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 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: Creating policies that put the UK's industries at a financial disadvantage to its global competitors might ultimately help the UK meet its carbon reduction target for UK production (as UK industrial products are replaced by cheaper imports), but global emissions will not fall (and will likely increase due to the higher carbon footprint of many of the global competitors).

The UK's Energy Intensive Industries (EII's) are already at a financial disadvantage to many of their global competitors as a result of the high electricity costs and the UK only Carbon Prices Support. There is a real danger that the UKs EII's will be offshored in the near future because of the difficulty in decarbonising their production economically.

If future costs are placed on EII's for decarbonising heat (hydrogen/Carbon Capture & Storage), network reinforcements for the electrification of heat and transport and general network cost increases, EII's will eventually be priced out of the UK, only for their products to be replaced by imports; many of which that have a higher carbon footprint than the equivalent UK product. Whilst UK production emissions will decrease, global carbon emissions will increase.

Government should financially support decarbonisation technologies that will help EII's to decarbonise. In doing so, the UK's EII's will help significantly reduce the UK's carbon

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?

emissions (and reduce global emissions), whist maintaining industrial production in the UK and supporting local economies and continuing to contribute to the UK GDP.

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 behaviour of consumers is an important factor in delivering carbon reductions. Current UK policy results in all energy consumers paying for low carbon or renewable electricity generation by an increase on all of our electricity bills (in addition to the UK only Carbon Price Support). Inevitably this means electro-intensive industries are paying a premium to produce lower carbon products. However, consumers of the products largely compare products on price alone, and not on the carbon emissions produced. This means that lower carbon UK products can be overlooked in favour of cheaper, higher carbon alternatives from producers located outside the UK.

Government should therefore look to create markets for lower-carbon products so that consumers can make informed decisions on the carbon emissions of their products. If consumers are willing to pay a higher price for lower carbon products, perhaps that should be reflected in lower corporate/business/operational taxes.

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: Whilst achieving net zero is important, the UK will not solve global warming on its own.

If carbon reduction policies force UK industry to close or move abroad, the UK will lose the ability to influence the carbon intensity of those products. Having an industrial manufacturing base in the UK will give us the ability to govern industrial carbon emissions from UK production and for UK consumption. If the UK gets this right, we could become a world leader in the industrial decarbonisation policies and processes that will attract industry to the UK. Get this wrong, and the financial burden of decarbonisation will result

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?

in UK industry becoming uncompetitive in the global market and will be forced to close or relocate to other areas of the globe which will do nothing in helping to achieve the global decarbonisation/temperature targets.

To understand how the UK contributes to global carbon emissions, consumption emissions should be reported along with territorial/UK production emissions. Reducing carbon emissions from UK production achieves nothing from a global perspective if the UK is simply increasing imports.

Given the uncertainty with moving to a new technology or fuel, Government policy could introduce incentives for those industries that move to the new fuel/technology initially to test the technology/processes. Additionally, cross-industry working groups should be formed to share best practice and funding available to cover the costs of EII's moving to alternative lower carbon fuels.

In the medium term, blue hydrogen (from Natural gas) along and CCUS should be encouraged as a transition towards eventual green hydrogen.

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: UK industry should be given the necessary time to plan for and invest in new technologies. The UK's EII's have already invested heavily in the decarbonisation of their products.

To achieve the next level of decarbonisation though, major investment in infrastructure development such as electricity network reinforcement, hydrogen networks and CCUS is needed.

This is not achievable for EII's individually (either financially or technically) but will need the co-operation of multiple organisations and will take time to implement. The UK's EII's should not be mandated to decarbonise before these other processes have been commissioned and proven.

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: If the UK gets industrial decarbonisation right, we could become a world leader in the policies and processes that will attract industry to the UK. Get this wrong, and the financial burden of decarbonisation will result in UK industry becoming uncompetitive in the

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?

global market and will be forced to close or relocate to other areas of the globe which will not help achieve the global decarbonisation/temperature targets.

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: It is essential that policies are agreed as soon as possible to ensure that industry knows the preferred decarbonisation pathway. Industry investment cycles for large infrastructure projects are typically ~15 – 20 years (but can be much longer) so it is critical that decisions about decarbonisation pathways are made soon as the net zero target is only 1 investment decision away for most EII's. There is evidence that investment is being withheld from the UK until clear policies have been made about the decarbonisation pathway. A clear energy strategy will enable industry to understand risks and invest in decarbonisation technology accordingly.

To understand how the UK contributes to global carbon emissions, consumption emissions should be reported along with territorial/UK production emissions. Reducing carbon emissions from UK production achieves nothing from a global perspective if the UK is simply increasing imports.

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: Reporting the progress of local area's/cities is important to measure success. However, some areas may have a natural advantage in terms of geographical location (CCUS for example) and therefore EIUG does not believe the Committee should be setting generic targets for different area's of the UK.

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: International competitiveness is an important factor for the UK's EII's. All of the UKs EII's are finding it difficult to compete with their international competitors as a result of the additional costs placed on energy users for renewable generation and the UK only Carbon Price Support.

This has resulted in UK industrial electricity prices currently being amongst the highest in Europe. If future costs are placed on EII's for new nuclear, decarbonising heat, CCUS and electricity network reinforcement (for the electrification of transport), EII's will eventually be

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?

priced out of the UK, only for their products to be replaced by imports. Creating policies that put the UK's industries at a financial disadvantage to its global competitors might ultimately help the UK meet its carbon reduction target for UK production (as UK industrial products are replaced by cheaper imports), but global emissions will not fall (and will likely increase due to the higher carbon footprint of many of the global competitors).

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: All of the UKs EII's are finding it difficult to compete with their international competitors as a result of the additional costs placed on energy users for renewable generation and the UK only Carbon Price Support.

This has resulted in UK industrial electricity prices currently being amongst the highest in Europe. If future costs are placed on EII's for new nuclear, decarbonising heat, CCUS and electricity network reinforcement (for the electrification of transport), EII's will eventually be priced out of the UK, only for their products to be replaced by imports.

Creating policies that fund large scale decarbonisation infrastructure projects will speed up that project, encourage participation by providing longer term certainty of the project, protect EII's from the project costs which will protect UK jobs by maintaining industrial production in the UK and supporting local economies.

However, substantial support and financing will be required to transition towards the net zero target.

If the UK gets this right, we could become a world leader in the industrial decarbonisation policies and processes that will attract industry to the UK. Get this wrong, and the financial burden of decarbonisation will result in UK industry becoming uncompetitive in the global marketplace and will be forced to close or relocate to other areas of the globe which will do nothing in helping to achieve the global decarbonisation targets.

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: It is important to consider that some areas of the country may have a natural advantage in terms of geographical location (CCUS clusters for example) or considered rural (or difficult to access) from a Network Operators perspective (and therefore network reinforcement costs be prohibitively excessive).

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: Co-ordination of decisions and policies is essential in creating a long-term effective UK policy. Without co-ordination there is a risk of migration of industry from one area of the UK to another as regional policies compete.

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: All of the UK's EIIs are at risk of carbon leakage/offshoring given a) the high electricity costs in the UK, b) the UK only Carbon Price Support and c) the international competitiveness of the products they manufacture.

If carbon reduction policies force UK industry to close or move abroad, the UK will lose the ability to influence the carbon footprint of those products. Having an industrial manufacturing base in the UK will give us the ability to govern industrial carbon emissions from UK production and for UK consumption.

If the UK gets this right, we could become a world leader in the industrial decarbonisation policies and processes that will attract industry to the UK. Get this wrong, and the financial burden of decarbonisation will result in UK industry becoming uncompetitive in the global market and will be forced to close or relocate to other areas of the globe which will do nothing in helping to achieve the global decarbonisation/temperature targets.

To understand how the UK contributes to global carbon emissions, consumption emissions should be reported along with territorial/UK production emissions. Reducing carbon emissions from UK production achieves nothing from a global perspective if the UK is simply increasing imports.

Given the uncertainty with moving to a new technology or fuel, Government policy could introduce incentives for those industries that move to the new fuel/technology initially to test the infrastructure/processes.

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: Flexible generation from hydrogen will be an important factor in the generation mix. For the period 2025-2035, blue hydrogen (produced from natural gas) could be an important transition fuel before green hydrogen becomes viable (from a cost and availability perspective).

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: Without CCUS, Electrification of heating currently appears to be the only feasible technology to decarbonise traditional natural gas boilers. Combined with electrification of transport (particularly with rapid charging), there will need to be significant infrastructure investment in the local electricity distribution networks.

CCUS will enable the UK to decarbonise heat with hydrogen (using SMR and natural gas) but it will require substantial investment in CCUS networks and infrastructure along with hydrogen networks.

It is important to know the cost of these solutions to enable decisions to be made about investments. How these infrastructure investments will be funded will be key.

All of the UKs EII's are finding it increasingly difficult to compete with their international competitors as a result of the additional costs placed on UK energy users for renewable generation and the UK only Carbon Price Support. This has resulted in UK industrial electricity prices currently being amongst the highest in Europe.

If future costs are placed on EII's for new nuclear, decarbonising heat, CCUS and electricity network reinforcement EII's will eventually be priced out of the UK, only for their products to be replaced by imports.

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: