Committee on Climate Change

Independent advice to government on building a low-carbon economy and preparing for climate change

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?

The committee should also consider:
-The Royal Society's report on Greenhouse gas removal (2018). ISBN: 978-1-78252-349-9 https://royalsociety.org/topics-policy/projects/greenhouse-gas-removal/
-The National Academy of Sciences, Engineering and Medicine's report Negative Emissions Technologies and Reliable Sequestration. A Research Agenda (2018). ISBN 978-0-309-48449-7

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?

Some negative emission technologies could be located to exploit the optimum natural and economic resources of a location. For instance, developing renewable energy systems to power direct air capture in places that otherwise have small electricity markets. These confluences of resources would become an asset that would require investment to develop. In these situations, it would be within the national interest to know where these opportunities are located, and the investment required to develop them.

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?

One policy approach for all industries is likely to be ineffective. What works for the cement and lime industry will be unlikely to work for the steel industry. Given that <5% of global cement and lime are exported, the costs of increased mitigation may be passed onto national markets. For steel, national initiatives in isolation may force the steel industry to relocate to areas with lower restrictions/values/costs on emissions.

In a world that ubiquitously penalises CO_2 emissions, a 'low-carbon' nation that has infrastructure for CCS, low carbon power, low carbon skills, a low carbon investment strategy, and incentivises greenhouse gas removal, may ultimately be viewed as a 'haven' for industry.

The UK should pursue an international approach for industries that involve transportable products (steel, aluminium), and a national approach for lower value materials (cement, lime, aggregates). Underpinning all of these is an investment in CCS infrastructure.

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?

In reference to Question 6. Steel, cement, lime, aluminium, and the combustion of coal or biomass produce alkaline materials (slag, kiln dust, red mud, ash) that may be able to remove carbon dioxide from the atmosphere (Renforth et al., 2011).

For instance, the UK produces around 8 million tonnes (Mt) of steel, towards a total demand of approximately 20 Mt (the balance made by imports). Approximately 2.5 Mt of a by-product called 'slag' is produced from this, which has the chemical potential to capture ~ 1.2 Mt of CO_2. If all UK steel demand was met through national production, the potential of CO_2 capture in slag increases to around 3 Mt.

The UK manufactures around 12 Mt of Portland cement (90% of the demand) every year. This represents a 'latent' CO_2 capture potential of 6 Mt that sits within buildings and passively (slowly) captures CO_2 during the life cycle (MPA 2015). The UK has about 655 Mt of cement sitting in buildings with a total/cumulative CO_2 capture potential or around 300 Mt. This potential could ultimately be realised during demolition (i.e. after 50 years of service-life). For instance, the UK produces around 80 Mt of demolition 'waste' that is almost completely recycled as secondary aggregate (with a CO_2 capture potential of around 6 Mt per year). Theoretically CO_2 sequestration could be engineered into the recycling process.

The UK produces around 40 Mt of aggregate from igneous rock (e.g. basalt, BGS 2015). Around >10% of material (~4 Mt/yr) too small to sell as aggregate and is stockpiled in quarries. This material has a CO_2 capture potential of ~1.5 Mt/yr. The annual CO_2 emissions from the quarrying sector is approximately 0.2 Mt.

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?

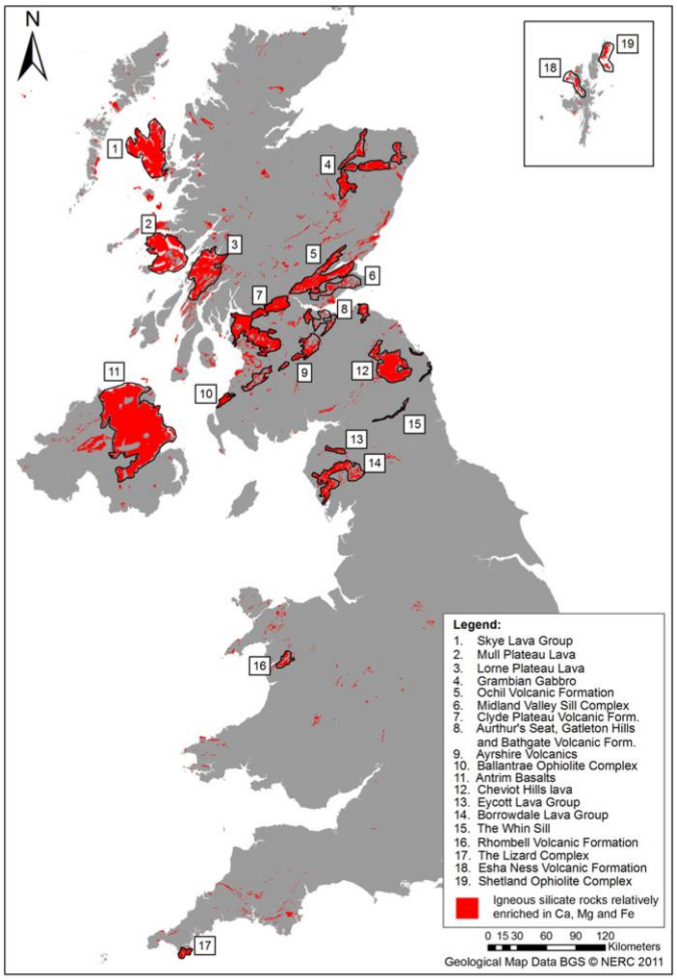
The UK's greenhouse gas removal potential in these materials could be 5 – 10 Mt per year (see Renforth 2012).

These industries are currently far from net negative CO_2. However, the potential for CO_2 removal in alkaline materials is not accounted for, and if it were combined with other methods of mitigation, may substantially reduce CO_2 emissions from industry. Stacked globally, these materials may be able to capture between 3 and 7 billion tonnes of CO_2 per year by 2100.

BGS (2015) Minerals Yearbook, British Geological Survey
MPA (2015). Sustainability. Mineral Products Association.
Renforth et al., (2011). Silicate production and availability for mineral carbonation. EST 45
Renforth (2012) The potential of enhanced weathering in the UK. IJGGC 10

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?



The UK contains over 500 km^3 of silicate rock within extractable distance from the surface. The total carbon capture potential of this material is 430 billion tonnes. The constraints of the resource mean that not all of this potential would be exploitable. However, it should be noted that most of this potential exists in Scotland and N. Ireland (see Figure left). Yet, >22 and >2 billion and tonnes of CO_2 capture potential are present in England and Wales respectively. (Renforth 2012)