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:
It is important that the Committee take into consideration the broader sustainability (beyond emissions) of the possible emission pathways available to the UK, and take care not to recommend/encourage emission pathways that could lead to severe damage to the UK's natural heritage, or global biodiversity. Impacts will depend on the scale and location of any project (or feedstock source), but below we offer some key high-level points regarding issues to be aware of. Further information about ecological constraints, and RSPB recommended upper limits for generation from major technology types, can be found in RSPB's 2050 Energy Vision summary and technical reports.

- **Hydroelectricity plants** – due to flooding of large areas of habitat, and dramatic downstream physical and hydrological process disruption, it is unlikely that there are any suitable UK sites remaining for the development of new large-scale hydropower reservoir schemes with low ecological risk.
- The ecological risks of **tidal lagoons** are potentially significant, although (depending on where they are located) they are not expected to be as great as shore-to-shore barrages. Cumulative impacts could be substantial if multiple lagoons are built, and better ecological research is required before this technology can be considered viable at scale.
- Risks to biodiversity from **onshore and offshore wind technologies** strongly depend on where turbines are sited. Negative impacts on birds and other wildlife including bats and cetaceans, can include disturbance and/or displacement, barrier effects, collision risk, and habitat loss or damage. Ecological headroom for the marine environment to withstand impacts is being rapidly used up by poorly located offshore windfarms. Early indications from new RSPB science suggest that collision mortality from already consented offshore windfarms over 25 years could result in serious declines in the UK populations of key species such as the kittiwake (~1/5th) and great black backed gull (~1/3rd). There is considerable potential for ecosystem wide disruption from offshore wind if deployed at scale and in damaging locations.
- **Bioenergy supplies must be sustainable** genuine emissions savings must be ensured, and the use of bioenergy should be prioritised in hard to decarbonise sectors i.e. transport and heat (not electricity generation). Genuine wastes and residues should be prioritised, in accordance with the waste hierarchy.

The Committee should also consider the latest science on the potential sequestration and multibenefits of **protecting and restoring ecosystems,** particularly as lower risk options than other greenhouse gas removal methods.

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?

We are not responding to this question.

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?

We are not responding to this question.

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?

We are not responding to this question.

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?

We are not responding to this question.

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?

Aviation

Aviation is indeed a hard to treat sector but the focus should be on capacity constraints, new technology and fleet efficiency. Extensive research has showed that it is hard to produce first generation biofuels without significant negative emissions (and biodiversity) impacts from direct and indirect land use change. Social trends towards greater desire to travel oversees for business and leisure reasons could directly challenge attempts to constrain capacity.

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Agriculture

Regulation plus incentives via ELMS will be necessary to drive behaviour and technology change:

- **A target for net zero farming** before 2050 in the Agriculture Bill will send a strong signal of the need to drive down emissions in the sector. Emissions accounting needs to be restructured to enable recognition of measures farmers take to reduce GHG on-farm e.g tree planting.
- **A nitrogen balance sheet** would help Government develop evidence-based policies and targets to improve the efficiency with which we use nitrogen and drive both behavioural and technology change
- **Investing in healthy soils and ecosystems**. Farmers need to be incentivised to restore carbon-rich habitats, regularly test soils, increase the area of land farmed organically, ensure crop rotations, incentivise leguminous cover crops to capture natural nitrogen and prevent erosion. There should also be mandatory soil organic matter monitoring in-line with Government commitments to 4per1000 initiative, with an objective to increase SOM by 20% in 20 years.
- **Promoting agroforestry and sustainable woodland creation** – incentivising planting the right trees in the right place sequesters carbon, protects soils, increases biodiversity, diversifies farm income and provides shelter for livestock.

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?

Although we almost certainly need to remove carbon dioxide from the atmosphere in order to reach the Paris Agreement goal, all of the main negative emission technologies for greenhouse gas removals have significant drawbacks and (perhaps except afforestation) have not been tested at the scale required. BECCS and afforestation use a lot of water and land – land that might otherwise be use for wildlife or agriculture. All except afforestation need a lot of money and direct air capture needs a huge amount, together with an enormous amount of energy.

It should also be stressed that the IPCC's scenarios which employ NETs are cost minimisation models and so they will tend to be deployed in countries where the cost are lowest (developing countries) but which are perhaps not best equipped to implement the technologies.

It therefore seems wise to exclude or at least minimise the use of NETs. Part of the solution is to reduce emissions sooner and more rapidly. It is notable that the models which employ greenhouse gas removals on the largest scale are those which assume that decarbonisation rates will be slow over the next few decades and that NETs will need to be introduced on a large scale later in order to compensate for overshooting the carbon budget. Early and rapid emission reductions coupled with the early introduction of GGR

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would considerably reduce the total amount of CDR required.

The RSPB supports greenhouse gas removals through conserving and enhancing natural sinks and reservoirs of greenhouse gases. Conserving and restoring natural habitats can significantly contribute to climate change mitigation, as well as benefiting biodiversity and ecosystem services. Key habitats need to be protected and restored, particularly peatlands and wetlands, semi-natural forests and woodlands and permanent grasslands. Sustainable land management practices, supported by public and private finance, can help to reduce emissions from the wider countryside.

When combined with rapid reductions in greenhouse gases in the near future, the conservation and enhancement of natural sinks and reservoirs can play a key role in reaching the 1.5°C Paris agreement goal. Whether the enhancement of natural sinks can entirely replace negative emission technologies is unclear but they could certainly minimise their use. In addition, conservation and enhancement has many co-benefits whereas negative emission technologies pose many problems.

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?

Due to the limited supply of shallow waters globally, governments and industry in South East Asia, America, and some European countries such as France and Norway are showing increasing interest in stimulating the commercialisation of floating offshore wind. Investment by these regions will speed up the previously anticipated rate of commercialisation of this technology. Whether the UK takes a lead in the development of this technology (as recommended by Crown Estate Scotland - http://www.crownestatescotland.com/media-and-notices/news-media-releases-opinion/study-reveals-long-term-uk-floating-wind-potential-17-000-jobs-and-ps33-6bn-by-2050), or not, global cost reductions will enable the UK to switch to this technology and move deployment away from highly ecological sensitive areas.

The global increasing market in electric vehicles will continue to drive, and speed up momentum on, flexibility and demand management innovation in the electricity network in order to maximise on balancing benefits with increasingly less predictable demand and supply.

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?

It is worth noting the unforeseen substantial increase in veganism, vegetarianism and flexitarianism that has taken place recently (over 20-fold increase in the number of people declaring themselves vegan over 12 years) as a result of increased awareness of the health and environmental impacts of meat consumption. Other social shifts include the plastic bag tax substantially reducing the use of single use plastic bags in just a year

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highlighting that society can shift in what it finds "acceptable" very rapidly given the right information and/or incentives and penalties.

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?

1. **Set a net-zero target:** The Government must send strong signals of direction of travel by committing to net zero by 2050, and supporting other efforts to do the same.
2. **Spatially plan for energy and nature together**: Suitable sites for renewable energy are a limited and valuable resource. UK governments (with other relevant bodies) should improve the ecological evidence base and facilitate/undertake strategic spatial planning, to inform roadmaps for decarbonisation and identify biodiversity enhancement opportunities. This spatial planning should consider the cumulative impacts of both generation and transmission infrastructure together, helping to maximise ecologically-sound resource use whilst aligning the UK's low carbon transition with other key policy aims including delivery of the Aichi Biodiversity Targets.
3. **Protect and enhance our carbon rich habitats and landscapes**:
    a. Peat: protect and restore all upland and lowland peatland habitats to favourable conservation status by 2030 and stop burning blanket bogs with immediate effect.
    b. Woodlands: conserve the few remaining areas of ancient and semi-natural woodland in the UK and create new woodlands for carbon sequestration, wildlife, flood alleviation and recreation in appropriate locations, at the right scale and supporting native species.
4. **Eliminate energy waste:** Reducing energy waste is critical to enable the UK to transition to 100% low carbon energy with lowest ecological risk. A Zero-Carbon Homes equivalent policy and strong investment in a nationwide retrofitting programme is needed.
5. **Establish a strong suite of policies to deliver a climate-neutral, environmentally resilient food and farming sector by 2050 at the latest**. This needs clear milestones including a robust 2030 target to reduce total net emissions from crops, soils and livestock by 25% and a clear plan to promote sustainable diets.
6. **Promote low carbon, low ecological impact innovation:** e.g. floating offshore wind to take advantage of deep water areas where wind speeds are more consistently high.
7. **Make economic incentives work for nature and the climate:** lowest impact technologies are encouraged to avoid a backlash and slowdown of the energy transition. The proposed Environmental Watchdog could play a key role here, by scrutinising the environmental impact of regulations and incentives.
8. **Ensure bioenergy supplies are sustainable** genuine emissions savings must be ensured, and the use of bioenergy should be prioritised in hard to decarbonise sectors i.e. transport and heat (not electricity generation). Genuine wastes and residues should be prioritised, in accordance with the waste hierarchy.

