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: n/a

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: n/a

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: n/a

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: n/a

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:

Most measures taken in the UK to achieve the 38% cut in emissions to date have been "out of sight" to the consumer: eg 36% from cleaner electricity vs reduced electricity use by industrial &

residential (18%) and private transport (7%) (Carbon Brief). Even these reductions were driven by more efficient products (cars, lighting) rather than consumer behaviour change.

Attempts to mobilise behaviour change have been largely unsuccessful. Two areas of effort stand out: domestic energy efficiency, and transport behaviour change to public / active transport. The Green Deal failure demonstrates lack of interest in domestic retrofit even when finances are, theoretically, made acceptable. Meanwhile road mileage is still growing (TSGB01) despite many local schemes, and average vehicle CO2 increasing (TSGB 2019) as consumers buy more 4x4s, regardless of climate change coverage.

Any attempt to assess and mobilise consumer behaviour change must take this experience into account, and recognise that the prevailing messaging and culture in the economy is in the opposite direction: to fly more, buy big cars and eat burgers. It would be a dangerous error to place primary reliance on behaviour change in defiance of these factors, leaving us at risk of achieving only a fraction of the technical potential identified.

Net zero policy should therefore follow a precautionary approach by minimising reliance on behaviour change. The primary thrust of net zero policy should, wherever possible, be on **changing systems and editing choice to provide only well performing low/zero carbon options for the consumer** (supply side approach). This approach is already under way in electricity supply and vehicles and can be applied to heat too. It will not always be as economical as consumer behaviour change, but it has a greater likelihood of success. **Certainty is worth a premium.** Early action will also help clarify the costs of "out of sight" system change measures, guiding the value of economic incentives needed to drive consumer behaviour change.

Nevertheless consumer behaviour change is an essential part of net zero, both in reducing the costs of system change (domestic energy and surface transport) and addressing the areas where system change has less potential (flying, diet).

In assessing the potential, there is no alternative to pilot projects. In domestic heat, these are not about efficiency potential, but about how many householders in different stock and ownership categories can be persuaded to carry out levels of retrofit. Such pilot projects can also test different incentive structures. It is critical to target homeowners and private landlords (social housing is an easier prospect with an existing evidence base).

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 uncertainty we face is the readiness of consumers to undertake major behaviour changes and/or investments to deliver emissions reductions. The changes concerned are domestic energy retrofit, modal shift away from car, reduced flying and reduced meat eating. The uncertainty can be summed up as follows:

- **Domestic energy retrofit**: evidence is more negative than positive, with most commentators highlighting lack of interest by consumers even when finances are, theoretically, made acceptable, as with the Green Deal. IET highlights a "lack of user demand" and "retrofit… is not an attractive consumer proposition for owners or occupiers". In listing barriers in advance of the Green Deal, Buro Happold highlights "energy efficiency not viewed as a priority" and "lack of incentive for landlords". Green Alliance: "cost is not the sole, or even most important factor for people. Hassle and aesthetics are at least as important. The current policy approach does not take this into account". Without evidence to refute these views, it would be unwise to place more than the minimum reliance on this

approach in achieving net zero. (there are some grounds to be more optimistic in social housing).

- **Mode shift from car**: evidence is better, though needs improving – see section E18**.**
- **Reduced flying / meat eating:** clearly, we have not tried this before. However demand elasticity data is available that would provide a guide to any price based policy in these areas.

The focus here is on domestic energy retrofit. While significant technical potential has been established in existing CCC reports, there is a significant possibility that only a fraction of this potential might be achieved, as consumers are apathetic, or reject the aesthetic impact, disruption and investment required. Significant incentives (beyond energy cost saving alone) are likely to be required, and we need to establish how high these might need to be (the upper limit being the cost of supply-side measures).

Any shortfall in demand-side domestic carbon reduction will have to be made up in heating supply-side policy: electrification and/or gas grid decarbonisation. So far, the evidence is that supply side policy in electricity has been very successful, underlying our 38% cut in emissions and requiring no action by consumers. For this reason it is recommended that government strategy on decarbonising heat combines the **relative certainty of a supply-led approach with the greater economy of the demand-led approach**. While we do not yet know how much heat decarbonisation will be delivered by supply vs demand-side measures, we know both are required, so we should make a start on both to enable us to gain experience in cost and takeup. Reasons supporting this are:

- A demand-led approach alone has a significant chance of failure, and cannot achieve full decarbonisation even if success is high – so some level of supply-led action is also required. In particular, the substantial Victorian housing stock faces space constraints and aesthetic concerns which limit both internal and external wall insulation and heat pumps. This is not well reflected in the Element Energy report which lists only 3% as “heritage”. But 20% of housing is pre-1919[1] and will face major technical and consumer preference constraints, eg maintaining original features.

- Supply-led action is required to decarbonise industrial heat, so we know this technology is required at some scale. The sooner we can pilot what we know we need anyway, the sooner we will have improved information on the relevant costs and make a start on innovating to improve them (with export potential). It is a no-regrets option to have gas grid decarbonisation primed and ready to scale to meet energy efficiency shortfalls. This supports the existing CCC recommendation to deliver a large-scale low carbon hydrogen production facility in the 2020s.
- While the CCC hydrogen report raised the possibility of decommissioning some or all of the gas grid and relying on energy efficiency and electrification, this requires heroic levels of energy efficiency retrofit and/or electricity generation. In particular, heat pumps remain challenging for lower efficiency housing and any reported instances of cold houses or poor SPF, even if a low proportion, will badly set back support for net zero policy. With hard-to—decarbonise homes (especially Victorian) spread across the country, it is hard to see us managing without a decarbonised gas grid, even if its capacity is reduced as much as possible from current levels by efficiency and electrification.
- New gas boilers should be required to be hydrogen ready to maintain this option[2]. Oil as well as other fossil fuels should be banned for central heating in new housing in the Future Homes standard (or sooner) – the consultation appears to leave this open.

[1] Data for England
[2] Worcester Bosch claims the cost of grid decarbonisation is one third that of electrification. This claim should be examined.

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: n/a

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: n/a

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: n/a

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: n/a

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: n/a

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: n/a

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: n/a

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: n/a

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: n/a

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

ANSWER: n/a

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: n/a

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:

a) The Sustainable Travel Towns project 2004-9 (STT) is credited with a 10-12% reduction in car trips, driven by an active but low tech travel information / planning campaign reaching 22-45% of the population. These gains are not thought to have decayed rapidly. The London Congestion Charge achieved a 15% traffic reduction following implementation. Against this background, 10% mode shift to public/active transport in urban areas appears realistic, but only with significant and ongoing local action to initiate and maintain behaviour change including information, traffic/parking management, and well functioning, affordable active/public transport systems. The advent of smart travel technologies should enhance the potential.

However, the sustainable mode options are generally only available in urban areas. Around 65% of car miles are in urban areas >25,000 population[3], so the 10% shift would be 6.5% of total car miles. The STT study shows the potential, but pre-dates the arrival of smart travel apps and new business models. There is a case for a further study to assess the potential of mobile technology and shared modes to deliver an enhanced STT.

b) While vehicle usage patterns are generally quite stable, there have been some major changes in transport in recent years which are not yet well understood, studied or optimised. These include smart travel apps, car clubs/sharing, bike sharing, and ride sourcing/Transport Network Companies (TNCs, eg Uber). There is an urgent need to ensure that we are gathering enough data on shared modes and understanding their current and potential impact (see Future of Mobility Review).
The STT study and other work suggests that we do not yet make best use of the currently available alternatives to traditional car use. We should maximise our understanding and exploitation of these alternatives before making major new investment in them. Particular recommendations are[4]:

- Update Smarter Choices understanding to reflect use of smart mobile apps and new shared modes such as car sharing and TNCs. This may require a new STT type study.
- Shared transport and Mobility as a Service (MaaS) offers a potential opportunity to transform transport approaches nationwide. Evidence from car club reporting shows that users require 80% fewer vehicles, drive fewer miles, the vehicles are >40% more efficient,

[3] Analysis of Travel in Urban & Rural Areas factsheet, DfT 2010.
[4] These recommendations reflect our experience in the development of a MaaS app "Smarter Travel Solution", funded by Innovate UK.

and members shift to active and public transport. Given the embedded carbon in vehicles, including EVs, we need to reduce overall car numbers.

- However, car club membership and MaaS face challenges in dealing with varied, often lacklustre Local Authority and public transport operator approaches. A new national policy framework for shared transport should be developed and piloted to: ○ Put a uniform national framework in place for car/bike sharing, with one point of contact, common requirements for sharing companies, and allow competing operators in Local Authority areas. This would simplify arrangements for both operators and Local Authorities.
    - Define a minimum level of parking space to be made available to car clubs: not just as the vehicle base, but also preferential city parking to encourage sharing. EV charging should also be incorporated.
    - Put in place low carbon requirements for shared vehicles
    - Provide incentives for shared vehicles, operators and members.
    - Collect data and develop targets for car/bike sharing and its co-benefits.
    - Support MaaS: there is a need to make access to public transport ticketing easier for MaaS aggregators. Barriers include a high cost of entry to the rail market, mobile transaction costs for low value bus tickets, and variable approaches to e-ticketing and smart cards.

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

ANSWER:

It is important to distinguish between the different levels of vehicle automation. Levels 1-3 are unlikely to have significant impact on transport demand compared to Level 0, as an attentive driver is still required. Level 1-2 may deliver smoother driving and reduced fuel use, as may any level which could enable platooning.

At Level 4 the driver is able to disengage (if legal) and undertake another task, just as they might if travelling by train. This would increase the attractiveness of car travel vs public transport and may increase road transport demand, especially for business travel.

At Level 5 there would be a fundamental impact if vehicles were able to travel some distance, or entire journeys, without a driver. There would then be an additional transport “demand” from empty vehicles which still use fuel and road space. Scenarios include:

- Autonomous driverless taxis are cheaper, increasing demand.
- Car sharing would be enhanced by the option to summon a vehicle automatically, or for a fully autonomous vehicle to act as a shared taxi.
- The option to abandon a car right at a destination and leave it to park itself would make car travel more attractive.
- A driverless car might be left circulating in traffic if no parking is available, adding to congestion (an OEM presentation has suggested this).
- Similarly, a car might be “sent home” rather than parked, and then summoned later, increasing demand.

Overall, only a driverless car scenario (L5) is likely to have a major demand impact. This would mostly increase demand by making car travel more attractive and adding empty cars to traffic. But it would also make car sharing more attractive and practical, assisting in a change to the car

ownership model. The different cost structure of car sharing might make for reduced car ownership and more efficient use of vehicles, including more public transport use, as found by current car sharing analysis (see Como reporting). Driverless vehicles are a possibility within the 6CB timescale, but will require legislation. This means government may be able to (and should) restrict those features/uses of autonomous driving which might deliver a reduction in transport sustainability.

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: n/a

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: n/a

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: n/a

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: n/a

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

ANSWER: n/a

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: n/a

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: n/a

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: n/a

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: n/a

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: n/a

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: n/a

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:

As set out in section B5 a large scale hydrogen production facility is essential both to deliver industrial heat, and maintain the option of grid decarbonisation and deal with shortfalls in domestic energy efficiency improvements. In addition to this, we need to look in more depth at hydrogen production from electrolysis. While electrolysis has so far been considered more expensive than reformation with CCS and was not favoured in the CCC Hydrogen report, there is the possibility of innovation leading to major improvements in electrolysis efficiency, as identified by BNEF, which forecasts a cut of 50% or more in the cost of renewable hydrogen by 2030. There are also the following advantages:

- Electrolysis is amenable to modular installation. This means it can benefit from economies of scale, eg with mass produced container units, and can be tested and scaled in small increments.
- Much of the electrolysis cost is electricity. However, in a grid with high renewables penetration there will frequently be excess capacity which will reduce electricity cost.
- Modular electrolysers can be installed locally to demand, reducing gas grid needs. This distributed approach allows it to blend H2 with methane in the short term.
- Hydrogen electrolysis from renewables is genuinely zero carbon, unlike gas reformation, and does not have carbon storage challenges, or the technical risks associated with unproven CCS. It may therefore offer a certainty premium.
- The cost difference as currently estimated is not that high: £73 vs £45/MWh (CCC Hydrogen report). Pilot projects (which need not be large) should be carried out to assess the potential for cost reductions. In the short term a RHI hydrogen tariff should be studied.

The CCC Hydrogen report included only brief consideration of the H21 project. This project has now been developed further and should be considered in detail by CCC, as a project commensurate with the scale of change needed for net zero. The costs quoted should be factored into updated CCC estimates for gas grid decarbonisation.

Early applications: as stated elsewhere hydrogen is needed for industrial heat, so the first large scale facility should be located with an industrial cluster. For electrolysis, improved understanding of costs and innovation potential is the goal, pilot projects should inject to the gas grid, or linked to testing of hydrogen vehicles.

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: n/a

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: n/a

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: n/a

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: n/a

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: n/a

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: n/a

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: n/a