Committee on Climate Change

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

The Sixth Carbon Budget and Welsh emissions targets – Call for Evidence

Background to the UK's sixth carbon budget

The UK Government and Parliament have adopted the Committee on Climate Change's (CCC) recommendation to target net-zero emissions of greenhouse gases (GHGs) in the UK by 2050 (i.e. at least a 100% reduction in emissions from 1990).

The Climate Change Act (2008, 'the Act') requires the Committee to provide advice to the Government about the appropriate level for each carbon budget (sequential five-year caps on GHGs) on the path to the long-term target. To date, in line with advice from the Committee, five carbon budgets have been legislated covering the period out to 2032.

The Committee must provide advice on the level of the sixth carbon budget (covering the period from 2033-37) before the end of 2020. The Committee intends to publish its advice early, in September 2020. This advice will set the path to net-zero GHG emissions for the UK, as the first time a carbon budget is set in law following that commitment.

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).

The Act also specifies other factors the Committee must consider in our advice on carbon budgets – the advice should be based on the path to the UK's long-term target objective, consistent with international commitments and take into account considerations such as social circumstances (including fuel poverty), competitiveness, energy security and the Government's fiscal position.

The CCC will advise based on these considerations and a thorough assessment of the relevant evidence. This Call for Evidence will contribute to that advice.

Background to the Welsh third carbon budget and interim targets

Under the Environment (Wales) Act 2016, there is a duty on Welsh Ministers to set a maximum total amount for net Welsh greenhouse gas emissions (Welsh carbon budgets). The first budgetary period is 2016-20, and the remaining budgetary periods are each succeeding period of five years, ending with 2046-50.

The Committee is due to provide advice to the Welsh Government on the level of the third Welsh carbon budget (covering 2026-30) in 2020, and to provide updated advice on the levels of the second carbon budget (2021-25) and the interim targets for 2030 and 2040. Section D of this Call for Evidence (covering questions on Scotland, Wales and Northern Ireland) includes a set of questions to inform the Committee's advice to the Welsh Government.

Question and answer 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 answers to <u>400 words</u> per question and provide supporting evidence (e.g. academic literature, market assessments, policy reports, etc.) along with your responses.

A. Climate science and international circumstances

Question 1: The climate science considered in the CCC's 2019 Net Zero report, based on the IPCC Special Report on Global Warming of 1.5°C, will form the basis of this advice. What additional evidence on climate science, aside from the most recent IPCC Special Reports on Land and the Oceans and Cryosphere, should the CCC consider in setting the level of the sixth carbon budget?

ANSWER: Given the scale of the climate crisis we are facing it is important the most recent and best scientific evidence is used.

Around 60% of the greenhouse gas emissions produced by agriculture are methane, primarily from the enteric fermentation processes of ruminant livestock and slurry and manure management. At current global meat consumption levels and within the limits of current technology, there are few options for farmers to reduce these emissions beyond productivity improvements. Therefore, any potential policy mechanisms to reduce methane emissions at a farm level could have a significant impact on farmers and landowners and food production generally.

This is particularly pertinent given the current IPCC-accepted metrics to account for methane under GWP100 do not accurately assess the actual warming potential of methane. While we understand that this is the internationally accepted metric, we would encourage the Committee on Climate Change and the UK government to take the actual warming potential of methane into account when assessing carbon budgets, using a more accurate metric like GWP*. To not do so could result in policy mechanisms that disproportionately impact farmers.

We were heartened to see the new metric taken into account in the recent CCC Land Use report, however we would disagree with the conclusion taken by the CCC to support the continued use of GWP100. We do not believe using the GWP* metric would provide a reason for the land use sector to take no action, on the contrary, it would demonstrate that the land use sector has more ability to make a positive contribution to net-zero. The metric shows how the land use sector can contribute to net-cooling, unlike any other sector, both by reducing livestock numbers by 10% and through tree planting.