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?

On costs, we would expect tighter UK targets, introduced with policy certainty to lead to the same cost profiles as have been exhibited with existing renewable technologies.

At the nascent stage of their evolution in the UK renewable technologies needed government support and government facilitation, through targets, regulatory frameworks and direct subsidies, to develop within an energy market characterised by mature, centralised technologies. Renewable systems are different from those technologies. They are often decentralised, have high capital but minimal running costs and they generate differently. They need different connector and transmission infrastructure and generally have larger footprints (i.e. solar/wind farms). Government support was crucial to developing renewable sources of energy and bringing them to the stage where they can compete commercially with fossil fuel technologies.

This support created investor and private sector confidence and an increasingly commercially viable market is now emerging. For example, between 2015 and 2016 - the cost of onshore wind power fell from over $110 per megawatt hour (mWh) a year ago to $85 as they become more efficient and cheaper to build. Over the same period, coal-fired power stations have seen their costs rise from nearly $98 mWh to $115 and gas from $100 to $114, after the EU agreed new rules that will start to internalise their environmental costs by increasing the amount they must pay for their carbon emissions.

The same trend, of sharply declining generation prices is now observable with offshore wind. Competition, investment, innovation, and scale all contribute to the rapid cost declines that have been achieved throughout the industry's supply chain—from turbine manufacturing to installation to power transmission.

A second critical consideration is to appraise economic performance from the perspective of the whole UK society, not narrowly in the context of business performance. The essential metric of economics is wellbeing and many of the goods and services which influence wellbeing so not show up in existing market calculations. There is a wealth of new evidence to show the substantial benefits which accrue to UK society from interventions to restore biodiversity in terms of the array of services such restoration delivers. These benefits include health and wellbeing outcomes, water and air quality improvements and carbon sequestering potential. Restoring and improving the management of peatlands, forests, enclosed farmlands and coastal margins can yield substantial gains in terms of carbon balances. These land based opportunities are well established, do not rely on unproven technology and frequently offer some of the lowest opportunities for both mitigating and adapting to climate change.

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?

We are not aware of specific UK studies of the differences in impacts for 1.5 and 2 Celsius worlds. The studies summarising global level changes are a useful, representative guide towards the different level of impacts we may expect to see in the UK, where the average temperature rise already experienced is very slightly ahead of the global average. Globally, twice as many plant and vertebrate species, and three times as many insect species, are projected to lose more than 50% of their range at 2°C compared with 1.5°C average global temperature increase. (Warren UEA / WRI)

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?

Recent projections from the Met Office show that extremes of heat could be 2-5 times more common than currently in a 2°C warmer world. About half of this impact is avoided by limiting warming to 1.5°C.

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 different countries in the UK will have different opportunities and scope for improvement in different sectors, and also different impacts.

Ecological sensitivity of onshore wind increases the further north and west in the UK so the appropriateness of different energy mixes from the perspective of biodiversity impact will change in different parts of the UK

Energy efficiency needs to be particularly prioritised in Scotland as the colder climate means more energy is needed if the housing stock has low heat retention. Scotland also has a large proportion of the upland peat in the UK that needs protecting and restoring.

In Wales, the Welsh Governments Woodland Estate includes extensive areas of afforested peatlands and should be a priority for restoration and an exemplar of sustainable management of natural resources but at present the slow pace and lack of urgency in restoring afforested peatlands within the estate shows a lack of leadership and commitment to achieving carbon emissions reductions.

In Wales there is also huge opportunity for improvement of building stock to reduce emissions and also deliver significant economic benefit. The economic value of refurbishment is highlighted in the figures given in the recent Institute of Welsh Affairs Report, The Economic Impact of Energy Transition in Wales (2018) suggesting that by 2035 a £1.1bn investment in refurbishment generates 2,200 fte, significantly higher than other areas of investment.

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?

In the section on "appraisal of the costs, risks and opportunities from setting a tighter long-term target" we encourage the CCC to look at the risks to nature of the recommendations made both in relation to action and inaction.

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The biodiversity crisis can be exacerbated by inappropriate climate mitigation measures; equally there can be tremendous multi-benefits for nature for example from well-thought out and implemented habitat restoration measures. Multi-benefits for nature often have additional co-benefits e.g. flood protection and assisting with adaptation to a warmer climate through more resilient ecosystems.