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:

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:

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:

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:

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:
The role of consumer, individual and household behaviour is connected to lowering energy demand levels, and to reducing emissions from agriculture through diet change. Lower energy demand and diet change are essential contributors to the Net Zero emissions goals, limiting the

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?

remaining emissions to a minimum, and hence reducing reliance on negative emission technologies. Demand reductions, not just efficiency, are crucial here (Shove 2017).

The principal areas where demand reductions & shifts should play a major role are in:

- Mobility: major energy demand reductions through shifts to zero-carbon public transport and electric cycling, both in cities and rural areas. Facilitating low-cost local leisure and rail-based holidays throughout the UK & Europe, coupled with a frequent-flyer levy, should reduce demand for air travel significantly.
- Buildings: phased area-based roll-out of major retrofit can lead to significant lower energy demand.
- Diets: shift to healthy plant-based diets will reduce non-CO2 emissions to a minimum.

However, an "incentivising behaviour" framing results in outcomes which are: costly (per emissions reduction achieved); ineffective (in terms of potential realised) and unequal (in terms of social benefit). Instead, demand reductions should be achieved through large scale public engagement (including education and communication), democratic participation and public investment. The priority should be to protect the well-being of UK populations, especially the most vulnerable. Existing research programs which can support this effort include CREDS, CUSP, CAST and Living Well Within Limits centres/projects. The focus should be on well-being, and democratic engagement with communities that allows them to critically assess which elements of demand actually contribute to their well-being (Brand-Correa and Steinberger, 2017).

The types of ambitious demand-lowering measures that will achieve emissions reductions in line with the Paris agreement include:

- Car-free cities, with cycle-focused and highly reliable, interconnected zero-carbon public transit, moving away from private vehicles except in the cases of disability, age, family circumstances and private occupation. In rural areas, reliable interconnected public transit should be guaranteed.
- Area-based public investment in high standard housing retrofit (benefiting from economies of scale and large-scale engineering innovation through smart-meter real-time assessment).
- Shift to plant-based diets in all institutional settings (professional cafeterias, schools and hospital refectories, etc). Cooking program challenges and neighbourhood teaching of plant-based meal preparation.

Since these are not piecemeal voluntary measures, they can be rolled out at scale and hence assessed at scale.

REFERENCES:

Brand Correa & Steinberger
(2017) https://www.sciencedirect.com/science/article/pii/S0921800916308448
Shove (2017) https://doi.org/10.1080/09613218.2017.1361746

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:

The most important uncertainties are around the risks of unproven technologies for carbon dioxide removal, as well as performance management and technology deployment in hard-to-abate sectors. A policy strategy which focuses much more strongly on demand-side measures (going beyond behaviour incentives) has many advantages in robustness and maintaining progress.

For achieving the Net Zero targets, and, even more crucially, remaining within carbon budgets (Jackson 2019), policies focusing on demand reductions are beneficial in a three principal ways: (1) they reduce the level of low-carbon energy generation; (2) they reduce the scale of negative emissions technology deployment; (3) they are possible with currently available and proven technologies. Demand reductions thus have a triple benefit in terms of risk reduction and lower investment required. They should be understood as underpinning Net Zero sectoral transformations, rather than being marginal add-ons.

Low energy demand options lower the risk of a transition to zero-carbon, since they provide flexibility and resilience for the use of energy, averting grid and other infrastructure overload. The benefits of demonstrated energy demand reductions translate to investments in local expertise, resulting in UK-based innovation, resilience, and economic strength, thus replacing reliance on energy imports with reliance on local professional and industrial capacity. The area of demand reductions should form a core part of any low-carbon industrial strategy, especially in terms of regional investment in traditionally deprived areas outside London.

REFERENCES:

Jackson (2019) https://www.cusp.ac.uk/themes/aetw/zero-carbon-sooner/

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:

Yes, the budgets should be revisited in the light of the latest scientific evidence on the emissions reductions necessary for achieving the Paris agreement. This evidence demonstrates the importance of total carbon budgets (Jackson 2019), not just targets, as well as the benefit from rapid and radical near term emission reductions. The emphasis on large-scale rapid reductions from specific sectors, like surface transport, whose emissions have been rising rather than declining, thus requires urgent consideration.

REFERENCES:

Jackson (2019) https://www.cusp.ac.uk/themes/aetw/zero-carbon-sooner/

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:
The co-benefits of acting on climate change can be evidenced in multiple domains: these include (1) health, (2) nutrition, (3) biodiversity, (4) economic resilience, (5) well-being & (6) avoidance of impacts.

Health: one of the main co-benefits for the UK's achieving net-zero is in the abatement of deadly air pollution, especially from transport, which is linked to multiple health risks (respiratory, cardiovascular, etc) (ICCT, 2019). Another co-benefit of widespread housing retrofit would be the reduction in energy poverty, and associated excess deaths from cold and respiratory diseases linked to poor interior air quality (mold & damp) (E3G & NEA 2018).

Nutrition co-benefits from shifting to plant-based diets include multiple health benefits (Willett et al 2019), ranging from cardiovascular to diabetes to avoidance of weight gain.

Biodiversity co-benefits from action on climate change come from afforestation initiatives which preserve and recreate habitats, enabling rewilding of the UK's impoverished biodiversity. Land use removed from livestock raising and returned to forest also has important biodiversity benefits.

Economic resilience will be increased through rapid climate action, by moving the UK's productive capacity to low-carbon sectors (Busch et al 2019), and avoiding carbon bubble risky investments (Carney 2015).

Well-being in general can be preserved and enhanced through efforts to achieve energy sufficiency, or "decent living energy" according to Rao & Baer (2012), and reduce inequality, for all households (Wilkinson & Pickett, 2009).

Avoided impacts from climate change obviously depend on effective international, not just UK, action. However, it is also true that international action cannot be expected to happen without UK contribution. Avoided impacts from effective action on climate change include lower risk of deadly heat waves, reduced incidence of major storms, floods, droughts and fires, limiting sea level rise and biodiversity loss, as well as placing less strain on international trade and stability (IPCC, 2018).

REFERENCES:
E3G & NEA (2018) http://www.nea.org.uk/wp-content/uploads/2018/02/E3G-NEA-Cold-homes-and-excess-winter-deaths.pdf
Busch et al (2019) https://sri-briefing-notes.leeds.ac.uk/wp-content/uploads/sites/68/2019/10/SRI-Briefing-Note-23.pdf
Carney (2015) https://www.bis.org/review/r151009a.pdf
ICCT (2019) https://www.theicct.org/sites/default/files/publications/Global_health_impacts_transport_emissions_2010-2015_20190226.pdf
IPCC (2018) https://www.ipcc.ch/sr15/
Rao & Baer (2012) https://doi.org/10.3390/su4040656
Wilkinson & Pickett (2009) The Spirit Level: Why More Equal Societies Almost Always Do Better.
Willett et al (2019) https://doi.org/10.1016/S0140-6736(18)31788-4

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 Net Zero policy advice was very weak on demand reduction. More and more studies are coming out demonstrating the public cost and benefit of large-scale housing retrofit (Nieto 2019, Nieto 2020), as well as measures that reduce private vehicle-based transport. These policies will be crucial for achieving rapid and durable reductions in energy demand. Another demand area, the shift to plant-based diets, also requires policy action for large-scale diffusion, for instance mandating a "planetary health diet" for all institutional food suppliers (schools, hospitals, workplace refectories and catering).

Other policy areas which are not emphasized sufficiently in the CCC's Net Zero advice include disclosure and regulation of international and national finance to disincentivise all fossil fuel investments (not just coal), and eliminating, finally and fully, all UK government subsidies, domestic and foreign, for fossil fuel industries and infrastructures (Steinberger & Hofferberth 2019).

REFERENCES:
Nieto (2019) https://sri-working-papers.leeds.ac.uk/wp-content/uploads/sites/67/2019/12/SRIPs-120.pdf
Nieto (2020) https://sri-working-papers.leeds.ac.uk/wp-content/uploads/sites/67/2020/01/SRIPs-121a.pdf
Steinberger & Hofferberth (2019) https://sri-briefing-notes.leeds.ac.uk/wp-content/uploads/sites/68/2019/10/SRI-Briefing-Note-24.pdf

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:
Many cities are well ahead in planning and implementing a path towards Net Zero. E.g. Leeds City Council has committed to a 50% reduction in emissions by 2025 (https://news.leeds.gov.uk/council-approves-plan-to-more-than-halve-carbon-emissions-by-2025/). This process involved a big role played by the Leeds Climate Commission in providing science-based evidence to support decision-making in the city. But more importantly, the target and path to implementation were developed alongside Leeds citizens, through a diverse range of public engagement activities as well as a Citizens Assembly, which provide legitimacy and political acceptability.

In this sense, cities and regions are moving faster than the national parliament, and thus The CCC should take evidence of best practice at the city/region level in the construction of its scenarios. For instance, The CCC could scale up in its modelling exercises what's already been proposed or agreed in different cities and regions. See for example Leeds Climate Commission's roadmap to Net Zero reports (https://www.leedsclimate.org.uk/leeds-carbon-roadmap).

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?

ANSWER:
Yes, they can be managed, but they must take into account the following element:

The critical element of **policy design** is the decision-making criteria. If the criterion is exclusively cost-effectiveness, the impacts on other aspects beyond economic performance will not be correctly assessed (Mattioli et al., 2018).

The critical element of **policy funding** is that it must not be regressive, and ideally allocated through more direct and decentralised form of democracy and governance. Upcoming research from Owen, Barrett and Taylor shows how the current structures for funding a low-carbon energy transition are very regressive, and analyse two policy options (can provide the reference once published).

The critical element of **policy delivery** is that, when it comes to basic services, private provisioning is inefficient, costly and deeply inequitable. The UN's special rapporteur provides ample evidence of this (https://www.ohchr.org/Documents/Issues/Poverty/EOM_GB_16Nov2018.pdf), and Bayliss and Mattioli (2018) provide evidence specifically for the case of water, energy and local bus transport.

REFERENCES:
Bayliss, K., Mattioli, G. (2018): https://sri-working-papers.leeds.ac.uk/wp-content/uploads/sites/67/2019/05/SRIPs-116.pdf
Mattioli, G., Brand-Correa, L.I., Steinberger, J.K. 2018. "Living well within limits, a conceptual framework for socio-ecological justice". Paper presented at the Workshop on Socio-ecological justice, Erfurt, Germany, 21-22 September 2018 (available on request).

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:
Judgments on whether to adopt a certain policy path over another have been taken, in recent history, based on the balance of costs and benefits. By doing so we are necessarily taking a particular view on the "metric" and "distribution" of justice. Such view does not necessarily guarantee that cost and benefits are shared fairly, but merely that the benefits are higher than the costs (this is the justice metric), regardless of how the costs and benefits are distributed.

There are different approaches in the environmental and energy justice literature that offer different metrics and distributions of justice. Particularly widespread is the "triumvirate" approach, where emphasis is put on three elements to work towards more just outcomes of any particular process (in this case a transition to Net Zero): procedure, representation and distribution (Jenkins et al. 2016). There are other approaches to justice, which Sovacool & Dworkin (2015) have categorised as the most relevant for particular energy issues.

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?

The key message here is that, to move towards more just outcomes in a transition to Net Zero, we must move way from utilitarian conceptions of justice, and importantly stop relying exclusively on cost-benefit analyses as the bases for decisions.

REFERENCES:
Jenkins, K., Mccauley, D., Heffron, R., Stephan, H., & Rehner, R. (2016). Energy Research & Social Science Energy justice: A conceptual review. 11, 174–182. http://dx.doi.org/10.1016/j.erss.2015.10.004
Sovacool, B. K., & Dworkin, M. H. (2015). Energy justice: Conceptual insights and practical applications. Applied Energy, 142, 435–444. https://doi.org/10.1016/j.apenergy.2015.01.002

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:

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:

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:

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

ANSWER:

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:

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:

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

ANSWER:

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:

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:

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:

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:

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

ANSWER:

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:

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:

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:

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:

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:

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:

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:

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:

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:

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:

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:

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:

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:

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: