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?

In addition to the IPCC 1.5SR, the other IPCC special reports on the oceans, cryosphere, and land are very relevant to impacts at 1.5C and above and negative emissions. Further, since the IPCC 1.5SR relies heavily on simple climate models it is vital that the committee takes into account the results from more complex GCM/ESMs taking part in the CMIP6 assessment. These are likely to lead to updates on the allowable carbon budget and impacts.

There are also specific items from the Met Office that should be considered including the outputs of the BEIS/Defra funded Met Office Hadley Centre Climate Programme and UKCP18. A reference list can be provided on request.

The committee should also look at the outputs from the recent NERC/BEIS programme on 1.5C, which further updates some of the relevant earth system science and carbon budgets, impacts and pathways.

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?

Whilst current literature indicates it is possible to compare different gases using single metrics we also recommend continued study using time-series, and consideration of how side-effects and co-benefits of the various gases can be taken into account. This is necessary when considering timing of action and costs. The latest Earth System Model results using UKESM1 should be considered. UKESM simulations are currently in progress and will be available during 2019.

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:

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:

Evidence base and awareness raising

- The UK has a well-founded international reputation for leadership on climate change, working at the forefront of international negotiations and agreements. This has been built on, and draws credibility and authority from, an underpinning base of UK global leadership in climate science.
- By working in partnership internationally (particularly with developing countries), new communities of climate scientists have been created around the world, helping raise awareness and understanding of the challenges faced in developing countries. Growing these communities increases our understanding of weather and climate, enabling new breakthroughs and new developments to better mitigate and adapt to climate change. This research also raises the awareness and understanding of decision-makers in the partner countries, empowering them to take action.

Focus countries

- Through programmes such as the Newton Fund supported Weather and Climate Science for Service Partnership (WCSSP) programme, the UK is working collaboratively with countries such as China and Brazil – both of which are major emerging economies with an important role to play in tackling global greenhouse gas emissions – to help develop the scientific evidence base needed to inform their climate mitigation and adaptation efforts.

Science for decision-making: mitigation and adaptation

- It is increasingly recognised as important to consider blended approaches to address climate change and not focus solely on mitigation or adaptation as stand-alone issues. For example work across Climate Science for Service Partnership (CSSP) Brazil (one of the projects in the WCSSP programme) aims to develop the scientific evidence base needed to inform climate mitigation and adaptation decisions. A key aspect of mitigation is to understand the role of natural and anthropogenic sources of greenhouse gases, and how mitigation and adaptation policies can impact these and global budgets. The collaborative research in CSSP Brazil aims to build shared capability to quantify carbon dioxide and methane – both greenhouse gases – sources in Brazil and relate these to land-management activities so that Brazilian decision makers can assess the likely impact of management policies, such as reducing deforestation or forest preservation, on their national greenhouse gas accounting

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:

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:

Emission pathways to 1.5C imply net zero emissions are required by the 2050s with negative emissions beyond. The required negation emissions are likely to be in the order of 12-15 $GtCO_2$ per year excluding any irreducible emissions that will be in addition. Enabling the substantial reduction in emissions prior to 2050 will likely require negative emissions deployment from the very near term ramping up to high levels by the 2060s. If decarbonisation rates are slow then either negative emissions will need to be deployed quicker or the total level of negative emissions will need to be higher.

Bio-Energy Carbon Capture and Storage (BECCS) is a plausible technology that could contribute towards this goal. BECCS involves the harvesting of carbon crops (annuals, forest management, and coppicing). However, there are significant risks associated with enhancing deforestation either directly or indirectly by increasing competition for land. Not only is land-use change a significant source of emissions but natural ecosystems are potentially large carbon sinks for the future. The additional emissions likely to occur from BECCS deployment can be minimised through intensification of production and conversion of already degraded pastureland combined with a co-policy of reduced pastoral production (reduced dairy and meat production).

Achieving negative emissions entirely through BECCS would likely require land conversion on a massive scale that is not unfeasible given current understanding but likely to be very challenging and have significant direct impacts associated with water resources, agriculture and biodiversity.

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:

Question 10 (Policy): Including the role for government policy, how can the required changes be delivered to meet a net-zero target (or tightened 2050 targets) in the UK?

ANSWER:

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:

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?

There is considerable evidence available from the EU Helix Programme (www.helixclimate.eu) and additional studies from the UK AVOID2 programme now appearing in the literature. Particular work to note includes:

Arnell et al. 2016 https://link.springer.com/article/10.1007/s10584-017-2115-9
Betts 2018 http://rsta.royalsocietypublishing.org/content/376/2119/20160452
Koutrolis et al (2018) https://www.mdpi.com/2073-4441/10/10/1331/htm
Alfieri et al (2018): https://www.mdpi.com/2225-1154/6/1/6/htm

These works cover multiple scales including global European and UK impacts consider changes in extremes, water resources and flooding. Moreover, they show a differentiation in impact between 1.5 and 2C albeit with substantial uncertainties.

Other results are available from the BEIS/Defra funded Met Office Hadley Centre Climate and further information from the Helix programme is available from the Project Director, Prof Richard Betts

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:

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: