

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:

As no doubt others have suggested (and I am certain that the CCC will be already well-aware), the recent RS/RAE report on Greenhouse Gas Removal is highly relevant to the 'pathways' issue:

<https://royalsociety.org/~media/policy/projects/greenhouse-gas-removal/royal-society-greenhouse-gas-removal-report-2018.pdf>

Also:

1) The recent US report on Negative Emission Technologies:

<https://www.nap.edu/catalog/25259/negative-emissions-technologies-and-reliable-sequestration-a-research-agenda>

2) The UNEP 'Emissions Gap' report:

<https://www.unenvironment.org/resources/emissions-gap-report-2018>.

3) And wider context provided by the Global Carbon Budget 2018, and associated publications:

<http://www.globalcarbonproject.org/carbonbudget/>

There are also, of course, very many other papers and reviews in the literature. A listing of those arising from the UK Greenhouse Gas Removal programme can be found at:

<https://www.ggrprogramme.org.uk/outputs-and-impact/>

Question 2 (CO₂ 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:

I do not have specific expertise in this topic area. However, it would seem necessary to consider GWPs for methane and other non-CO₂ GHGs for periods less than 100yr in the context of overshoot risks and 2050 targets. Even over 100yr timescales, it seems that the GWP for methane may have been underestimated by ~20%:

<http://adsabs.harvard.edu/abs/2017AGUFM.A51N..08H>

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:

If the UK is to show 'world leadership' in climate change policy (and to maintain international respect and credibility, in the context of climate justice), it would seem necessary for the UK contribution to mitigation to relate directly to its contribution to causing the problem. Hence based on:

1) Historical, cumulative emissions of CO₂, at least over the past century, since these continue to cause global warming (rather than proportion of current global emissions).

Refs below

2) Emissions associated with imported raw materials, manufactured goods and food products (since these emissions may not have occurred otherwise in originating countries). However, reciprocal arrangements ought also to apply – and would need to be internationally agreed and negotiated - with GHG emissions associated with equivalent UK exports being the responsibility of the country that is importing them. Thus 'trade balances' in CO₂e need to be determined.

Boden TA, Andres RJ, & Marland G (2017). Global, Regional, and National Fossil-Fuel CO₂ Emissions (1751-2014)(V. 2017). Carbon Dioxide Information Analysis Center (CDIAC), Oak Ridge National Laboratory (ORNL), Oak Ridge, TN

Peters, G.P., Andrew, R.M., Solomon, S. & Friedlingstein, P., (2015). Measuring a fair and ambitious climate agreement using cumulative emissions. *Environmental Research Letters*, 10(10), 105004.

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:

The 'easy' answer is to immediately end all UK support for fossil fuel use overseas, through UK Export Finance – estimated by NGOs to have cost ~£7 billion since 2000 (<https://unearthed.greenpeace.org/2017/04/19/uk-trade-billions-export-finance-fossil/>). It would presumably be relatively straightforward to directly switch such amounts into CCS, renewable energy development and energy storage.

On the basis that the UK makes the commitment to net zero by 2050 (or sooner), it should work directly with all other countries making similar commitments to accelerate the development of clean energy - and R&D on greenhouse gas removal.

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:

The likelihood of an effective global market in carbon credits is a political question rather than a scientific one. Nevertheless, it would seem highly desirable, with mutual benefits if well-structured, and the UK could increase effort in achieving that goal.

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:

Residual emissions do seem inevitable. Nevertheless, there are potential routes for substantive emission reductions in the identified sectors, and these should be fast-tracked:

Aviation: priority R&D for aviation biofuels, supplemented with solar energy and ultra light-weight batteries

Agriculture: priority for enhancing soil carbon (for approaches, see Rumpel et al: <https://www.nature.com/articles/d41586-018-07587-4>); also reducing methane by feed supplements to ruminants

Industry: Scalable CCS and CCUS

Buildings: CO₂-negative cement; greatly increased use of wood from sustainable sources.

With regard to risk of increasing emissions from such sources, the growth of aviation-based tourism is particularly problematic. A carefully-phased and internationally-agreed requirement for offsetting (by well-regulated carbon trading) would seem necessary to address this problem.

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:

The recent RS/RAE report on Greenhouse Gas Removal directly addresses this issue, through the development of a portfolio of approaches. See: <https://royalsociety.org/~media/policy/projects/greenhouse-gas-removal/royal-society-greenhouse-gas-removal-report-2018.pdf>. The report's conclusions and recommendations seem sound.

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:

Global deployment will drive cost reduction through economies of scale and improved efficiencies – whilst long-term emission reduction targets/policies by the UK and others would undoubtedly stimulate the required innovations. However, policy effort must be ambitious and sustained, not hesitant and half-hearted (as has seemed to be the case for UK emission reduction in the past decade).

There also needs to be direct financial (and/or regulatory) incentive for removal and storage – with the most straightforward being based on the polluter-pays principle. Thus, over a period of ~30 years there needs to be a phased requirement that industries/sectors emitting GHGs either decrease by ~3% (of original emissions) per year every year or offset by that amount – to achieve net zero by 2050. Offsetting could be ‘internal’ to that sector or by payment to others.

Note that current policies to achieve emission reduction by using UK-sourced natural gas (via fracking) would have been valid for a much longer transition pathway from fossil fuels to renewables; however, that approach is no longer compatible with the rapid rate of decarbonisation required under current conditions.

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:

Behavioural change can contribute to some degree, but there does need to be larger structural changes, supportive policies and financial incentives. Example: switching to low energy light bulbs, other efficiency measures or change of diet might reduce personal emissions by 10-20%, but those benefits are easily lost (e.g. if we all have 20% more electrical appliances over the next 10 years, or the national/global population increases by that amount). However, if all electricity has to be from renewable sources by, say, 2030, then much more substantive emission reduction is possible.

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:

Achieving net zero by 2050 will not be easy – but should now be considered as the minimum necessary, with the feasibility of more ambitious targets (e.g. net zero by 2045 or 2040) also investigated. The recent RS/RAE report on Greenhouse Gas Removal addresses the question of how that might be achieved in technological terms (link already given in responses to Q1 and Q7).

However, the constraints on successful delivery are likely to be as much political as

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problems as technological, relating to implementation timescales (being longer than the 5 year parliamentary cycle). It is therefore suggested that decisions on UK climate policy should become a cross-party responsibility, based on Select Committee recommendations and the advice of the Committee on Climate Change.

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:

Whilst costs and risks are, of course, important considerations, the emphasis needs to be on benefits and opportunities. The direct health benefits of cleaner air need to be quantified (in range of £billion?), also economic benefits of new technologies with export potential, and value of long-term avoidance/reduction of the cost of climate impacts and adaptation for high-emission scenarios. Expenditure on climatic security ought anyway to be considered equivalent to expenditure on military defence, that is regarded as a basic responsibility of government – without necessarily being subject to either short-term cost-benefit analyses or long-term discounting rates (of questionable validity when irreversible, global scale consequences, including biodiversity and cultural losses, are involved).

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:

Recent scenario-based climate projections at the national level by the Met Office (UKCP18; <https://www.metoffice.gov.uk/research/collaboration/ukcp>) provide the basic information to answer this question – in context of flood and drought severity, and rising sea level. Such analyses are useful to politicians (and wider public) in that they focus on more tangible national impacts, rather than climatic disasters in Africa, South East Asia or the Pacific.

However, climate impacts elsewhere in the world will increasingly affect the UK too, in terms of knock-on economic impacts, international investments, political instabilities, climate refugees, food security and sustainable development goals – as detailed in the IPCC Special Report on 1.5°C.. Caution is therefore needed in giving too much emphasis on UK-scale impacts; they are in addition to the impacts elsewhere, not an alternative perspective.

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:

I do not have relevant expertise to answer this question.

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:

The issues discussed in the Background seem comprehensive – and provide a challenging task for the Committee. Of particular importance would seem the need to identify “the actions needed in the near term that would be consistent with achieving the long-term targets”. The overall framing is also important: CO₂ and other GHGs need to be regarded as damaging pollutants, equivalent to plastic waste. The net-zero target is therefore the logical response: “stop polluting, as rapidly as possible”, on the basis that future clean-up will be necessary (GHG removal) for all future emissions.