Building a zero-carbon economy – Call for Evidence

Background

On 15 October 2018 the governments of the UK, Scotland and Wales asked the Committee on Climate Change (CCC) to provide advice on the UK and Devolved Administrations' long-term targets for greenhouse gas emissions and the UK's transition to a net zero-carbon economy. Specifically: when the UK should reach net zero emissions of carbon dioxide and/or greenhouse gases as a contribution to global ambition under the Paris Agreement; if that target should be set now; the implications for emissions in 2050; how such reductions can be achieved; and the costs and benefits involved in comparison to existing targets.

The advice has been requested by the end of March 2019.

The UK's long-term emissions target is currently for at least an 80% reduction in greenhouse gas emissions from 1990 to 2050. It covers all sectors, including international aviation and shipping and is measured on a 'territorial' basis (i.e. based on emissions arising in the UK). On a comparable basis, emissions in 2017 were estimated to be 38% below 1990 levels.

The current target was set in 2008 based on advice from the Committee. That advice considered that to avoid the worst impacts of climate change, the central expectation of global temperature rise should be limited "to, or close to, 2°C", while the probability of crossing "the extreme danger threshold of 4°C" should be reduced to an extremely low level. That meant global emissions would roughly have to halve by 2050. The 2008 advice made the assumption that the UK should not plan to have a higher level of per capita emissions in 2050 than the global average.

The long-term target guides the setting of carbon budgets (sequential five-year caps on emissions that currently extend to 2032 and require a reduction in emissions of 57% from 1990 to 2030). Both the 2050 target and the carbon budgets guide the setting of policies to cut emissions across the economy (for example as set out most recently in the 2017 Clean Growth Strategy).

Any change to the long-term targets would therefore be expected to have significant implications, not just in the long-term but on current policies to drive the transition.

The CCC will advise based on a thorough consideration of the relevant evidence. We expect that to cover:

- The latest climate science, including as contained in the IPCC Special Report on 1.5°C.
- The terms of the Paris Agreement.
- Global pathways (including those reported by the IPCC) consistent with limiting global average temperature rise in line with the goals of the Paris Agreement.

- International circumstances, including existing plans and commitments to cut emissions in other countries, actions to deliver on those plans and opportunities for going further.
- An updated assessment of the current and potential options for deep emissions reductions in the UK and emissions removals from the atmosphere, including options for going beyond the current 80% target towards net zero.
- An appraisal of the costs, risks and opportunities from setting a tighter long-term target.
- The actions needed in the near term that would be consistent with achieving the long-term targets.

This Call for Evidence will contribute to that advice.

Responding to the Call for Evidence
We encourage responses that are brief and to the point (i.e. a maximum of 400 words per question, plus links to supporting evidence, answering only those questions where you have particular expertise), and may follow up for more detail where appropriate.

You do not need to answer all the questions, please answer only those questions where you have specific expertise and evidence to share. It would be useful if you could use the question and response form below and then e-mail your response to: communications@theccc.gsi.gov.uk using the subject line: 'Zero carbon economy – Call for evidence'. Alternatively, you can complete the question and answer form on the CCC website, available here.

If you would prefer to post your response, please send it to:

The Committee on Climate Change – Call for Evidence
7 Holbein Place
London
SW1W 8NR

The deadline for responses is 12 noon on Friday 7 December 2018.

Confidentiality and data protection
Responses will be published on our website after the response deadline, along with a list of names or organisations that responded to the Call for Evidence.

If you want information that you provide to be treated as confidential (and not automatically published) please say so clearly in writing when you send your response to the consultation. It would be helpful if you could explain to us why you regard the information you have provided as confidential. If we receive a request for disclosure of the information we will take full account of your explanation, but we cannot give an assurance that confidentiality can be maintained in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not, of itself, be regarded by us as a confidentiality request.

All information provided in response to this consultation, including personal information, may be subject to publication or disclosure in accordance with the access to information legislation (primarily the Freedom of Information Act 2000, the Data Protection Act 1998 and the Environmental Information Regulations 2004).

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.

Part 1: Climate Science

Question 1 (Climate Science): The IPCC's Fifth Assessment Report and the Special Report on 1.5°C will form an important part 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:

There are a number of additional aspects that the committee should consider.

Embedded within all of the scenarios utilised in the Special report on 1.5˚C there are varying levels of negative emissions. The physical ability to deliver large scale negative emissions has been questioned by many e.g. Anderson and Peters[1]. There are questions about the physical limits that land use imposes on potential negative emissions, and there are questions about the financial deliverability of them. How, for example, can we afford in the UK to pay people to work offshore sequestering CO_2 captured from bioenergy combustion?

As such, the CCC in its advice to government, should only aim to utilise the very smallest amounts of negative emissions as proposed by Geden et al.[2] to offset difficult to mitigate emissions. This would result in a pathway for the UK with a reduced reliance on negative emissions than implied by the scenarios in the 1.5˚C special report. This in turn implies a greater level of near term emission reduction to compensate for the non or minimal reliance on net negative emissions later this century.

Secondly, initial unpublished analysis of the carbon budgets produced in the Special report on 1.5˚C has highlighted some systemic biases, which need to be taken into consideration before any budgets are utilised in policy.

Firstly, there would appear to be no scenarios in the 1.5˚C databases which have no overshoot, some have very little overshoot, but no scenarios show a pathway which avoids 1.5˚C of warming. As a result, if we are to pursue "limiting warming to 1.5˚C" we will need to have a UK climate change policy which exceeds all the scenarios utilised in the 1.5˚C special report.

Secondly, there are two remaining carbon budgets described by the 1.5˚C special report, depending upon the measure of global temperature that is used. If global Surface Air Temperature (SAT) is utilised, then there is a remaining budget, for 66% probability, of 420 $GtCO_2$ remaining (albeit with associated uncertainties), however the remaining budget is larger if a Surface Air Temperature/Sea Surface Temperature combination is used, suggesting 570 $GTCO_2$ for 66% probability. Policy, however should utilise the lower carbon budget of 420 $GtCO_2$ for the following two reasons. Firstly, the larger SAT/SST budget is clearly an outlier and not representative of many 1.5˚C scenarios which have limited overshoot, as can be seen in figure below:

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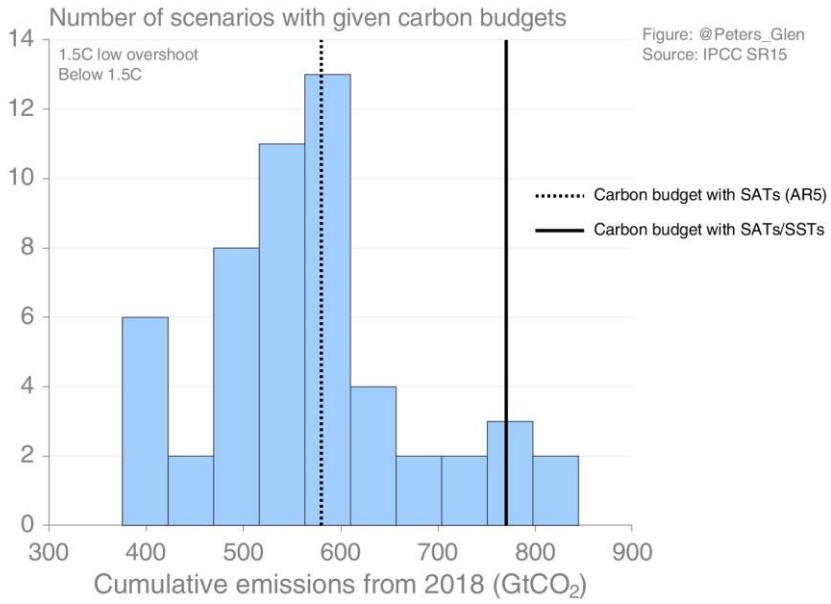

Whereas the smaller budget associated with SAT is much more representative of the scenarios which have a low overshoot of 1.5˚C.

Secondly, many of the impacts described in the 1.5˚C special report will be lower if the smaller carbon budget is utilised. Reducing the impacts of climate change has to be the main purpose of climate change policy, so policy should utilise the lower carbon budget implied by the utilisation of Surface Air Temperature.

In addition, the level of pre-existing warming utilised in the 1.5˚C carbon budgets does not take into consideration the most recent years of warming, this is to account "for additional uncertainty due to possible short-term natural variability". However, given that most temperature data sets are suggesting greater than 1˚C of warming, perhaps even 1.1˚C of SAT warming in 2018 and by the time any new policy is actually implemented we are likely to have even further warming. Then remaining carbon budgets need to be adjusted accordingly to have any relevance in meeting the target of limiting warming to 1.5˚C.

The 1.5˚C special report also utilised both FAIR and MAGICC models. These two models produced quite different temperature responses, largely due to variations in the values associated with the impact of aerosols on warming. There is some uncertainty as to which methodology is more accurate, and additional research needs to be carried out. However, in the meantime, policy should utilise the smaller carbon budgets implied by using MAGICC, in case the FAIR model proves to be inaccurate. If the FAIR methodology proves to be more accurate, then we may even end up with less warming and lower impacts as a result of the more cautious use of the MAGICC model. No bad thing.

It is also important to note that the 1.5˚C special report budgets are global and do not take into consideration richer (OECD) countries cutting their emissions faster than poorer non-OECD countries. CCC advice on carbon budgets should reflect this as described in later

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question answers in this consultation response.

[1] "The Trouble with Negative emissions"
http://science.sciencemag.org/content/354/6309/182

[2] "Targeting carbon dioxide removal in the European Union"
https://www.tandfonline.com/doi/full/10.1080/14693062.2018.1536600?scroll=top&needAccess=true

Question 2 (CO_2 and GHGs): Carbon dioxide and other greenhouse gas gases have different effects and lifetimes in the atmosphere, which may become more important as emissions approach net-zero. In setting a net-zero target, how should the different gases be treated?

ANSWER:

Part 2: International Action

Question 3 (Effort share): What evidence should be considered in assessing the UK's appropriate contribution to global temperature goals? Within this, how should this contribution reflect the UK's broader carbon footprint (i.e. 'consumption' emissions accounting, including emissions embodied in imports to the UK) alongside 'territorial' emissions arising in the UK?

ANSWER:

Evidence that should be considered in assessing the UK's appropriate contribution to global temperature goals can be found in:

"What if negative emission technologies fail at scale? Implications of the Paris Agreement for big emitting nations"
https://www.tandfonline.com/doi/full/10.1080/14693062.2017.1346498#aHR0cHM6Ly93d3cudGFuZGZvbmxpbmUuY29tL2RvaS9wZGYvMTAuMTA4MC8xNDY5MzA2Mi4yMDE3LjEzNDY0OTg/bmVlZEFjY2Vzcz10cnVlQEBAMA==

"Natural Gas and Climate Change"
https://www.research.manchester.ac.uk/portal/files/60994617/Natural_Gas_and_Climate_Change_Anderson_Broderick_FOR_DISTRIBUTION.pdf

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In essence though, non-OECD country's remaining carbon budgets should be considered first as per the Paris Climate Agreement. This should take the form of "an aggregate peak in non-OECD emissions occurring between 2022 and 2023, with 10% mitigation each year by 2045 and over 95% cut in emissions (c.f. 2015) by the early 2060s." The remaining carbon budget for the OECD countries including the UK should then be calculated, in my view by per capita.

UK carbon reduction targets must include all UK emissions: terrestrial, shipping, aviation and consumption in both the long term targets and interim targets. Absence of any of these sources of emission in the long term targets means that we are not taking full responsibility for our own lifestyles which is morally unjustifiable. Whereas absence of any of these sources of emission in interim targets (like aviation currently is) can result in policy decisions, which are often influenced by short term political agendas, being made which are compliant with the interim targets, but can compromise the long term carbon reduction or temperature targets defined by the Paris agreement.

The absence of shipping, aviation and consumption emissions from both intermediate and long term targets has already given rise to the false sense of progress in cutting carbon emissions. If for example terrestrial and consumption emissions are considered, then there has only been a 0.1% per annum reduction in CO_2 emissions in the UK since 1990 (Global Carbon Project Atlas 1990-2016). The absence of consumption, aviation and shipping emissions from current policies and reporting is misleading and is likely to have resulted in less progress in cutting the carbon emissions for which the UK is actually responsible.

As a result, the CCC should include the full emissions from terrestrial, consumption, aviation and shipping in its interim and long term targets and should also report on progress on all these emission sources

Question 4 (International collaboration): Beyond setting and meeting its own targets, how can the UK best support efforts to cut emissions elsewhere in the world through international collaboration (e.g. emissions trading schemes and other initiatives with partner countries, technology transfer, capacity building, climate finance)? What efforts are effective currently?

ANSWER:

Question 5 (Carbon credits): Is an effective global market in carbon credits likely to develop that can support action in developing countries? Subject to these developments, should credit purchase be required/expected/allowed in the UK's long-term targets?

ANSWER:

Part 3: Reducing emissions

Question 6 (Hard-to-reduce sectors): Previous CCC analysis has identified aviation, agriculture and industry as sectors where it will be particularly hard to reduce emissions to close to zero, potentially alongside some hard-to-treat buildings. Through both low-carbon technologies and behaviour change, how can emissions be reduced to close to zero in these sectors? What risks are there that broader technological developments or social trends act to increase emissions that are hard to eliminate?

ANSWER:

Aviation emissions can be reduced significantly through a behaviour management. Current self-regulated aviation emission reduction strategies are not commensurate with even a 2°C target[1,2] let alone a 1.5°C target, indicating significant further action is required. Emission reductions through technology advances or fuel replacement cannot be deployed quickly enough plus there are serious questions about the impact of using large quantities of biofuel for aviation would have on food production and ecosystems. The emissions from the aviation industry however can be reduced by demand management. Two opportunities for managing demand in the aviation industry are:

1. A personal carbon quota scheme[1]

2. An incremental Air Passenger Duty scheme, whereby the Air Passenger Duty paid by an individual for a flight increases with each flight taken by that individual within a particular year.

Both mechanisms can be administered by a credit card scheme, with the carbon quota or air passenger duty adjusted to manage demand to levels commensurate with pursuing a 1.5° C target achieved through mitigation. To be more palatable with the public, there would need to be a significant level of marketing and education as to why it is necessary to cut our emissions from aviation.

[1]Alice Bows-Larkin (2015) All adrift: aviation, shipping, and climate change policy, Climate Policy, 15:6, 681-702, DOI: 10.1080/14693062.2014.965125

https://www.tandfonline.com/doi/pdf/10.1080/14693062.2014.965125

[2] Larkin, A, Mander, S, Traut, M, Anderson, K & Wood, F 2016, Aviation and Climate Change–The Continuing Challenge. in Encyclopedia of Aerospace Engineering., Capitalism and Commerce in Imaginative Literature, Wiley-Blackwell. DOI: 10.1002/9780470686652.eae1031

https://onlinelibrary.wiley.com/doi/abs/10.1002/9780470686652.eae1031

Question 7 (Greenhouse gas removals): Not all sources of emissions can be reduced to zero. How far can greenhouse gas removal from the atmosphere, in the UK or internationally, be used to offset any remaining emissions, both prior to 2050 and beyond?

ANSWER:

Reliance upon carbon dioxide removal should be limited to offsetting hard to mitigate

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emission sources, as per by Geden et al.:

"Targeting carbon dioxide removal in the European Union"
https://www.tandfonline.com/doi/full/10.1080/14693062.2018.1536600?scroll=top&needAccess=true

Question 8 (Technology and Innovation): How will global deployment of low-carbon technologies drive innovation and cost reduction? Could a tighter long-term emissions target for the UK, supported by targeted innovation policies, drive significantly increased innovation in technologies to reduce or remove emissions?

ANSWER:

Question 9 (Behaviour change): How far can people's behaviours and decisions change over time in a way that will reduce emissions, within a supportive policy environment and sustained global effort to tackle climate change?

ANSWER:

The UK has not significantly tapped into this at all yet. There has been no large scale investment in promoting behaviour change. There should be a large scale government funded information campaign to promote behaviour changes. A large proportion of society are keen to help protect the environment and future generations. There should be a full scale multi-media approach, including, but not exclusive to TV, Radio, newspapers and social media. Behaviour change marketing should be framed as "positive steps" that people can take in order to increase uptake. In addition, there has been significant research on the psychological barriers to taking action on climate change. Any behaviour change strategies should tackle these barriers in order to be effective. They include the Consensus Gap (public understanding of 97%+ of scientists in agreement), spatial discounting (it will happen to others far away or far in the future), optimism about the impacts (climate change is not really too much of a problem or we can easily adapt), optimism about future solutions (someone, somewhere, or some technology in the future will fix climate change, so no need to act now), pessimism about self-efficacy (individual actions are so small, so why bother, it won't make a difference), token behaviour (I've changed my lightbulbs, or equivalent, so I don't think or realise it is necessary to do any more), social norming (nobody else is changing, so why should I bother). If a positive campaign is delivered which tackle all of these barriers, promoting people to take "positive steps" then significant and essential energy efficiency and mitigation can be achieved, along with greater levels of support for national policies being delivered by the government.

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ANSWER:

It is really important for the CCC to change the way it phrases solutions in relationship to targets as described by Geden in "Politically informed advice for Climate Action" (https://www.nature.com/articles/s41561-018-0143-3.epdf?shared_access_token=0ocueXo1vmdCayJnXa77sNRgN0jAjWel9jnR3ZoTv0NbJ1847fdHg9DhYd7orPmGTp8oyzIbMssS_cVxeR1X0Usnji-boAygjiRJo_c4UECgR48PsZ65QW3jXCppoKWf9Wk5bTDpRBDFYBFbOLB33mLM9sM3yGwP037a22pUI6I%3D) in order to help ensure the required changes are delivered by government policy.

As Geden states: "Researchers are not in a position to change core features of the policymaking process that limit the use of evidence, such as time constraints, path dependencies, limited capacity to digest new information, industries exerting their influence, and competing values. And scientific advisers will not be able to force policymakers to overcome inconsistency between talk, decisions and actions. But they can play their part in hedging inconsistency in climate policy. Consider the following thought experiment: assume that during the course of the IPCC Sixth Assessment Cycle, the research community adopts standards for assessing the achievability of climate stabilization targets more realistically, and, for instance, communicates its findings in a slightly different way. Instead of saying "yes, meeting the 1.5 °C target is still feasible, but only if A, B and C happens", the core message would be "no, meeting the 1.5 °C target is currently not plausible, unless governments implement A, B and C". The difference in wording is small, and scientifically, both versions are probably equally valid. But the climate policy perspective changes considerably. In the first case, policymakers can focus on the 'big prize', the cherished long-term target that is still in sight, and achievement of the target is already assumed. This is a common way of exploiting the future for today's political gains, because governments are quite lenient when it comes to delivering the appropriate action. In the second case, instead of handing over the 'big prize' to policymakers early on, climate researchers hold it back, but define clear requirements for bringing it again into play, based on the latest scientific findings. Such a communication would help to shift everybody's attention, from talk and decisions to actions, and from the far-away future to the next 5 to 10 years. Shifting the communication from a "yes, if… " to a "no, unless… " frame would prevent climate research and advice from resetting the clock time and again."

Another important aspect to delivering the required reductions in the UK is the inclusion of an intra-UK equity dimension. There is a strong relationship between income and levels of carbon emission clearly shown in Oxfam's Extreme Carbon Equality Report (https://d1tn3vj7xz9fdh.cloudfront.net/s3fs-public/file_attachments/mb-extreme-carbon-inequality-021215-en.pdf) :

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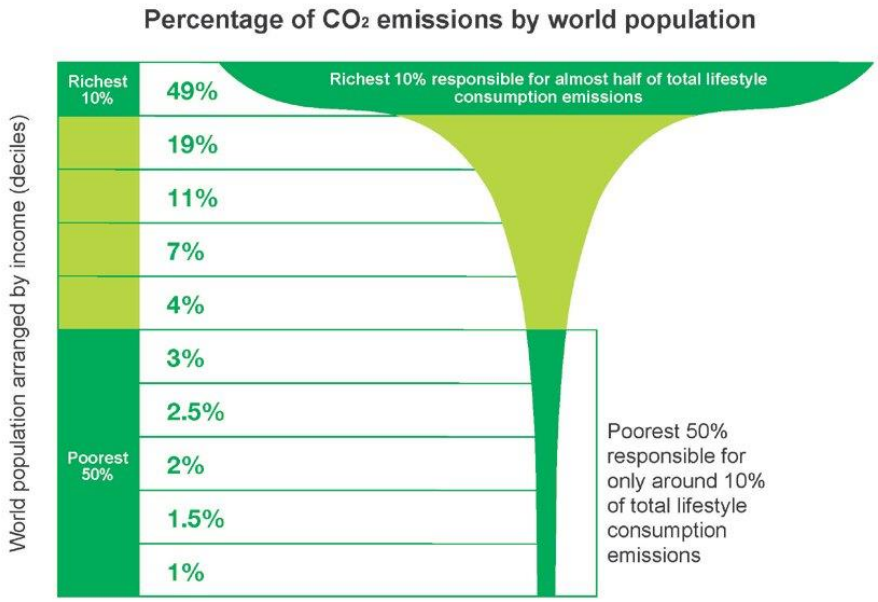

UK carbon reduction strategies should target the highest emitters first and allow for an increase in the emissions of the very poorest (people currently living in fuel poverty) in the short term. This could be easily implemented by introducing a carbon fee and dividend, thus carbon emissions are subject to a fee which rises year on year, in line with delivering the UK's fair share of 1.5˚C carbon budget, with the money raised being equally divided amongst the population. Thus the poorest and lowest emitters are protected from the price rises and the high emitters will increasingly be encouraged to reduce their emissions. To be effective the carbon fee should be applied to all terrestrial, consumption, aviation and shipping emission sources.

Part 4: Costs, risks and opportunities

Question 11 (Costs, risks and opportunities): How would the costs, risks and economic opportunities associated with cutting emissions change should tighter UK targets be set, especially where these are set at the limits of known technological achievability?

ANSWER:
There are only investments no costs.

Question 12 (Avoided climate costs): What evidence is there of differences in climate impacts in the UK from holding the increase in global average temperature to well below 2°C or to 1.5°C?

ANSWER:

Part 5: Devolved Administrations

Question 13 (Devolved Administrations): What differences in circumstances between England, Wales, Scotland and Northern Ireland should be reflected in the Committee's advice on long-term targets for the Devolved Administrations?

ANSWER:

The Scottish Government should utilise the following research by Kuriakose et al. to determine its climate change policies for delivering the Paris agreement:

"Quantifying the implications of the Paris Agreement: What role for Scotland?" https://www.research.manchester.ac.uk/portal/files/82366490/Quantifying_Scotland_s_Carbon_Budgets_for_Paris.pdf

If a 1.5˚C target is to be pursued, then even faster mitigation needs to be delivered.

Part 6: CCC Work Plan

Question 14 (Work plan): The areas of evidence the Committee intend to cover are included in the 'Background' section. Are there any other important aspects that should be covered in the Committee's work plan?

ANSWER: