2010 as per AR5. Analysis should begin from the start of 2016, with reasoned estimates made for those years where there is, as yet, no empirical emissions data. This would offer a more accurate and candid (though admittedly challenging) account of current emission levels, than does a focus, for example, on 2011 as a base line.

A greater emphasis needs to be placed on the level of future non-CO₂ emissions likely under future scenarios, with estimates of how much this constrains future levels of CO₂ emissions to avoid 2°C.

There is significant uncertainty over the potential for mitigation of non-CO₂ emissions, particularly those related to agriculture associated with feeding a growing and more affluent population. Strong drivers include an increase in meat consumption and growth in fertiliser use as well as climate change impacts that may lead to further increases in non-CO₂ emissions, through augmented fertilizer input, for example. The higher the non-CO₂ emissions, the lower the available CO₂ budget for energy and industry. It is important for the Committee to refresh its understanding of the non-CO₂ scenarios, noting which RCP scenario is being used to construct CO₂ budgets (within IPCC both RCP2.6 and RCP8.5 for non-CO₂ assumptions appear to be used to estimate constraining CO₂ budgets). For further discussion on this matter see Bows-Larkin et al., 2014, [The importance of non-CO₂ in carbon management](#), *Carbon Management*, 5, 2, 193-210, DOI:

10.1080/17583004.2014.913859.

Question 2 *To what extent are the UN talks in Paris likely to have implications for the Committee's advice beyond the pledges and positions announced in advance of the talks?*

ANSWER:

The term “likely” here is pivotal. If the talks are to be premised on scientific rigour underpinning the 2°C objective, with the probabilities consistent with the “must stay below” language of repeated international commitments, then the Committee will have to substantially alter its advice to government. By contrast, if the outcome is one that is politically palatable and quantitatively expedient, then the advice will stand or may require incremental tweaks.

It is “likely” that Paris will fail to deliver the ambitious outcome commensurate with a reasonable probability of remaining within 2°C, with the added danger that there is greater political buy-in than occurred in Copenhagen. This would be a real failure dressed as an important step in the right direction.

If this were to be the case, the CCC could take on the independent role of providing a clear and neutral summary of the Paris outcome.

Question 3 *Based on the available evidence, does the EU 2030 package reflect the best path to its stated 2050 ambition? How might this package change, specifically its targeted emissions reduction, either before the end of Paris or after Paris?*

ANSWER:

The EU2030 package, and the emission reductions of 40% by 2030, is inadequate to achieve the aim of putting the EU on a path to achieve its stated ambition. Put simply, the basic arithmetic of: (1) the IPCC's 2°C carbon budgets; (2) highly optimistic assumptions on deforestation and cement; (3) stringent emissions pathways for industrialising and poorer nations; and (4) the EU's oft-cited commitment on 2°C; requires the European Council to increase the 2030 target to, at least, an 80% reduction in emissions.

For more information please see: <http://kevinanderson.info/blog/letter-to-the-pm-outlining-how-2c-demands-an-80-cut-in-eu-emissions-by-2030/> and <http://kevinanderson.info/blog/enthusiasm-over-small-fall-in-eu-emissions-masks-underlying-apathy-on-2c/>

Question 4 *How does the UK's legislated 2050 target affect its ability to support international efforts to reduce emissions, including its position in negotiations? Does the level of UK carbon budgets have any additional impact (over-and-above the 2050 target) for the UK in international discussions?*

ANSWER:

The UK's legislated 2050 target is misaligned with the global objective of avoiding 2°C with a reasonable to high probability, and therefore impacts on the levels of mitigation necessary internationally. This is because it is likely that the emissions from many emerging economies and developing countries will continue to grow, and reach a peak post-2020. As a result, very little budget will be available even by 2030 for nations such as the UK (Anderson and Bows, 2011, [Beyond 'dangerous' climate change: emission scenarios for a new world, *Phil Trans R Soc A*, 369, 20-44 DOI: 10.1098/rsta.2010.0290](#)), thus emission reductions required by the UK are close to an 80% cut by 2030 rather than 2050. If the UK only reduces emissions in line with this target, either emission reductions from other nations will need to be higher, or the world is to expect a greater risk of breaching the 2°C threshold.

Furthermore, as time goes on and progress towards mitigation around the world is measured, the 2050 end-point target will require adjustment. It is much more important than that the UK focuses on its short-term budgets, and updates and potentially further constrains these as appropriate, given the levels of CO₂ measured year-on-year at a global scale. Maintaining a long-term (2050) end-point target could influence decision making over energy system change, reducing the urgency with which energy policy is implemented, and diverting attention away from addressing cumulative emissions (Anderson et al., 2008, [From long-term targets to cumulative emission pathways: reframing UK climate policy, *Energy Policy*, 36, 10, 3714-3722, DOI: 10.1016/j.enpol.2008.07.003](#)). Climate change is about the budgets not an (relatively) arbitrary 2050 target – this framing of UK policy should be the other way round – however politically uncomfortable that may be. The level of CO₂ budgets, if not aligned with the 2°C goal, and updated to reflect how global CO₂ emissions are changing, impacts on international efforts to avoid 2°C.

Current legislation does not explicitly include international aviation and shipping emissions. If 2°C is to remain the global objective, all emissions should be included in any target. These two sectors have significant drivers in the UK, and globally are expected to increase – further constraining the budget available for other sectors

(Bows-Larkin, 2014, [All adrift: aviation, shipping and climate change policy, Climate Policy](#), DOI: 10.1080/14693062.2014.965125). Including emissions from these sectors explicitly within carbon budgets is essential to fully account for emission sources, and to deliver mitigation in line with 2°C.

B. The cost-effective path to the 2050 target

The carbon budgets need to set a path that is achievable from today without being over-optimistic about what is achievable in later periods to prepare for the 2050 target.

The Committee has previously set out scenarios for 2030 that balance effort before 2030 with potential opportunities from 2030 to 2050. The scenarios aim to include ways of reducing emissions that are likely to be relatively low cost and actions that will develop options that may need to be deployed at scale by 2050.

These scenarios, reviewed in detail in the Committee's report *The Fourth Carbon Budget Review – the cost-effective path to the 2050 target*, include substantial investment in low-carbon power generation, roll-out of low-carbon heat (heat pumps and district heating), development of the markets for ultra-low emissions vehicles and a combination of energy efficiency measures and fuel switching in industrial sectors.

The scenarios also reflect detailed assessments of what is practically deliverable, and the Committee monitors progress towards them as part of its statutory duties. The *2014 Progress Report to Parliament* indicated that current policy would not be enough to meet the fourth carbon budget, but that the 'policy gap' could be closed at affordable cost.

The set of policy options required to close the gap include:

- Strengthening the EU Emissions Trading System.
- Setting a clear objective for Electricity Market Reform (EMR) beyond 2020.
- Focusing on low-cost residential energy efficiency.
- Simplifying policies targeting commercial energy efficiency.
- Tackling financial and non-financial barriers to low-carbon heat.
- Pushing for strong EU targets for new vehicle efficiency in 2030.

The Government has subsequently published various documents, including its formal response, as required under the Climate Change Act, and the National Infrastructure Plan. The Plan includes investments of around £100 billion in low-carbon power generation in the 2020s, in line with the scenarios from the EMR Delivery Plan that reach 100 gCO₂/kWh by 2030. It also has significant investments in offshore oil and gas and in the road network. This includes £15 billion of new spending on roads and around £50 billion on offshore oil and gas.

Question 5 *In the area(s) of your expertise, what are the opportunities and challenges in reducing emissions to 2032, and at what cost? What may be required by 2032 to prepare for the 2050 target, recognising that this may require that emissions in some areas are reduced close to zero?*

ANSWER:

There are technical and operational opportunities in the shipping sector that are not being taken advantage of in terms of mitigation (Bows-Larkin et al., 2014, [High Seas, High Stakes](#), High Seas Project Final Report, Tyndall Centre, University of Manchester; Gilbert et al., 2015, [Technologies on the High Seas: meeting the climate change challenge, Carbon Management](#), DOI: 10.1080/17583004.2015.1013676). These including alternative methods of propulsion, alternative fuels, more wide-spread adoption of slow-steaming, further technical efficiency change etc. At present local pollution regulations are pushing the industry towards low-sulphur fuels such as diesel, which may, over the life-cycle, lead to greater levels of CO₂ emissions. This risks the industry locking itself into stranded assets. Taking a whole-systems view on all emissions sources would likely lead to different conclusions on the future of shipping fuels Gilbert, 2014, [From reductionism to systems thinking: how the shipping sector can address sulphur regulation and tackle climate change, Marine Policy](#), 43, 376-378, DOI: 10.1016/j.marpol.2013.07.009.). Moreover, there remains uncertainty over how to upscale the production infrastructure necessary for alternative fuels and the use of renewable propulsion (e.g. wind technology) requires incentivising to increase confidence in operational performance – full-scale demonstration is needed. As with other sectors there is a tendency to look for short-term solutions and financial gain and to remain ignorant regarding the longer-term issue of climate change. Lastly, challenges remain when viewing climate change mitigation as part of a system. The interconnections between sectors and competing demands for fuels and resource means that sectors such as shipping may be left playing settle fiddle for the race for fuels such as bioenergy.

Without addressing emissions from either international shipping or aviation risks even more other sectors requiring emission cuts close to zero in the timeframe to 2050 (Bows-Larkin, 2014, [All adrift: aviation, shipping and climate change policy](#),

[Climate Policy](#), DOI: 10.1080/14693062.2014.965125).

Across all sectors, the focus on costs neglects the myriad of other criteria that should be applied to considering and comparing responses. Climate change is too complex, pervasive and heterogeneous an issue to be reduced to a single homogeneous index – money. This approach is not only ethically flawed, but ignores a wealth of other academically rich approaches for making difficult decisions.

Perhaps the CCC could seriously consider developing alternative metrics, dialogues and narratives around responding to our 2°C commitments?

Question 6 *What, if any, is the role of consumer, individual or household behaviour in delivering emissions reductions between now and 2032? And, separately, after 2032?*

ANSWER:

The longer emissions continue to rise, the greater the cuts needed to remain within a set carbon budget. Focusing first on the energy system, given the lead in time for large-scale supply side solutions such as carbon capture and storage, this points to an urgent need to implement demand side solutions to reduce energy demand, which positions consumers/citizens, individuals and households with a very significant role.

Moving beyond adoption of technology, and changing practices, individuals and communities can play a significant role acting as a catalyst for wider (and potentially novel) action (Tyndall Centre Radical plan conference http://www.tyndall.ac.uk/sites/default/files/radicalplanabstracts_0.pdf). Many people are working to bring about change, and may catalyse social movements which may in turn influence policy. In this sense, separating society into individuals, institutions, businesses, governments etc. neglects the systemic nature of contemporary society – all the more so with the social media. Where individuals and communities initiate initiatives within our complex system Government or other organisations have a role here, in facilitating such ‘seeding’ and being there to foster/fertilise the few seeds that do show promise.

A third role for individuals and consumers is to examine how society uses goods

and commodities, and to challenge their assumptions: 'Do I need to buy this?', 'Can I fix this rather than buy a new one?' and 'Before I recycle can this be re-used?' By becoming more a more material efficient society and adopting principles in line with the circular economy, industry could move away from supporting a linear economy and become more service based to support and help enable a change to society's practices. This is crucial, given that the role of the UK's industrial sectors (via the use of its products within supply chains and as end-use commodities) must be seen within the context of reducing emissions across the whole of society (Gilbert, Roeder et al. 2013 – Can the UK afford (not) to produce chemicals in 2050? <https://www.escholar.manchester.ac.uk/uk-ac-man-scw:209888>). There is significant pressure on our industries to decarbonise and a strong over-reliance for supply side measures to deliver our climate change targets, in particular carbon capture and storage technologies. However, it is unlikely that between now and 2050 these supply side measures will deliver the savings required; historically, the savings have been incremental. The largest saving has been a result of the closure of production sites and/or relocation to other nations with lower production costs and energy and feedstock costs.

Question 7 *Is there evidence to suggest that actions to further reduce emissions after 2032 are likely to be more or less challenging to achieve than actions in the period up to 2032?*

ANSWER:

This question is premised on a climate change agenda far removed the UK's 2°C commitments. The UK needs to have delivered virtually all its decarbonisation by the early 2030s; so for a moderate probability of 2°C, even with the weak equity considerations (and no negative emission fudges) – there is no real scope for substituting/delaying action to post 2030.

Question 8 *Are there alternatives for closing the 'policy gap' to the fourth carbon budget that could be more effective? What evidence supports that?*

ANSWER:

The adoption of stringent product standards. Why sell A rated fridges when

according to DECC they consume ~80% more energy than A++ versions with identical features and of the same size, etc.? The same also holds for cars. Standards provide a clear and longer-term market signal than an iterative carbon price etc. – set stringent standards (much more than the very weak EU car standards) and give a clear signal that they will be ratcheted up year on year. E.g. starting from 2016 no cars to be sold above 110gCO₂/km, tightened at say 8% p.a. NB. This is minimum emission standard is for *all* domestic cars – not a fleet average. This also helps in terms of early adoption and any role-model dimension in transitioning to lower carbon technologies – as wealthier individuals also have to abide by the standard.

For more on this see: <http://kevinanderson.info/blog/why-carbon-prices-cant-deliver-the-2c-target/>

Revisit the concept of personal carbon trading as an instrument to help deliver the much higher rates of mitigation now necessary to stay within 2°C budgets.

Set emission standards for the portfolio of power stations of any generating company. For example, a mean for any supplier of 350gCO₂/kWh from 2016 onwards, tightening at 10% p.a. (or more).

Across the board and from a climate perspective government should remain agnostic as to particular technologies. It may prefer some options over others for non-climate reasons, but this should be made clear and climate should not be used as an excuse for favouring particular technologies.

Question 9 *Are the investments envisaged in the National Infrastructure Plan consistent with meeting legislated carbon budgets and following the cost-effective path to the 2050 target? Would they have wider implications for global emissions and the UK's position in international climate negotiations?*

ANSWER:

The scale and scope of investment plans are far removed from what would be necessary for the UK to meet its international commitments on 2°C (probabilities and equity). Crucially, many of the investments planned will act as a significant

ratchet on emissions and play against mitigation efforts. Nowhere is this more keenly illustrated than with planned investment in additional aviation capacity.

C. Budgets and action

The UK's statutory 2050 target requires actions across the economy to reduce emissions. Many of these actions will be driven by (UK and devolved) Government policy and implemented by businesses and consumers. There will be an important role for Local Authorities in successful delivery.

Although the carbon budgets do not require specific actions, they provide an important indication of the overall direction that policy will take in future. Once set, carbon budgets can only be changed if there has been a significant change in the relevant circumstances set out in the Climate Change Act.

Feedback from businesses as part of the Committee's 2013 Call for Evidence for the review of the fourth carbon budget was that stability is an important and valuable characteristic of carbon budgets.

Question 10 *As a business, as a Local Authority, or as a consumer, how do carbon budgets affect your planning and decision-making?*

ANSWER:

Question 11 *What challenges and opportunities do carbon budgets bring, including in relation to your ability to compete internationally? What evidence do you have for this from your experience of carbon budgets to date?*

ANSWER:

Question 12 *What would you consider to be important characteristics of an*

effective carbon budget? What is the evidence for their importance?

ANSWER:

An effective budget has to include all sectors of the economy and the DECC decision to defer judgement on whether to include international aviation and shipping emissions in the UK's carbon budgets until 2016 demonstrated a disregard for climate change science (Bows, A., M. Traut, et al, 2013, <http://www.tyndall.ac.uk/publications/briefing-notes/2012/aviation-and-shipping-privileged-%E2%80%93-again-uk-delays-decision-act>). To prepare for the 2050 target, these sectors should be included, as per the original advice from the CCC during the last budget. The rationale is twofold.

Firstly, the United Nations Framework Convention on Climate Change (UNFCCC) negotiations has yet to yield any binding global target on emission reduction. Consequently, leaving control of emissions from aviation and shipping to the international community is likely to see emissions rise in line with business as usual (Smith et al, 2014, <http://www.imo.org/OurWork/Environment/PollutionPrevention/AirPollution/Documents/GHG3%20FULL%20REPORT.pdf>).

Secondly, the conflict between the fundamental framing of ICAO and IMO – as bodies that treat all nations equally – and the demands placed on them by Kyoto to differentiate between Annex 1 and non-Annex 1 nations, has proved a major obstacle to delivering any meaningful mitigation. Given these reasons, if the UK is not to renege on its commitment to 2°C, aviation and shipping emissions must be included in the UK national emission targets.

D. Other issues

The Climate Change Act requires that in designing the fifth carbon budget we consider impacts on competitiveness, fiscal circumstances, fuel poverty and security of energy supply, as well as differences in circumstances between UK nations. High-level conclusions on these from our advice on the fourth carbon budget were:

- **Competitiveness** risks for energy-intensive industries over the period to 2020 can be addressed under policies already announced by the Government. Incremental impacts of the fourth carbon budget are limited and manageable.
- **Fiscal impacts.** The order of magnitude of any fiscal impacts through the 2020s is likely to be small, and with adjusted VED banding and full auctioning of EU ETS allowances could be neutral or broadly positive.

- **Fuel poverty.** Energy policies are likely to have broadly neutral impacts on fuel poverty to 2020, with the impact of increases in electricity prices due to investment in low-carbon generation being offset by energy efficiency improvement delivered under the Energy Company Obligation. Incremental impacts through the 2020s are likely to be limited and manageable through a combination of further energy efficiency improvement, and possible income transfers or social tariffs.
- **Security of supply** risks due to increasing levels of intermittent power generation through the 2020s can be managed through a range of flexibility options including demand-side response, increased interconnection and flexible generation. Decarbonisation of the economy will reduce the reliance on fossil fuels through the 2020s and thus help mitigate any geopolitical risks of fuel supply interruption and price volatility.
- **Devolved administrations.** Significant abatement opportunities exist at the national level across all of the key options (i.e. renewable electricity, energy efficiency, low-carbon heat, more carbon-efficient vehicles, agriculture and land use).

Question 13 *What evidence should the Committee draw on in assessing the (incremental) impacts of the fifth carbon budget on competitiveness, the fiscal balance, fuel poverty and security of supply?*

ANSWER:

It needs to consider the medium- and long-term implications of significant global climate change and compare any short-term concern for fiscal balance, fuel poverty and security of supply against the systemic implications of such levels of climate change.

Question 14 *What new evidence exists on differences in circumstances between England, Wales, Scotland and Northern Ireland that should be reflected in the Committee's advice on the fifth carbon budget?*

ANSWER:

See response to Q15. The CCC needs to revisit the framing of its analysis – this would still be consistent with its remit under the 2008 Climate Change Act. It would also bring its analysis and advice in line with the UK Government's international commitments on climate change and equity.

Question 15 *Is there anything else not covered in your answers to previous questions that you would like to add?*

ANSWER:

The CCC's UK budgets do not reflect international commitments on 2°C and equity; evidenced by this questionnaires repeated reference to the 2050 target – a political expedient with only a tenuous link to UK commitments.

The CCC must be a candid and independent broker, translating global

commitments into domestic obligations/policy advice.

The CCC should have a coherent, transparent and sequential logic to their analyses; e.g.:

- Translate the language of UK leaders commitments on 2°C into probabilities (use the IPCC taxonomy of “likelihood” as a good start)
- Use the IPCC budgets for the different probabilities (the AR5 budgets are confusing to say the least; - but a clear set of budgets with accompanying and explicit assumptions, particularly on non-CO2 GHGs, is possible).
- Subtract the emissions since the 2011 start date assumed in most of the IPCC’s budgets (NB. 2011 to 2015 emissions are a little under 150GtCO₂)
- From the global budget, remove estimates for century-level emissions from cement production and deforestation (I estimate, respectively, ~100GtCO₂ and ~150GtCO₂). The wealthy nations have already deforested and already have highly developed (and cement rich) infrastructures and built environments. *Unlike energy, there are currently no, at scale, substitutes for cement; so cement (& process emissions) are a prerequisite of development and hence should be considered a global overhead.* The 100Gt figure assumes a rapid curtailment of deforestation, and 150Gt a significant uptake of CCS in cement production and some clinker substitution (see the technology uptake in the IEA’s cement road map 2009 and their 2014 ETP report).
- Revisit the CCC’s apportionment rule underpinning the 80% by 2050 target. This is not equitable. If every wealthy nation took this approach the remaining budget for poorer nations would be so small as to significantly curtail any near-term development.
- Recalculate the UK’s budget range in line with the UK making its *fair* contribution to maintaining the global temperature *below* a 2°C rise.
- This logical approach will dramatically reduce the UK’s budgets; even for CCC’s low probability of 2°C (i.e. ~63% chance of exceeding 2°C).

NB. Geoengineering/Negative emissions

The ubiquitous adoption of negative emission technologies to ‘increase’ the available budget is a systemic bias that pervades research on budgets and policy – including that by the CCC.

No more than ~10% of scenarios should rely on negative emissions.

