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

The below submission has been written by CPRE, the countryside charity. We have not answered every question posed in the call for evidence, but rather focused on those that are within the remit of our work and where we have expertise.

Thank you.

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 400 words 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:

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:

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:

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:

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:

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: 65% of local authorities have declared a climate emergency, as have a number of strategic and neighbourhood authorities. Many councils are looking towards their own operations

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?

and buildings to help address the climate emergency. A survey, by ECA, found 78% of councils are planning towards net-zero operations by 2050 and 23%/49 councils have a target to be carbon neutral by 2030. At the same time, many of these councils do not know their current carbon footprint (11 of the 49 aiming for 2030), monitor their energy (43%) or have an action plan to meet net zero (47%).

The carbon budget should support, not stifle ambition. At the same time, it is imperative that clear guidance and national standards enable local authorities to meet their ambitions.

At the same time, local authorities should also be empowered to enforce high quality design of new developments. A recent report, commissioned by CPRE, audited 142 developments in England. It found that three quarters of development should not have been granted planning permission due to poor design. Within this, while 73% of development was considered to be 'good' or 'very good' with an Energy Performance Certificate (EPC) rating of grade A and B, 17% failed to reach grade C the national minimum standard.

For example, the future homes standard, currently under consultation, includes a question on whether to restrict local planning authorities from setting higher energy efficiency standards for dwellings. It is important that this flexibility remains to enable LPAs, where it is appropriate to do so, to transition more quickly than national standards. The advice should seek to recommend this course of action.

It is worth noting that planning policies and standards currently in place, and under consideration in the system, will potentially govern the construction of buildings and infrastructure over the period up to 2030 and beyond, putting even more pressure on the retrofitting not only of existing buildings (which will comprise 80% of all buildings in 2050), but also those constructed between now and then, but which still won't be built to standards and in forms (including location and density) that recognise and respond to the climate emergency. As such it is essential that local areas, cities, etc. are actively encouraged to set more ambitious local standards and rapidly update their planning policies as soon as possible.

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:

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:

Where possible, new low carbon employment opportunities should be targeted at areas that are disproportionately impacted by the loss of fossil fuel based jobs. New jobs should be spread across towns and villages so that rural communities benefit as well as their urban counterparts. Local communities must be able to control their own future. No area should be made to bear a disproportionate volume of new infrastructure to meet the demands of other regions. Cities like London must play the maximum possible role meet their own energy demands, while rural communities must be able to shape their own energy landscapes, matching their demand to the volume of renewable installations they are willing to host. The value of natural capital employed in transitioning to net-zero must be retained by local communities rather than being captured as corporate profits.

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:

A: There is no technological limit to the proportion of surface transport trips that could either be avoided or replaced by active travel modes and public transport, especially in the medium-term to 2050. In principle demand-responsive and public transport options could provide a substitute for all car mileage that cannot be avoided by reducing the demand for travel. The relevant factors determining the extent of modal shift are the ambition and the willingness to mobilise economic resources to achieve this change.

The speed and scale of the modal shift in surface transport will be dependent on the provision of incentives to use public transport alongside disincentives to avoid private car use. It is notable that the CCC's net-zero report still envisages a very large fleet of cars and substantial private vehicle ownership by 2050 despite this clearly representing a sub-optimal pathway for decarbonising the surface transport sector.

Current scientific analysis comparing the lifecycle emissions of electric vehicles and diesel cars finds a carbon equivalent saving of just 10-24% from switching to EVs. This is primarily due to the very significant embodied emissions in the production of EVs. The significant carbon cost of producing new electric vehicles to replace the existing petrol fueled car fleet should also be considered alongside other impacts, such as pollution from microplastics released by break and tire wear, compared with the well-documented mental and physical health benefits of active travel. When all of these aspects are taken into account, it is clear that the best and fastest way to achieve net-zero emissions from surface transport, while maximising co-benefits, will be to develop a strategy for significantly reducing private car mileage and replacing it with active travel and public transport modes.

Avoiding the carbon emissions associated with the production of large volumes of electric vehicles will mean that the surface transport sector will be able to make a far more significant contribution to meeting the carbon budgets set out by the CCC.

B: Reducing the demand for travel and maximising modal shift will require making alternatives to private car use as comparatively cheap, convenient, and reliable as possible.

The most effective way to reduce travel demand and increase shift to active or sustainable modes is to radically change the way in which towns and cities are developed, increasing average development densities, promoting a mix of uses and making the best use of brownfield, derelict and under-used land in urban areas. The proliferation of low-density, single-use housing estates and single-storey retail and warehouse sheds in recent years must be ended.

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In contrast to the proposals in the CCC's net-zero report there should be no incentives for new car purchases of any kind. Instead, scrapping privately owned vehicles could be encouraged by offering vouchers for free public transport or finance for the purchasing of a pair of electric bikes.

Disincentives for private car use could be implemented through a comprehensive road-pricing scheme taking into account distance travelled, congestion, and the availability of alternative modes. In addition, it is clear that the Department should cancel all plans for investing in the expansion of the road network. These policies would provide very substantial sums of money to fund incentives for alternative low carbon travel modes. However, any new road charging scheme needs to take into account rural areas where there is currently no alternative.

Transport policy must be reoriented to ensuring that all parts of the country have public transport options for everyday journeys rather than the current overwhelming focus on strategic commuting routes. Transport investment should be strictly kept to a clear hierarchy prioritising walking and cycling, followed by public transport. Money currently allocated to RIS2 should be used for investing in walking and cycling infrastructure instead.

There must be a major investment in rural bus services, particularly local authority supported routes where there is insufficient population density to currently allow profit-making commercial services. An ambition should be set to ensure that everyone living outside hamlets and isolated dwellings lives within walking distance of a regular bus service. This should be complemented by a significant expansion of the rail network, in particular rural branch line services.

Public transport should be made affordable through public subsidy, the cost of which could be partially covered by a levy on businesses that benefit from greater connectivity, as in many European countries.

Transport franchising powers should be made fully available to local authorities to allow cross-subsidy between rural and urban services, as well as the integration of bus routes with train timetabling.

Reducing travel demand can be achieved by improving broadband and mobile coverage across rural areas to support home working. Services and facilities should be re-sited within local communities, for instance through new community hospitals. Producing and consuming within local food markets would reduce the need for HGV travel, while supporting rural economic opportunities to counterbalance agglomeration effects that concentrate economic growth in urban areas would minimise long-distance commuting.

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:
A)
Heating accounts for over a third of UK emissions (Source) with 85% of the homes in existence today will be around in 2050 (Source). Therefore, it is essential to address heating in both existing and new buildings as quickly as possible.

In order to achieve this, clear and ambitious national standards to decarbonise are needed. These standards should have interim targets to ensure progress towards meeting a target of 2045. For example, the Clean Growth Strategy is working to phase out the installation of high carbon forms of fossil fuel heating in new and existing businesses off the gas grid during the 2020s. Ensuring that this transition does not simply result in the use of the 'next best' heating systems, but deploys technology to maximise the carbon savings.

A quarter of local authorities in a survey by ECA have a target to be carbon neutral by 2030. This shows that there is clear appetite to transition much more quickly by 2030.

B)
At the same time, as outlined in our response to Question 10, almost a quarter of new developments audited failed to meet national minimum standards on energy performance. The audit found that one of the key factors in determining good design was the use of design codes and design review processes. This suggests that instead of relying on large developers to change their behaviour, clear standards are required.

The audit also surveyed those living in and around new developments. It found that almost 60% of residents were unaware of the energy efficiency rating of their own home. This may suggest a wider lack of awareness about the role of housing in the climate debate and suggest that behaviour change is likely to be challenging without a broader campaign to raise awareness.

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:

Cuts to local government funding have left a skills and capacity shortage in many local authorities. As noted in our response to question 10, a design audit suggests that design codes alongside enforcement are key to delivering good design. However, many local authorities do not have the capacity to do this. To “achieve ‘good’ or ‘very good’ outcomes requires more than a passive check against a generic checklist of design principles, it requires a proactive and site-specific process of guidance and accompanying peer review. It requires a design governance process that is consistently applied, not only at the start when the masterplan is approved, but through all reserved matters applications and in relation to how developments are phased on site. It also requires that design quality is prioritised by the Planning Inspectorate during any appeals processes.”

It is also important to look beyond individual buildings, but to the design of new communities. Effective design through buildings orientation, street layout and use of green infrastructure such as trees to provide shading can reduce need for heating and cooling in buildings. At the same time, mixed use developments, street layout and location of development with active and public transport infrastructure can enable communities to live more sustainable lifestyles. These issues should be addressed in a national guidance to support local authorities to enforce good design as part of new development.

Additionally, councils are not fully empowered to reject poorly designed developments as they are penalised based on the number of homes in their planning pipeline, and not the quality of those homes. Removing the Housing Delivery Test and clear steers from MHCLG would provide some confidence to local authorities to reject developments on the basis of poor design.

Historic and older buildings provide a particular challenge and it will be important that skills are developed to ensure that our heritage assets support net-zero carbon in a sensitive way.

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:
A national land use strategy should provide an overarching framework for decisions to guide where we locate new energy infrastructure and new homes to better enable new and existing buildings to take advantage of green energy sources. At the same time, it would encourage better farming practice and restore nature, for example – helping address both the climate and ecological crises.

A land use strategy can be used to evaluate assumptions for future scenarios. It is alarming that the current CCC approach includes an assumption that the land used for settlement in England will increase from 12% to 20% (an increase by two-thirds of land

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cover in just three decades). Greenfield land itself is an important carbon store and future policies should seek to limit land take in line with the UN Sustainable Development Goals (Goal 11.3.1). A basic assessment of household growth and land take suggests a more realistic growth of 4%. This calculation included some of the assumptions between homes and space taken up by infrastructure that formed part of the original Land Use, Land Use Change and Forestry (LULUCF) work. The CCC should provide further evidence regarding the trajectories and include a wider range of scenarios on land take for settlements. CCC could also consider looking at the way land is used for development, in particular the planning process, which safeguards land and can target the restoration and creation of nature, as part of scenarios for the future.

Calculation note: The largest loss of greenfield land to development in the last 5 years is 14,721 hectares (MHCLG, Land use change statistics). If this rate stayed the same, then just over 500,000 hectares would be developed between 2016 and 2050 – less than 4% of England's land area. At the same time average density of housing is very low – at 25 homes per hectare, and last year saw just 53% of residential addresses built on brownfield land: we can build more and use less land.

The integration of smart growth principles across national and local planning and decision making is essential to reducing land take and ensuring sustainable development:

- The government should reintroduce an effective brownfield first policy. This would not only encourage the reuse of existing buildings and materials and ensure that embodied carbon is not emitted, but also support the co-location of development with existing infrastructure and development at a higher density
- While England is often reported as having a high housing density, yet many of its cities are built at a much lower density that other world-leading cities. Building at higher density reduces travel distances, encourages low carbon travel and leaves more green space that can then capture carbon.
- Multifunctionality of new development, for example installing solar panels in all new development, can ensure that new buildings and infrastructure uses renewable energy.

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: We see Contracts-for-Difference as a key enabler of low carbon power. It has had a highly positive impact on helping renewables gain market share and can continue to do so in forthcoming rounds. In common with other leading UK NGOS, we would wish to see further investment in the low carbon and renewable energy (LCRE) sector as part of any accelerated programme to meet net zero by at least 2045 or earlier.[1]

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However, with poor overall progress in reducing emissions to date, it would be timely to review both business models and policy instruments with a view to radically accelerating investment in the LCRE sector. This should accord with 'new green deal' principles[2] which respect the importance of place, including levelling up local economies and devolved decision-making. A repurposed plan-led system, with a stronger role for strategic sub-national planning, enhanced local authority powers and resources, will be a crucial enabler.

We are also committed to a significantly enhanced role for decentralised energy, including onshore wind, at all scales. Deploying a much wider mix of LCRE technologies will also be vital as more land area becomes utilised for climate change mitigation. A decentralised, zero carbon energy system must also be rural-proofed: empowering and benefitting local communities, and delivered in harmony with our natural environment and landscapes.

In order to deliver community renewables more effectively, a raft of policy and financial innovations will be required[3], allowing a level playing field for smaller, local forms of low carbon supply. Chief among the necessary changes to business models are electricity market reforms, allowing fair access for local renewable energy producers to sell direct to local customers.

In summary, we are clear that Government must take a key role in investing in low carbon innovation and promoting radical behavioural change; market forces alone cannot deliver a rapid switch to low carbon systems. In addition, decision-making and funding for the energy transition must be devolved, recognising the value of delivery by more democratically engaged bodies, particularly local authorities, city regions and other new devolved bodies. Decentralised energy and community-centred low carbon solutions are the crucial new elements that can help deliver more rapid decarbonisation, in part by reducing friction in the current planning system.

[1] see https://www.greenpeace.org.uk/wp-content/uploads/2019/08/Government-Investment-for-a-greener-and-fairer-economy-FINAL-30.08.19.pdf - especially section D – Power.

[2] see https://neweconomics.org/uploads/files/GND_2019_WEB.pdf

[3] see for example https://communityenergyengland.org/pages/what-policies-are-cee-asking-for

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:

A:

We have examined the illustrative power scenarios from the NZTR. CPRE's mission as the countryside charity is to enhance, promote and protect the countryside and this, together with the land use planning system, is the lens through which we view and respond to the climate emergency.

We wish to see a strict energy hierarchy to future supply, prioritising demand reduction and energy efficiency and then renewables. Exploration and development for coal, oil and gas should be immediately disincentivised. The current moratorium on shale gas should be maintained as it is incompatible with current decarbonisation targets. 'Conventional' gas will be required as a 'bridging' fuel but must be phased out quickly. As stated above, investment must be focused on low carbon solutions, including CCS, rather than developing new indigenous fossil fuels.

Existing nuclear supply will have a limited, bridging role but build time for new plants means nuclear cannot contribute to the rapid decarbonisation that the climate emergency demands, especially in relation to the generation mix in 2030/2035. High costs are also an issue, which leads us to question its role in 2050 on cost-effectiveness grounds.

Whilst we acknowledge that a future low carbon countryside, its ecosystems and landscapes, will 'work harder' and look different, the societal benefits it provides must be protected and enhanced. We must balance the green space that nature and people need against the intensity of future land use. To ensure land is used efficiently, especially in relation to land take for LCRE technologies, it is important that demand for energy is minimised.

Our major concern therefore with current CCC scenarios is that they are predicated on relatively conservative 'clean/green growth' strategies whereas more radical scenarios such as CAT's Zero Carbon Britain suggest that energy demand could be reduced by as much as 60 per cent.[1] In the same vein, we would also support some of the 'speculative options in the NZTR – notably importing low carbon electricity through increased use of interconnectors, linked to an offshore 'ring main' that would also help minimise onshore

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transmission infrastructure and also seeking efficiency gains in energy transmission and distribution generally (which decentralised systems would also contribute to).

Finally, current scenarios rely strongly on wind and solar, based on lower costs and speed of deployment. As we have already hinted, deploying a wider range of LCRE technologies, although potentially incurring more developmental costs (needing investment) until they mature, will also help minimise landscape impacts.

Bi: As stated above, we support enhanced interconnection (including a new UK offshore ring main) and low carbon imports to help smooth intermittency issues. We have long championed the role of smart grids and, whilst there are potential countryside impacts from new energy infrastructure associated with battery storage, these should usually be able to be mitigated/minimised. Decentralised energy, smart grids and flexible demand management, based on high speed (fibre) broadband, would be a win-win for rural communities where poor internet connectivity and lack of affordable warmth are serious issues.

As stated above, a broader range of less/no intermittent low carbon technologies will also assist with resilience of supply. These would include hydro (both run of river and pumped storage; the latter could be paired with excess RE generation), tidal and wave power, anaerobic digestion and other forms of biomass energy. Most of these technologies are mature but are under-deployed due to cost issues. The cost-effectiveness of their further future deployment now needs to be reviewed as part of a revamped national (i.e. Government-led) investment strategy to meet net zero earlier than 2045.

Bii: We do not have any evidence or further views to offer on this question.

[1] see https://www.cat.org.uk/info-resources/zero-carbon-britain/research-reports/zero-carbon-britain-rising-to-the-climate-emergency/

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:

The CCC believes that it is 'strategically important' to address aviation and shipping carbon emissions through formal inclusion in the UK's domestic legislation to complement international policies such as CORSIA and that "formal inclusion of IAS emissions would help to guide long-term policy approaches and infrastructure investment decisions."

Even with technological improvements and new fuels, aviation is set to be the largest emitting sector in the UK by 2050. We have serious concerns about the ability of the aviation industry to decarbonize at pace. 'Sustainable Jet Fuels' will only be able to meet around a third of the aviation industry's fuel demand by 2050 and many of the new aircraft and engine technologies will need extensive testing to ensure safety. The reliance of the industry on carbon offsetting does not comply with recommendations by the CCC to the government that its net zero target should not be met through offsetting.

We believe that aviation emissions should be included within the UK's carbon budgets and that the growth of the aviation sector should not be permitted to exceed these limits. This would not stop the UK from encouraging an international response to aviation and climate change and could ensure that the UK is a world leader in this sector.

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:
We agree that fundamental ambitious change in agriculture and land use is required. We differ on areas of emphasis for this ambition and suggest the CCC should review assumptions, analysis and ambitions. These are:

(i) There is overemphasis on 'land sparing' versus fostering multifunctional approaches to productive land management able to drive down current emissions rapidly and capture them through natural processes. Locking in high emissions from lowland peatland, and from synthetic/ fossil fuel derived fertilisers are serious concerns. On lowland peat ploughing contributes to serious oxidation but no tillage appraoches are not considered. For fertiliser use analysis of the upstream manufacturing emissions from source gas and energy is also absent, potentially responsible – including manufacture, inorganic fertiliser is responsible for 60% of EU agricultural emissions.[1] The CCC should assess alternatives which reduce fossil fuel intensive inputs such as simple soil nitrogen testing, cover/ catch crops and nitrogen fixing legumes.

(ii) Similarly, 'low carbon farming' methods discussed rely on precision farming or future technologies but not on widely practised 'agroecological' methods eg no tillage, herbal leys and diversity in crop rotation to restore soil fertility. Other benefits include restoration of soil structure and functions, increase in soil organic matter, significant cuts in diesel use and lower inputs due to soil, crop and livestock health. These methods are already in use at scale by commercial farmers – 8% of the UK was farmed under such conservation agriculture in 2016 [2].

(iii) The CCC assumptions for land conversion to settlements are deeply concerning and lack a rationale or analysis: they project UK land conversion of 1,028,600 ha (2017-2050) with associated emissions rising to 7.6 MtCO2e by 2050 and a settlement area in England of 20%. 500,000 ha could accommodate 15 million homes at low density (30 per ha) but for a putative population rise of 9 million by 2050.[3] This makes little sense. CPRE questions how such assumptions are consistent with sustainable land use or meeting Sustainable Development Goal commitments to halt land degradation (SDG 15 target 15.3) and for sustainable urbanisation (SDG11 target 11.3). Also, an unwarranted assumption is made that only improved pasture and rough grazing grassland - lower grade land 4 and 5 under the Agricultural Land Classification system - is converted, so not affecting food production significantly. [4] But Defra research shows that up to 40.6% of urbanisation occurred on Best and Most Versatile land (grades 1,2 and 3a) best suited to

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?

cropping. [5] Current policy to protect such land is weak; conversion to development of different grades is not tracked locally or nationally. Failure to analyse these assumptions leaves CCC arguing for continued food production on peatland emitting very high carbon but at risk of loss of highly productive land elsewhere.

[1] Selbourne, Lord, Viner, D. and M. Sayer, 'Net zero brings challenges and opportunities for landowners', *CountrySide,* No176, pp8-10.

[2] CPRE, *Back to the land*, 2019, p22.

[3] Climate Change Committee – *Land Use: Reducing emissions and preparing for climate change,* November 2018, p25

[4] CEH/ Rothamsted Research, Qu*antifying the impact of future land use scenarios to 2050 and beyond – Final Report*, November 2018, p48.

[5] Defra Soil Research Programme, *Review of the weight that should be given to the protection of best and most versatile (BMV) land Technical Report,* 2011

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:
CPRE agrees with the need for significant land use change for climate mitigation – as well as changes to management for adaptation – but priority should be given to:

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?

- Tree planting with appropriate, diverse species; natural regeneration; incorporating trees and woods extensively into farming systems with sensitivity to the landscape and semi-natural habitats

- Significant restoration of all peatland

- Ending peat extraction and use in horticulture; ending peatland burning

- New hedgerow planting and expansion

- Better soil management to rebuild soil fertility, increase soil organic matter and prevent soil erosion.

We agree with high ambitions for these aspects but in various aspects the CCC should review assumptions, analysis and ambitions. These are:

Peat land restoration - the 2050 goals for upland and lowland peatland restoration lack ambition. For lowland peat 25% restoration is at the low end of the CCC's Further ambition range. Without change to farming practices peat soils will keep degrading. This conflicts with the 25 Year Environment Plan gaol to sustainably manage all soils by 2030 and to halt soil degradation. Lowland croppable and grassland peat also produces up to 70% of GHG emissions for just 14% of UK peat area [1] (some 400,000 ha of 3.2 mn ha) mostly in England (incl. the Fens). This locks in carbon emissions of 30-39 to/ha/CO2e justified by the CCC for food production. But on ONS data of that 400,000ha currently 234,000 ha is used for livestock grazing or hay which the CCC elsewhere considers dispensable for use as for offset and bioenergy planting. Of the remaining 194,000 ha 60,000ha is arable/ cereals which could be grown effectively elsewhere on grade 2/3a land at lower carbon cost. Only 133,000ha (c 33%) is used for horticulture and, assuming it uses grade 1 soils, is harder to replace.[2]

Significantly greater restoration of lowland peat is justifiable on multiple grounds:

- Unrestored unwetted lowland peatland emits some 9.7mntoCO2e pa; to be neutralised by carbon sequestration in woodland this requires planting up a further 9% of UK agricultural land [3]

- Only horticultural use of such land on recent averages yields a positive income from farming (£566/ha compared to arable [-£12/ha] and livestock grazing [-£89/ha]) [4]

- lowland peatlands especially the Fens risk significant flooding from anticipated ea level rise and riverine flooding but with continuing slump in land levels; this questions the wisdom of assuming continued intensive food production in these areas to and beyond 2050

- Land purchase to end dry farming on lowland peat should be considered given the emissions intensity; others have noted the value of public ownership to restore upland peat but our analysis suggests also using this to remove lowland emissions per tonne CO2e avoided could be low cost over 30 years to 2050 (assuming land at value of £25,000ha).[5]

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 projected reliance on bioenergy from biomass should prioritise use of wood waste from the effective management of woodlands, hedgerows and other agroforestry before expansion of monoculture bioenergy crop production.[6]

[1] Climate Change Committee, *Land Use: Reducing emissions and preparing for climate change,* November 2018, p47

[2] Office for National Statistics, *Statistical bulletin UK natural capital: peatlands*, July 2019, p5

[3] 9.7 $MtCO_2$ e based on 56% of estimated 23 $MtCO_2$ e peatland emissions (p209) and tree planting offset figure - 'planting trees on 1% of additional agricultural land by 2030 delivers annual savings of 0.9$MtCO_2$ e by 2050' (p215); Climate Change Committee, *Net zero Technical report*, May 2015, p209 215:

[4] Office for National Statistics, *Statistical bulletin UK natural capital: peatland*s, July 2019 –p18 based on average Farm Business data 2013-14 & 2017-18

[5] Vivid economics/ADAS, *Policy framework for deep emissions reductions and carbon removals in agriculture and land use in the UK -Report prepared for the Climate Change Committee, Final report*, January 2020, p17

[6] *Bioenergy in the UK – Turning Green Promises Into Environmental Reality*

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 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?

The location of new development is likely to be a key determinant of investment

In many urban areas building and homeowners already have a choice in accessing energy from different suppliers and can make the choice to be supplied by renewable energy. It will be important that places in the countryside are not left behind and these areas may require more investment.

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:
Carbon capture and storage (CCS) can only be an interim measure in our efforts to reach net zero and its development should be limited.

Any CCS development should seek to deliver wider net environmental gains, with conditions to ensure that land is either redeveloped in line with a brownfield first approach or other land uses restored to deliver carbon saving benefits well beyond the life of the CCS infrastructure.

Nature based solutions, such as planting trees and hedgerows, will be far more important than CCS in our long-term efforts to address the climate emergency.