When setting carbon budgets, the CLA would encourage the CCC to consider looking at methane the way New Zealand has in their net-zero by 2050 target, aiming to get to net-zero CO2 but treating biogenic methane differently, aiming to reduce methane emissions but not aiming for zero.

Question 2: How relevant are estimates of the remaining global cumulative CO_2 budgets (consistent with the Paris Agreement long-term temperature goal) for constraining UK cumulative emissions on the pathway to reaching net-zero GHGs by 2050?

ANSWER: no evidence available

Question 3: How should emerging updated international commitments to reduce emissions by 2030 impact on the level of the sixth carbon budget for the UK? Are there other actions the UK should be taking alongside setting the sixth carbon budget, and taking the actions necessary to meet it, to support the global effort to implement the Paris Agreement?

ANSWER: no evidence available

Question 4: What is the international signalling value of a revised and strengthened UK NDC (for the period around 2030) as part of a package of action which includes setting the level of the sixth carbon budget?

ANSWER: no evidence available

B. The path to the 2050 target

Question 5: How big a role can consumer, individual or household behaviour play in delivering emissions reductions? How can this be credibly assessed and incentivised?

ANSWER: Consumer, individual or household behaviour can make a big difference when it comes to emissions reductions, however this needs to be underpinned by the right Government policy.

Much of the recent debate on climate change and land use has centred around the emissions from ruminant livestock, and this is a good example of where policies would be better targeted at consumer and household diets rather than solely at the production end.

As outlined in the recent CCC Land Use report, UK-produced beef produces half as much CO2e per kg than the global average. Incentivising farmers to reduce livestock numbers while current global and domestic consumption levels of beef, lamb and dairy remain the same would lead to greater global emissions as the UK would have to rely on a greater level of imports of these foods that would likely be of a higher emissions intensity. For this reason, any policies to incentivise a reduction in livestock numbers would be more effective targeted at consumers to reduce market demand.

In terms of evidence, the impact of this would be relatively easily assessed through annual data from Defra showing meat and dairy consumption trends and comparing them to production trends.

Question 6: What are the most important uncertainties that policy needs to take into account in thinking about achieving Net Zero? How can government develop a strategy that helps to retain robustness to those uncertainties, for example low-regrets options and approaches that maintain optionality?

ANSWER:

Future agriculture policy

Farmers and landowners are in a significant period of uncertainty now that the UK has left the European Union and they will no longer be receiving subsidies through the Common Agricultural Policy, but this is also an opportunity to design climate change into future policies.

While we know that CAP will be replaced with an Environmental Land Management Scheme (ELMS) in England and the Sustainable Farming Programme in Wales where farmers and landowners are paid for the public goods they provide and sustainable farming, the details of this are yet to be decided. It is also likely that private sector markets for carbon will develop. There is a need to understand the operation of these markets and ensure that government and industry work together to ensure appropriate governance and pump priming where necessary.

It is essential that nature-based solutions such as forestry and woodland are at the core of this policy. There are many barriers to tree planting, not least the permanent nature of the land use change, and concerns about impacts on farming and food production. But it is also important to balance the policy priorities of nature, climate, food and energy.

These programmes need to be accompanied by information, guidance and advice to support maximum benefits from the changes and best value for money for the public and private sector.

Technology and innovation

There are significant uncertainties in low-emissions agriculture technology and innovations. For example, rumen inhibitors, vaccines and feed additives seem extremely promising in reducing methane emissions from livestock but the full animal and human health impacts of these measures have not yet been conclusively explored.

Tree health, pests and diseases

The CLA is fully supportive of the CCC's ambitious tree planting targets, however the nature of afforestation is that it locks landowners into a specific land use for an extended period of time. Trees are also extremely vulnerable to new pests and diseases that will likely be exacerbated in warming temperatures. Tree provenance and resilience must be carefully considered in any future policies to ensure landowners do not take agricultural land out of production, lose income, and then find the trees are wiped out by a pest or disease. The current ash dieback outbreak is a good example of how quickly a disease can spread and how devastating it can be for woodlands around the country.

Standardisation of carbon accounting methodology

There is deep mistrust and misinformation on carbon footprints and 'the right actions' due to differences in carbon accounting methodology, particularly in the food and farming sectors where measurement and boundaries can vary. Standardisation of carbon accounting methodology at a business level will help with engagement of the industry but also set the foundation for establishing working carbon markets. A good example is the Woodland Carbon Code. This needs to be extended beyond woodland into other farming activities.

Question 6: What are the most important uncertainties that policy needs to take into account in thinking about achieving Net Zero? How can government develop a strategy that helps to retain robustness to those uncertainties, for example low-regrets options and approaches that maintain optionality?

This would also provide improved information for consumers to help them make the right choices.

Integrated policy making

There is tension amongst policy makers and farming businesses due to the inevitable trade-offs for different policy priorities. There are some clear win-win, no regret options, but even those that might be considered clear in policy terms, such as more trees, can become more difficult at a practical level on farm with many considerations. There needs to be consideration of the balance between climate, nature and food – there are inevitably trade offs and these should be considered at the outset. For example, reducing grazing livestock could result in negative impacts on local habitats.

Question 7: The fourth and fifth carbon budgets (covering the periods of 2023-27 and 2028-32 respectively) have been set on the basis of the previous long-term target (at least 80% reduction in GHGs by 2050, relative to 1990 levels). Should the CCC revisit the level of these budgets in light of the net-zero target?

ANSWER: the CLA has no specific evidence available, however it would seem prudent to revisit these budgets to help the UK have the best chance possible of meeting the net-zero target.

Question 8: What evidence do you have of the co-benefits of acting on climate change compatible with achieving Net Zero by 2050? What do these co-benefits mean for which emissions abatement should be prioritised and why?

ANSWER:

Tree planting

There are a number of wider public benefits to planting trees beyond carbon sequestration and storage. These include flood alleviation, landscape value, public access, biodiversity, improving water quality, animal health and welfare (by providing shade) and soil health. For this reason, tree planting should be heavily incentivised and farmers and landowners should be compensated for *all* the public benefits trees provide.

As recognised previously by the CCC, these co-benefits are provided through both large- and small-scale tree planting.

Improving productivity

Productivity improvements are currently the most conclusive way of improving the GHG emissions intensity of agriculture. This has a number of co-benefits including improving the profitability of the agriculture sector.

Promoting the UK agriculture industry on the whole has a number of co-benefits and avoids exporting our emissions by relying further on imports.

C. Delivering carbon budgets

Question 9: Carbon targets are only credible if they are accompanied by policy action. We set out a range of delivery challenges/priorities for the 2050 net-zero target in our Net Zero advice. What else is important for the period out to 2030/2035?

ANSWER: The period up to 2030/2035 will see significant change for farmers and landowners with new land management policies in place. It will be important that any policies designed to achieve net-zero recognise the importance of food production and require action proportionate to the emissions of each sector. Reducing carbon dioxide emissions from all sectors to reach net-zero must remain the priority.

Question 10: How should the Committee take into account targets/ambitions of UK local areas, cities, etc. in its advice on the sixth carbon budget?

ANSWER: From a land use perspective, the targets and budgets of local areas are extremely important to take into account as those local areas will have a more detailed understanding of the landscape and mitigation potential.

For tree planting, for example, there will be areas that are suitable for widescale forestry planting, landscape planting, amenity planting, and other areas where there is limited capacity to plant trees.

Question 11: Can impacts on competitiveness, the fiscal balance, fuel poverty and security of supply be managed regardless of the level of a budget, depending on how policy is designed and funded? What are the critical elements of policy design (including funding and delivery) which can help to manage these impacts?

1. ANSWER: Comparatively, UK livestock production is more efficient than the global average, so if the UK reduces livestock numbers but domestic or global consumption of livestock products continues to increase, the net result for climate change will be a global increase in emissions if a less efficient country picks up that demand. This can be described as ‘off-shoring’ greenhouse gas emissions.

Question 12: How can a just transition to Net Zero be delivered that fairly shares the costs and benefits between different income groups, industries and parts of the UK, and protects vulnerable workers and consumers?

ANSWER: A just transition to net-zero must take into account the entirety of the rural sector. We need local economies that are sustainable in the long term, with the right housing and transport infrastructure, including affordable grid connection or upgrades for electric vehicles. The agriculture sector in particularly is in a state of vulnerability given the challenges to be faced over the following decade as we come out of the Common Agricultural Policy.

Question 12: How can a just transition to Net Zero be delivered that fairly shares the costs and benefits between different income groups, industries and parts of the UK, and protects vulnerable workers and consumers?

Creating sustainable rural economies will encourage the growth of the rural sector, alleviating pressure on cities.

D. Scotland, Wales and Northern Ireland

Question 13: What specific circumstances need to be considered when recommending an emissions pathway or emissions reduction targets for Scotland, Wales and/or Northern Ireland, and how could these be reflected in our advice on the UK-wide sixth carbon budget?

ANSWER: Evidence with respect to Wales contained in Q14.

Question 14: The Environment (Wales) Act 2016 includes a requirement that its targets and carbon budgets are set with regard to:

- The most recent report under section 8 on the State of Natural Resources in relation to Wales;
- The most recent Future Trends report under section 11 of the Well-Being of Future Generations (Wales) Act 2015;
- The most recent report (if any) under section 23 of that Act (Future Generations report).

a) What evidence should the Committee draw on in assessing impacts on sustainable management of natural resources, as assessed in the state of natural resources report?

b) What evidence do you have of the impact of acting on climate change on well-being? What are the opportunities to improve people's well-being, or potential risks, associated with activities to reduce emissions in Wales?

c) What evidence regarding future trends as identified and analysed in the future trends report should the Committee draw on in assessing the impacts of the targets?

d) Question 12 asks how a just transition to Net Zero can be achieved across the UK. Do you have any evidence on how delivery mechanisms to help meet the UK and Welsh targets may affect workers and consumers in Wales, and how to ensure the costs and benefits of this transition are fairly distributed?

ANSWER: The CLA does not have any new evidence in this respect, however it is important that the CCC continues to acknowledge that there are some regional and geographical differences between England and Wales that will possibly require regionally-specific policies and carbon budgets. There may be more capacity to plant trees in Wales, but equally agriculture makes up a greater proportion of the economy in comparison to England (and greater proportion of emissions). Livestock farming tends to dominate in Wales, and grazing livestock are helping keep carbon stored in soils.

Question 15: Do you have any further evidence on the appropriate level of Wales' third carbon budget (2026-30) and interim targets for 2030 and 2040, on the path to a reduction of at least 95% by 2050?

ANSWER: The CLA appreciates that the carbon budget for Wales has taken into regard the importance of the agriculture sector.

Question 16: Do you have any evidence on the appropriate level of Scotland's interim emissions reduction targets in 2030 and 2040?

ANSWER: The CLA covers England and Wales, so no evidence available for Scotland.

Question 17: In what particular respects do devolved and UK decision making need to be coordinated? How can devolved and UK decision making be coordinated effectively to achieve the best outcomes for the UK as a whole?

ANSWER: Devolved and UK decision making must be coordinated across the UK as whole when it comes to land use decision making, particularly as the different countries have different mitigation options available to them and different tree planting capabilities.

E. Sector-specific questions

Question 18 (Surface transport): As laid out in Chapter 5 of the Net Zero Technical Report (see page 149), the CCC's Further Ambition scenario for transport assumed 10% of car miles could be shifted to walking, cycling and public transport by 2050 (corresponding to over 30% of trips in total):

a) What percentage of trips nationwide could be avoided (e.g. through car sharing, working from home etc.) or shifted to walking, cycling (including e-bikes) and public transport by 2030/35 and by 2050? What proportion of total UK car mileage does this correspond to?

b) What policies, measures or investment could incentivise this transition?

ANSWER: no evidence available.

Question 19 (Surface transport): What could the potential impact of autonomous vehicles be on transport demand?

ANSWER: no evidence available.

Question 20 (Surface transport): The CCC recommended in our Net Zero advice that the phase out of conventional car sales should occur by 2035 at the latest. What are the barriers to phasing out sales of conventional vehicles by 2030? How could these be addressed? Are the supply chains well placed to scale up? What might be the adverse consequences of a phase-out of conventional vehicles by 2030 and how could these be mitigated?

ANSWER: The CLA would like to draw the CCC's attention to the data published in October last year: http://maps.dft.gov.uk/ev-charging-map/ demonstrating that availability of charging points in Wales are significantly lower than the rest of the UK.

Question 21 (Surface transport): In our Net Zero advice, the CCC identified three potential options to switch to zero emission HGVs – hydrogen, electrification with very fast chargers and electrification with overhead wires on motorways. What evidence and steps would be required to enable an operator to switch their fleets to one of these options? How could this transition be facilitated?

ANSWER: no evidence available.

Question 22 (Industry): What policy mechanisms should be implemented to support decarbonisation of the sectors below? Please provide evidence to support this over alternative mechanisms.

a) Manufacturing sectors at risk of carbon leakage
b) Manufacturing sectors not at risk of carbon leakage
c) Fossil fuel production sectors
d) Off-road mobile machinery

ANSWER: no evidence available.

Question 23 (Industry): What would you highlight as international examples of good policy/practice on decarbonisation of manufacturing and fossil fuel supply emissions? Is there evidence to suggest that these policies or practices created economic opportunities (e.g. increased market shares, job creation) for the manufacturing and fossil fuel supply sectors?

ANSWER: no evidence available.

Question 24 (Industry): How can the UK achieve a just transition in the fossil fuel supply sectors?

ANSWER: no evidence available.

Question 25 (Industry): In our Net Zero advice, the CCC identified a range of resource efficiency measures that can reduce emissions (see Chapter 4 of the Net Zero Technical Report, page 115), but found little evidence relating to the costs/savings of these measures. What evidence is there on the costs/savings of these and other resource efficiency measures (ideally on a £/tCO2e basis)?

ANSWER: no evidence available.

Question 26 (Buildings): For the majority of the housing stock in the CCC's Net Zero Further Ambition scenario, 2050 is assumed to be a realistic timeframe for full roll-out of energy efficiency and low-carbon heating.

a) What evidence can you point to about the potential for decarbonising heat in buildings more quickly?

b) What evidence do you have about the role behaviour change could play in driving forward more extensive decarbonisation of the building stock more quickly? What are the costs/levels of abatement that might be associated with a behaviour-led transition?

ANSWER: According to the English Housing Survey, 53.3% of homes in 'rural' areas have oil fired heating, 25.6% have gas fired heating, 13.6% have electrical heating and the 7.5% have solid fuel. Rural areas will therefore pose the greatest challenge to decarbonise, but also have the greatest potential to use renewable energy, such as air pumps but only with the correct government funding as the current barrier is high installation costs.

Question 27 (Buildings): Do we currently have the right skills in place to enable widespread retrofit and build of low-carbon buildings? If not, where are skills lacking and what are the gaps in the current training framework? To what extent are existing skill sets readily transferable to low-carbon skills requirements?

ANSWER: There is a skills gap in rural areas which is especially important given the high proportion of traditional properties which require additional knowledge to safely and effectively retro-fit.

According to the English Housing Survey, 20% of all households were built before 1919 of traditional construction with permeable solid walls, as opposed to cavity walls of modern construction. Solid walls absorb moisture and release it through evaporation, allowing the building to 'breathe' whereas modern construction forms a barrier that prevents moisture from entering.

Ventilation is key in traditional buildings to ensure enough air is drawn through for sufficient evaporation. Modernisation, including double glazing, capping off chimneys and damp proofing methods can restrict the building's ability to breathe, leading to damp, mould and poor air quality. The most harmful measure, which can cause significant damage to both the fabric of a traditional building and to human health, is wall insulation: the need for moisture to move both in and out of a solid wall makes this measure inappropriate and unsafe for traditional stock.

It is therefore vital for retro-fit measures to differentiate between different construction methods. Given the requirement for traditional buildings to breathe, a greater focus on heating type, such as renewables, should be given to traditional properties, particularly those in rural areas.

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To support appropriate retro-fit in traditional buildings, rural businesses need to be upskilled.

Question 28 (Buildings): How can local/regional and national decision making be coordinated effectively to achieve the best outcomes for the UK as a whole? Can you point to any case studies which illustrate successful local or regional governance models for decision making in heat decarbonisation?

ANSWER: no evidence available.

Question 29 (Power): Think of a possible future power system without Government backed Contracts-for-Difference. What business models and/or policy instruments could be used to continue to decarbonise UK power emissions to close to zero by 2050, whilst minimising costs?

ANSWER: no evidence available.

Question 30 (Power): In Chapter 2 of the Net Zero Technical Report we presented an illustrative power scenario for 2050 (see pages 40-41 in particular):

a) Which low-carbon technologies could play a greater/lesser role in the 2050 generation mix? What about in a generation mix in 2030/35?

b) Power from weather-dependent renewables is highly variable on both daily and seasonal scales. Modelling by Imperial College which informed the illustrative 2050 scenario suggested an important role for interconnection, battery storage and flexible demand in a future low-carbon power system:

   i. What other technologies could play a role here?

   ii. What evidence do you have for how much demand side flexibility might be realised?

ANSWER: no evidence available.

Question 31 (Hydrogen): The Committee has recommended the Government support the delivery of at least one large-scale low-carbon hydrogen production facility in the 2020s. Beyond this initial facility, what mechanisms can be used to efficiently incentivise the production and use of low-carbon hydrogen? What are the most likely early applications for hydrogen?

ANSWER: no evidence available.

Question 32 (Aviation and Shipping): In September 2019 the Committee published advice to Government on international aviation and shipping and Net Zero. The Committee recognises that the primary policy approach for reducing emissions in these sectors should be set at the international level (e.g. through the International Civil Aviation Organisation and International Maritime Organisation). However, there is still a role for supplementary domestic policies to complement the international approach, provided these do not lead to concerns about competitiveness or carbon leakage. What are the domestic measures the UK could take to reduce aviation and shipping emissions over the period to 2030/35 and longer-term to 2050, which would not create significant competitiveness or carbon leakage risks? How much could these reduce emissions?

ANSWER: no evidence available.

Question 33 (Agriculture and Land use): In Chapter 7 of the Net Zero Technical Report we presented our Further Ambition scenario for agriculture and land use (see page 199). The scenario requires measures to release land currently used for food production for other uses, whilst maintaining current per-capita food production. This is achieved through:

- A 20% reduction in consumption of red meat and dairy
- A 20% reduction in food waste by 2025
- Moving 10% of horticulture indoors
- An increase in agriculture productivity:
  - Crop yields rising from the current average of 8 tonnes/hectare for wheat (and equivalent rates for other crops) to 10 tonnes/hectare
  - Livestock stocking density increasing from just over 1 livestock unit (LU)/hectare to 1.5 LU/hectare

Can this increase in productivity be delivered in a sustainable manner?

Do you agree that these are the right measures and with the broad level of ambition indicated? Are there additional measures you would suggest?

ANSWER: The land use and agriculture sector can and must play its part in reaching the net-zero targets. However, the measures indicated above do not demonstrate the full capability of the agriculture and land use sector to reduce greenhouse gas emissions. From a productivity perspective, looking solely at crop yields and livestock stocking density is an extremely narrow scope and fails to take into account other farming production systems, many of which can have lower greenhouse gas emissions. These could include organic systems, regenerative agriculture or agro-ecological practices like min till or cover crops.

The measures listed above are not necessarily compatible with Q24's assertion that the CCC assumes "take-up of low-carbon farming practices for soils and livestock".

Livestock stocking density can have a positive or a negative impact on the carbon content of soils. As UK soils store 10 billion tonnes of carbon, this is an important part of the overall climate change picture. Increasing stocking density or encouraging intensive systems may reduce greenhouse gases per unit of product, but the impact on soil health must be taken into consideration.

The CLA would like to refer the Committee on Climate Change to the Food Climate Research Network report *Grazed and Confused* (2017) which demonstrates the various nuances of this issue.

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Can this increase in productivity be delivered in a sustainable manner?

Do you agree that these are the right measures and with the broad level of ambition indicated? Are there additional measures you would suggest?

Question 34 (Agriculture and Land use): Land spared through the measures set out in question 33 is used in our Further Ambition scenario for: afforestation (30,000 hectares/year), bioenergy crops (23,000 hectares/year), agro-forestry and hedgerows (~10% of agricultural land) and peatland restoration (50% of upland peat, 25% lowland peat). We also assume the take-up of low-carbon farming practices for soils and livestock. Do you agree that these are the key measures and with the broad level of ambition of each? Are there additional measures you would suggest?

ANSWER:

The CLA would agree these are the key measures required for land use to contribute to the net-zero targets, however current policies are not incentivising the scale of change necessary.

Afforestation, agro-forestry and hedgerow targets are not close to being met, with current planting levels around 9,000ha per year. Bioenergy planting is even lower.

We agree with the broad level of ambition of each, and appreciate that the CCC does not intend for these to be prescriptive ‘targets’, but that net-zero can be met through different pathways incorporating these measures. However, these measures require large scale land use change that will only be achievable with long-term support for land managers starting today.

Peatland restoration targets are less likely. Peatland is an extremely important habitat in the UK and stores a large amount of carbon, however it is currently a net-emitter due to the degradation of the soil and draining for agriculture. While restoring peatland would contribute to our net-zero tagets, it is important that the benefits and risks are properly weighed up. Peatland in many areas of the UK is highly productive agricultural land and so wide scale restoration will likely come at the expense of food production in these areas. In many instances there would not be similarly productive land available elsewhere to pick up that production. Management techniques, including ensuring peat soils are not left bare or seasonal raising of the water table can go a significant way to preventing further degradation of lowland peat.

Question 34 (Agriculture and Land use): Land spared through the measures set out in question 33 is used in our Further Ambition scenario for: afforestation (30,000 hectares/year), bioenergy crops (23,000 hectares/year), agro-forestry and hedgerows (~10% of agricultural land) and peatland restoration (50% of upland peat, 25% lowland peat). We also assume the take-up of low-carbon farming practices for soils and livestock. Do you agree that these are the key measures and with the broad level of ambition of each? Are there additional measures you would suggest?

The Fens in the East of England is an example of where peatland, agriculture and climate change intersect. The Fens account for nearly half of the most productive 'grade 1' agricultural land in England, with nearly 40% of England's vegetables grown there. The productiveness of the land is due in large part to the fertile peatland soils that have been drained for agriculture for hundreds of years. While restoration would help reach climate change targets, this would be at the expense of food production in an extremely profitable and valuable part of the country.

Question 35 (Greenhouse gas removals): What relevant evidence exists regarding constraints on the rate at which the deployment of engineered GHG removals in the UK (such as bioenergy with carbon capture and storage or direct air capture) could scale-up by 2035?

ANSWER: no evidence available.

Question 36 (Greenhouse gas removals): Is there evidence regarding near-term expected learning curves for the cost of engineered GHG removal through technologies such as bioenergy with carbon capture and storage or direct air capture of CO_2?

ANSWER: no evidence available.

Question 37 (Infrastructure): What will be the key factors that will determine whether decarbonisation of heat in a particular area will require investment in the electricity distribution network, the gas distribution network or a heat network?

ANSWER: no evidence available.

Question 38 (Infrastructure): What scale of carbon capture and storage development is needed and what does that mean for development of CO_2 transport and storage infrastructure over the period to 2030?

ANSWER: no evidence available.