

Building a zero-carbon economy – Call for Evidence

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](#).

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?

WWF UK commissioned Vivid Economics to provide a feasible pathway to achieve net-zero greenhouse gas emissions in the UK. The [Keeping it Cool Report](#) and the underlying analysis is our main response to this consultation. The report was reviewed by an external review panel that included six key stakeholders and academics from each sector.

In addition:

- The IPCC Special Report on Global Warming of 1.5°C and the underlying literature which was assessed.
- [The EU's 2050 strategy:](#)
- [Especially the in-depth analysis full of climate risk assessment and emissions pathways](#)
- Energy Transitions Commission sectoral work
- European Climate Foundation series of net zero report
- WWF (2018) [Living planet report 2018](#)
- WWF (2018) [Wildlife in a Warming World](#)
- Food Ethics Council (2018), [Snapshot: UK sustainable food system in the spotlight](#)
- [Royal society paper](#)
- The potential for implementation of Negative Emission Technologies in Scotland [Pete Smith](#)
- [Modelling the transition to a lower net emissions New Zealand](#)
- [Net-Zero CO₂-Emission Pathways for Sweden by Cost-Efficient Use of Forestry Residues](#)

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?

Include all gases - the net-zero GHG should use an exchange rate such as the GWP100 when balancing emissions from sources and removals from sinks.

For example more than 50% of the climate impact from air travel is the result of non CO₂ impacts. To ensure a credible net-zero target, we recommend the government convert different gases using the latest UNFCCC GWP.

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?

Low carbon development models will help to mitigate future damage from climate change, however there is also a risk that UK efforts to decarbonise cause leakages, as emissions are exported abroad, undermining these efforts and provided a false sense that the UK is doing its fair share. This risk is compounded by the highly interconnected and global value chains such as the agriculture and food sectors, as well as in the context of biomass production from BECCS.

A decarbonisation strategy must ensure that any domestic or international sources of biomass / BECCS are sustainable and low carbon. This broader carbon emission must be monitored by the UK Government alongside terrestrial emissions to they are sustainable and low carbon.

Sectors such as aviation and shipping, where the consumer, product and service in questions transcends national boundaries making carbon accounting challenging in a new way. In the case of the aviation sector, for example, emissions from international flights are not yet sufficiently addressed the Carbon Offsetting and Reduction Scheme for International Aviation does not yet provide a robust, enforceable international environmental framework to address aviation emissions. It is vital that the UK takes a lead in developing such frameworks and pushes for long term ambition.

Until such a time as these mechanisms are fully operational, the UK must consider actions to address international emissions as within the remit of the UK's decarbonisation strategy. In adopting such, this suggests the need to revise recent decisions in relevant sectors – specifically Heathrow expansion which it at odds with and efforts for UK decarbonisation (see WWF UK, [Grounded – ten reasons why international offsetting won't solve Heathrow's Climate Change Problem](#)).

[Keeping it Cool](#) considers both international and domestic emissions from aviation and shipping. While challenging, this was deemed necessary to create a credible pathway to UK decarbonisation – as outlined above. With this inclusion analysis indicates we can achieve net-zero by 2045 with the right package of investment in technology, behaviour change and international collaboration.

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?

Action to tackle climate change cannot be taken in isolation. In 2020 world leaders will meet to update the sustainable development goals, later on to review the Aichi targets to protect biodiversity and finally countries must submit their nationally determined contributions to the Paris Agreement in order to restrict warming to 1.5°C. Therefore, to protect people, wildlife and our planet we must work together to deliver a **global deal for nature** in 2020, building a world in which people and nature can thrive.

The global deal for nature and people will be an affirmation from world leaders that the destruction of nature is an urgent threat to humanity's future. This will form a global roadmap that addressed climate change, food production and biodiversity in a united way.

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?

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?

[Keeping it Cool](#) shows that near net zero emissions in hard to treat sectors is **feasibly by 2045**. Such a scenario would include:

- **Considering both international and national aviation emissions within the UK decarbonisation strategy and carbon budgets:** Net-zero in domestic aviation and shipping would be expensive and address only 3MtCO₂. International flights cause 95% of aviation emissions attributed to the UK and to achieve deep emissions reductions in aviation, ambitious international cooperation is required – including in accelerating technology and innovation. This includes taking the lead on a more robust, widely adopted and long-term carbon offsetting scheme (e.g. a stronger CORSIA) and more critical management of infrastructure development (such as Heathrow expansion) to ensure compatibility with UK climate policy. Net-zero could be achieved in both international aviation and shipping sectors though a combination of relatively established method such as sustainably sourced biofuels; and hydrogen, electrification and synthetic fuels if R&D is ramped up in the near term. This scenario

includes breaking the growth trend by curving aviation demand growth to ~15%.

- **Acknowledge trends and impact of behavioural change, along with supporting agricultural policy:** Without dietary change, **agriculture** will likely still produce a third (32 MtCO₂e) of total GHG emissions by 2050. At the moment, the UK ranks 16th out of 28 in Europe on food sustainability, but 26th when it comes to GHG emissions from agriculture (Food Ethics Council, 2018). Behaviour change in farmers may be challenging because they sometimes operate with limited spare capital, so changes can easily create financial risks. Therefore, behaviour change will require sophisticated policies including incentives, training, awareness programmes and robust enforcement where possible. Furthermore, UK's exit from the European Union provides an opportunity to embed climate incentives into agriculture policy and land management systems. Some mitigation measures include; measures to reduce emissions from enteric fermentation, reduce fertiliser use through crops and soil measures, waste and manure management, reduce emissions from fuel combustion and behavioural changes.
 - **Decisive commitment to decarbonise industry in specific high emitting sectors:** The modelling show a feasible reduction in annual emissions in industry to around 15MtCO₂ in 2050, achieved through efficiency, CCS rollout and use of hydrogen and electricity for heat pumps. An ambitious low carbon transition will provide competitive advantage to UK industry where supporting policies mitigate the risk of carbon leakage or loss of economic activity. This reduction can be achieved while maintaining productive capacity and through strategic investment – for example rebuilding of assets in industries such as steel. Residual emissions would comprise of emissions not captured by CCS, remaining emissions from oil and gas operations, chemical processes and off-road construction and waste. Please refer to the attached report for scenario options.

To ensure that hard to treat sectors are incentivised to produce rapid technology development and low carbon solutions, we strongly recommend the government considers a management mechanism on GHG reduction (GGR) methods with powers to monitor, permit and verify GGR development across all sectors.

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?

Refer to our Keeping it Cool report and the underlying evidence.

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?

Taking note of the progress for decarbonisation thus far - **we argue that a strong tighter long-term emissions target and, persistent and predictable government support will be necessary to overcome key challenges associated with GGR deployment and roll**

out.

This recognises challenges UK industry face in dramatically altering or reversing entrenched industry practices even where low carbon proven technologies are available – e.g. passenger vehicle electrification; and uncertainty with unproven low carbon technologies. UK industry will ultimately realise low carbon transformation; and decisive and ambitious long-term emissions targets would stimulate early change to the advantage of the UK economy. We refer to the development of offshore wind in the UK as an example where low carbon technologies realised innovation, cost reduction through ambitious roll out, with appropriate government support; and recommend similar decisive approaches to technology innovation throughout the decarbonisation strategy.

We recommend that the UK Government can benefit from taking the lead in building (and shaping) expertise, policy, and investment for a UK world leading industrial decarbonisation sector. This would include significant and urgent UK investment in technology, resources and demonstration of GGR technologies. These technologies are vital to supporting a decarbonisation strategy in line with the Paris Agreement but must become commercially operational – and accompanied by the appropriate infrastructure and regulatory framework as soon as possible.

[Keeping it Cool](#) illustrates the scale of decarbonisation feasible and necessary for the UK to deliver its fair share in ensuring warming is limited to 1.5 degrees. We recommend that investment scales up in the near term to ensure the UK captures economic and industrial advantages establishing a commercially viable model, and as a mean to ensure ambitious UK decarbonisation, as well as support international decarbonisation.

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?

Behaviour change at scale towards low carbon lifestyles is essential to the decarbonisation of the agriculture sector and will further accelerate and reduce costs of UK's transition to net zero emissions.

Reducing meat consumption by 50% by 2030 in the UK (Eating Better, 2018), would reduce UK agricultural emissions by approximately 10 MtCO₂, significantly reducing the implementation challenge for farmers. Furthermore, bringing meat consumption in line with the UK dietary guidelines (from an average of 108g per day to below 50g per day) would result in a 39% reduction in our carbon footprint (BDA, 2018).

Dietary shifts away from animal protein are already occurring in the UK, evidenced by the rise in flexitarianism (21% of UK population), vegetarianism (9.5%) and veganism (3%) - (Waitrose & Partners, 2018).

Public policy and clear, cohesive messaging is needed in order to ensure dietary shifts are long-lasting and sustainable. Successful policy should move beyond a focus on individual behaviour to change broader societal norms. Reducing demand for animal products could also significantly reduce mitigation costs in non-agricultural sectors by increasing their available carbon budget (Livewell for LIFE, 2013). Public acceptability can enable or inhibit the implementation of policies and measures, as well as climate adaptation (SMP D.5.4 IPCC, 2018). Although meat consumption contributes substantially to the UK's emissions, a systemic approach to food is required to reduce emissions across the supply-chain, which

is why WWF-UK advocates for a sustainable food system.

Clear and cohesive messaging targeted at different demographic groups is crucial to support and enable behaviour change towards low carbon and sustainable diets. Research has shown that messaging should be adapted to the interests and characteristics of particular demographic groups. For example, animal welfare and health can be a powerful driver for some audiences, the environment can be a driver for others. Overall, messaging should be positive, focusing on the benefits of shifting to plant protein consumption and the taste and convenience of plant-based foods, rather than consuming less meat, as dieting research shows that a perception of restriction impacts the longevity of the desired behaviour. Messaging should aim to address existing perceptions, such as that plant-based diets are more expensive, or that satiety can only be achieved through consuming a meal which contains meat.

Research by Chatham House (2015) has demonstrated that once citizens are made aware of the link between meat and climate change, they accept the need for government action, believing governments should lead efforts to address unsustainable consumption through fiscal measures (e.g. meat tax).

There are two main challenges that could hinder the reduction in GHG emissions of reduced meat consumption. Reduced consumption does not necessarily imply reduced UK production (/emissions), as British meat could be exported to other countries with growing demands for meat such as China and India. Although the environmental impact of the lowest-impact animal products typically exceed that of plant-based products (Poore & Nemecek, 2018), fruit and vegetable alternatives can be more resource intensive in terms of land use and water. This is why a sustainable food system is needed, in which the environmental impacts are considered based on product, production system and sourcing geography.

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?

A clear and decisive **commitment by the UK government to deliver net zero by 2045 at the latest**. This will entail a revision of policies to make sure they are in line with the net zero target.

Apart from policies we need **behaviour change**, especially in our diets. The food system as a whole is responsible for a third of global greenhouse gas emissions, with the livestock system being responsible for 15% of these. Dietary shift, including rebalance of protein consumption away from animal products, have the potential to contribute substantially to reducing emissions globally, and reducing pressure on land, seas, and water (and therefore biodiversity). We need to focus on consumption in order to reduce demand for high-impact product, starting to make the unviable for producers, suppliers and retailers along the supply chain.

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:

Climate change poses extreme and chronic risks to natural and financial systems globally and domestically. As a recent review for the [Scottish Government shows](#), climate action should not be understood as a simple cost-benefit analysis, but primarily in terms of risk management because of the inherent uncertainty of high impact events and tipping points. It is economically prudent to mitigate those risks as much as possible to protect the wellbeing of people. As [Lord Stern recently reflected](#), the economic case for action has strengthened “The conclusion of the Stern Review that the costs of inaction greatly exceed the costs of action has strengthened still further. We have learned: that health risks from air pollution from burning hydrocarbons are deeply worrying; that technology has changed remarkably...that political will has slowed or stalled in some places but become much stronger in others...I would now emphasise two perspectives on the economics of climate change still more strongly. First, we must see this as an issue of the management of immense risks so that narrow or marginal cost-benefit analysis has only a limited contribution in the analysis. Second, the low-carbon transition is an attractive, dynamic growth story and an attempt at maintaining a high-carbon path is deeply damaging and unsustainable.”

Previous analysis for [WWF by Cambridge Econometrics](#) showed that meeting the UK’s fifth carbon budget would have positive wider effects, leading to 190,000 net additional jobs, 1.1% growth in GDP and households on average £565 better off, as well as an £8.5bn fall in oil and gas imports, compared to a scenario where climate goals were missed.

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:

Please refer to WWF Scotland’s response.

The Well-being of Future Generations Act is a piece of legislation in Wales through which the decarbonisation agenda needs to be assessed. WWF Cymru in their submissions to the UK CCC call for evidence on Welsh Targets requested that Goal “responsible Wales is given serious consideration in UK CCC assessment. WWF Cymru and other stakeholders considered this to include their international obligations under Paris COP of contributing to 1.5 degrees plus ‘fair’ system of shared responsibility towards developing countries. The

CCC did not undertake this assessment or its recommendations for targets under Environment Act for Wales and hence WWF Cymru considers the assessment of the current WG targets by UK CCC adopted by Welsh Government to be either inline with Well-Being Future Generations Act or Environment Act requirements. This is a serious gap in the assessment for Wales decarbonisation pathway.

Welsh Government has requested that UK CCC consider Wales' emission in the current review but following a stakeholder session in Cardiff on 23rd November where WWF Cymru asked the level of detail of Wales' assessment, it was suggested that UK CCC would only be considering Wales' contribution to overall UK pathway with limited detail on Wales' pathway. Again WWF Cymru have concerns this will not be sufficient level of detail for Wales either on what is achievable for Wales overall 2050 target also how it can be achieved. WWF Cymru therefore call for UK CCC to provide details on the scope of their assessment for Wales and where further analysis is required both to meet Wales' own legal requirements but also advice on ambitious pathway options.

WWF Cymru remained concerned about Welsh Government's capability and capacity in decarbonisation. We are particularly concerned by the statement in Welsh Government's consultation on 'Low Carbon Pathway to 2020' page 11 of their recent that the **actions proposed have not been assessed** with regard to "*their possible economic cost, emission reduction potential or wider impacts...*". This document cannot therefore be considered as a pathway or plan for achieving any emission reduction target or carbon budget, and it is clear that there is much work yet to be done to develop a plan. Advice and evidence base from UK CCC is critical in supporting Welsh Government to develop.

In UK CCC's advice to Welsh Government on its targets it highlighted it is hard for Wales to reach 80% by 2050 than other UK nations. Special attention therefore needs to be given to these hard to treat sectors of industry and agriculture to see where further development can be made. For example behaviour change of diets in Welsh should be considered as an avenue to help Welsh emissions. Our recent WWF UK report on 2050 targets highlighted the steel sector innovations which would contribute to net zero 2045 target for UK. This should be considered by UK CCC for its impact on Wales' targets.

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?

As WWF-UK we would like to emphasise the importance of re-evaluating the short to medium term targets. We were pleased with Claire Perry's announcement that the 4th and 5th carbon budgets will be reopened, as this is essential to achieve net zero emissions by 2045.