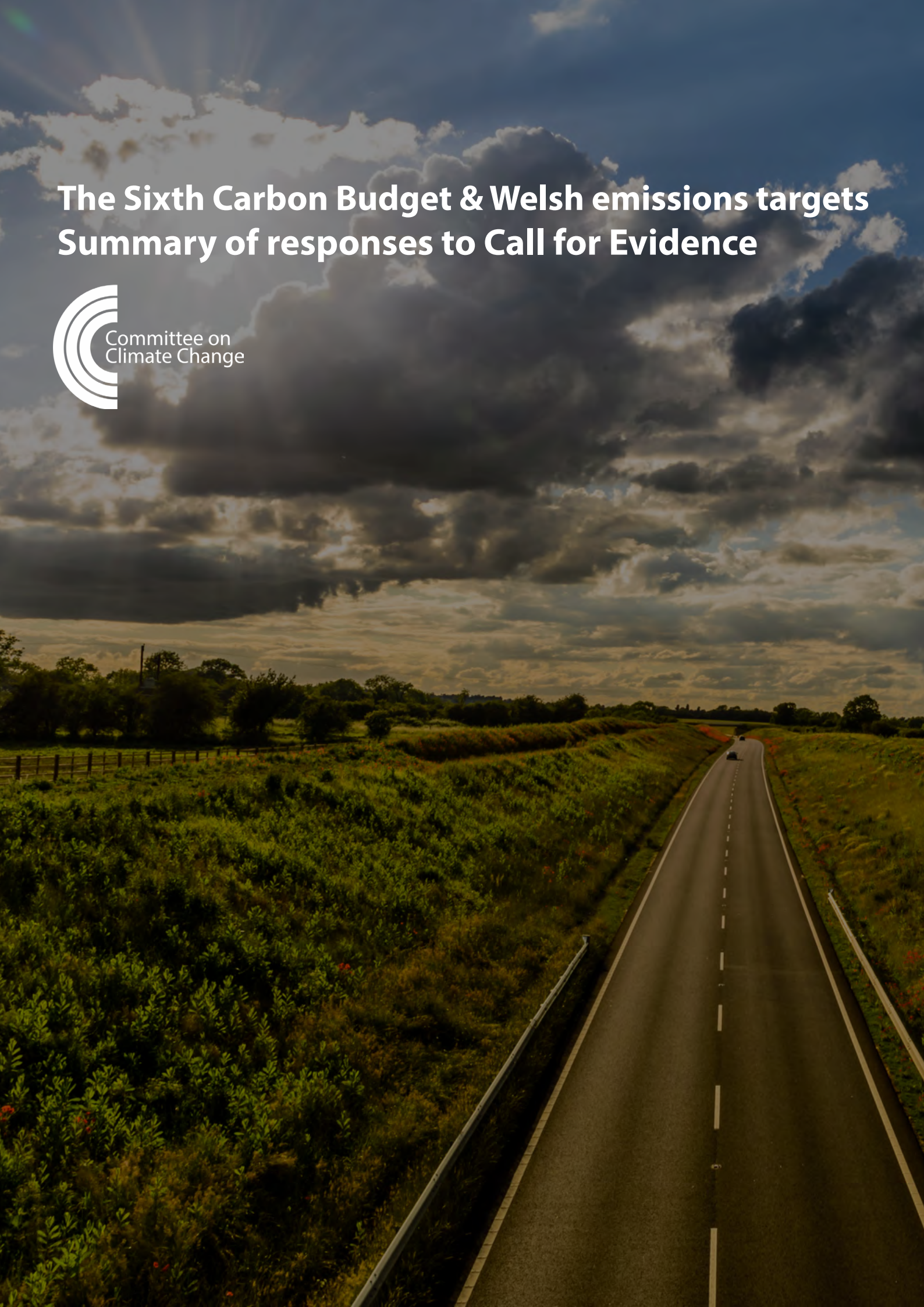
The Sixth Carbon Budget & Welsh emissions targets
Summary of responses to Call for Evidence

Committee on
Climate Change



Contents

1. Background to the UK's Sixth Carbon Budget and Welsh Third Carbon budget and interim targets

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. 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.

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.

The Committee launched a Call for Evidence to inform its advice on the Sixth Carbon Budget and Welsh interim targets which ran between 5 December 2019 and 5 February 2020. The Call for Evidence included 37 questions on five topics:

A. Climate science and international circumstances

B. The path to the 2050 target

C. Delivering carbon budgets

D. Wales, Scotland and Northern Ireland

E. Sector-specific questions

The Call for Evidence was an important part of the Committee's ongoing engagement programme for the Sixth Carbon Budget, but not the only one. We also held a large number of roundtable and bilateral meetings, including with relevant groups that did not respond to the Call for Evidence.

This report contains a high-level summary of the responses to the Call for Evidence received by the Committee and of the type of respondents. Responses can be found in full on the Committee's website.

2. The response to the Call for Evidence

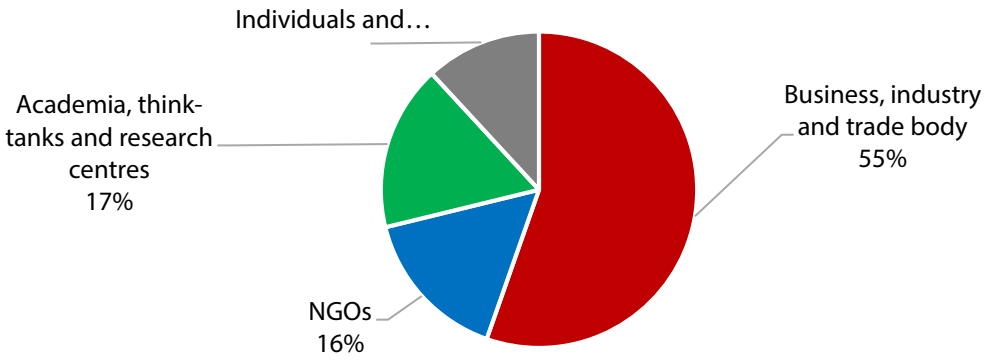
The Call for Evidence received **177 responses** from across business and industry, NGOs, academia and from individuals (Figure 1). A full list of respondents is available in the Annex at the end of this report.

This Call for Evidence included for the first time a large number of sector-specific questions (20 in total).

We urged respondents only to submit responses to questions in their particular areas of interest or expertise. As a result, no respondent submitted a response to every question, with some sections receiving more responses than others (Figure 2):

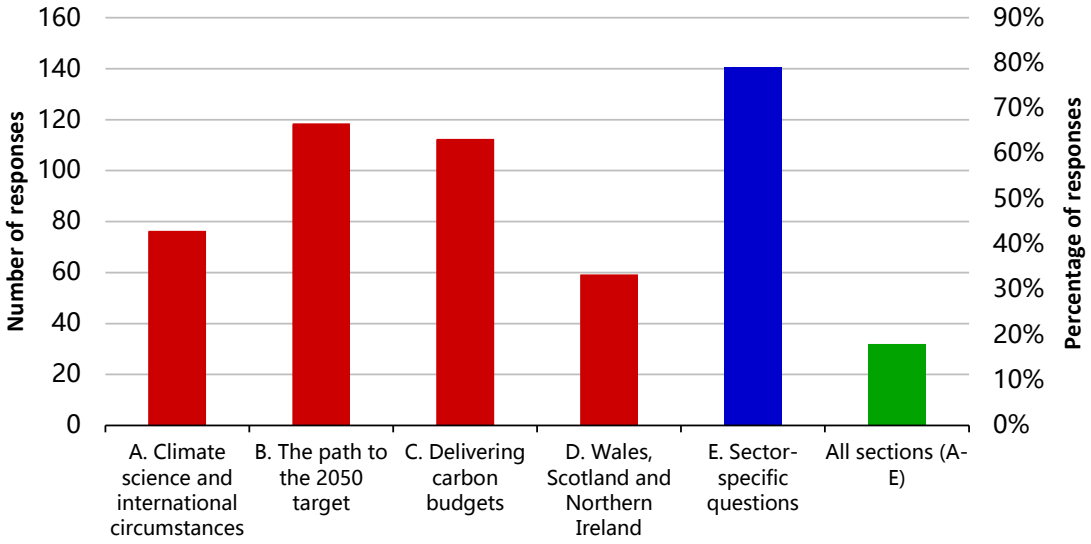
- 18% of respondents answered at least one question in all five sections.
- The vast majority of respondents (nearly 80%) answered at least one sector-specific question.
- One third of respondents answered questions relating to Wales, Scotland and Northern Ireland (section D).

Figure 1. Responses to the Call for Evidence by type of respondent



Source: CCC analysis.
Notes: 'Business, industry and trade body' includes consultancies; 'Individuals and other' includes public bodies.

Figure 2. Number of responses by section



Source: CCC analysis.
Notes: Number of responses by section correspond to a response to at least one question in a given section; percentage of responses corresponds to responses by section proportionate to total responses received.

3. Overview of responses

This section provides a summary of responses received to each question in sections A to D and a summary of respondents providing answers to questions in section E. The evidence submitted in response to questions in section E was considered by the CCC's sector teams and reflected in our Sixth Carbon Budget scenarios, where relevant, but is not summarised here.

This report does not reflect every response submitted, but is rather an attempt to provide an unbiased summary of the evidence and views received. These do not necessarily reflect the views of the Committee. Responses can be downloaded in full on the Committee's website.

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?

Thirty-five responses were submitted to this question, with nearly half (15) coming from NGOs.

Some respondents felt that the reports listed by the CCC were sufficient evidence on climate science to consider for the Sixth Carbon Budget. Amongst the most cited additional evidence was:

- Initial results from the World Climate Research Programme's Coupled Model Intercomparison Project Phase 6 (CMPI6).[1]
- Lenton et al. (2019) Climate tipping points — too risky to bet against, https://www.nature.com/articles/d41586-019-03595-0.
- Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (2019) Global assessment report on biodiversity and ecosystem services, https://ipbes.net/global-assessment.
- UN Environment Programme (2019) The Production Gap 2019 Report, https://www.unenvironment.org/resources/report/production-gap-report-2019.

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?

This question received the least responses out of all questions in the cross-cutting sections (A to C). Twenty-nine responses were received, with a relatively even split between business and industry (10 responses); NGOs (7); academia, think-tanks and research centres (7) and individuals (5).

[1] The project is due to be completed in 2021 and will inform the upcoming 2021 IPCC sixth assessment report (AR6). Initial results from some model runs are already available.

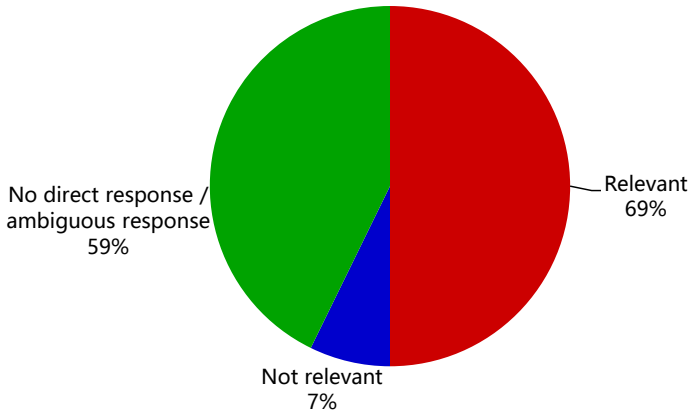
Many respondents did not directly answer the question or provided ambiguous responses. Of those who did, the majority felt that global cumulative CO_2 budgets were relevant for constraining UK cumulative emissions (Figure 3) but there was no consensus on the most appropriate way of doing this.

Several respondents highlighted the importance of equity-based approaches in determining the UK's share of remaining global carbon budgets:

- "…based on the UNFCCC principles of equity and common but differentiated responsibility, the UK share of the global budget should be apportioned equitably to reflect our historical responsibility and our resources and capacity to act faster and reduce emissions further than the global average." – Friends of the Earth Scotland
- "…equitable mitigation necessitates that some countries (richer countries, countries with greater cumulative GHG emissions) reduce their future emissions more rapidly than others." – Climate Econometrics Research Program, University of Oxford
- "Translating global carbon budgets to the national level however depends on decisions around fairness and equity as well as methodological choices, national inventories and the inclusion of international offsetting and emissions trading." – Priestley International Centre for Climate

Some respondents did not feel that remaining cumulative global budgets were relevant, but that the UK's long-term net-zero target and cost-effectiveness should instead be the main factors taken into account in determining UK carbon budgets.

Figure 3. Summary of views submitted in response to question 2



Source: CCC analysis.
Notes: Based on CCC assessment of responses.

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?

Fifty-eight responses were submitted to this question. The most common views on how international commitments should be accounted for in the level of the Sixth Carbon Budget were:

- Strengthened international commitments should be reflected in a more stringent Sixth Carbon Budget and nationally defined contribution (NDC) for the period out to 2030.
- International commitments should be considered in the context of UK competitiveness – i.e. the UK should keep pace with other countries to avoid carbon leakage.
- Linked to the above, the UK should seek to align action with EU commitments, as close alignment between sectors across Europe can mitigate against carbon leakage.

The most common actions cited by respondents which the UK should take alongside setting the level of the Sixth Carbon Budget, to increase leverage in international negotiations and encourage international action, were:

- **Role as COP26 president and wider diplomacy:**
  - Submit a revised and strengthened NDC for the period to 2030.
  - Use global diplomatic capability as part of COP26 presidency to ensure every signatory of the Paris Agreement is supported to submit strengthened NDCs.
  - Coordinate with other countries to agree to common reporting requirements (e.g. on baselines, target years, scope of emissions covered) for NDCs, to increase international transparency and comparability.
  - Ensure development and implementation of an international emissions trading scheme as part of COP26 negotiations which guarantees genuine mitigation in global emissions.
- **Consumption emissions and international trade:**
  - Commitment to target a reduction in UK consumption emissions, to avoid carbon leakage and increases in global emissions.
  - Ensuring new post-Brexit trading relationships allow progress towards national and global Net Zero by considering environmental standards and GHG emissions of imported goods.
  - Engage in ongoing discussions with the European Union on carbon border adjustments to even out standards between UK- and EU-based industries.
- **Domestic action:**
  - Tightening existing budgets (Fourth and Fifth Carbon Budgets).
  - Putting credible policies in place to deliver against existing commitments and developing a robust plan to deliver the Sixth Carbon Budget.
- **Technology and innovation:**
  - Collaborate with other countries regarding innovation in relevant technologies, including by facilitating sharing of intellectual property, expertise and technology.

  - Invest in emerging low-carbon technologies to reduce costs for developing countries.
- **Climate finance, export finance and international aid:**
  - Strengthen global implementation through the provision of increased climate finance for projects in developing countries.
  - End Overseas Development Assistance (ODA) and UK Export Finance (UKEF) investments supporting oil and gas projects.

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?

Forty-six responses to this question were submitted. Most respondents agreed that a strengthened UK NDC had significant international signalling value and alongside the UK's COP26 presidency presented an opportunity to boost global climate ambition:

- "Given the timing of COP26, revising and strengthening the UK's Nationally Determined Contributions (NDC) for the period around 2030 to reflect the Government's 2050 target will undoubtedly act as a further catalyst for others to set similar or more ambitious targets for decarbonisation." – Nuclear Industry Association
- "Revising and strengthening the UK NDC for the period around 2030 would provide a similar signal to countries around the world, and provides a target for these countries to hit and exceed." – Drax

Respondents also highlighted that:

- A strengthened NDC should represent a genuine increase in ambition.
- To be credible, it should be accompanied by strong and immediate policy action, as the UK is already off track to meet its current targets.

A small number of respondents disagreed and felt that:

- The UK's commitment to Net Zero by 2050 is a strong enough international signal.
- Setting new targets is not as important as implementing policies.
- There is a risk that a strengthened UK commitment will not be accompanied by international commitments, and decarbonising more quickly than other countries carries risks to the UK's international competitiveness and of carbon leakage.

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?

Eighty-five responses to this question were received. Respondents largely agreed that the role for consumer, individual or household behaviour in delivering emissions reductions could be significant but that it needs to be driven by Government policy – i.e. people need the right incentives to make low-carbon choices.

Many respondents highlighted that there was no single way of incentivising behaviour change and that a combination of measures would have to be deployed. The most cited measures were:

- **Information.** Providing people with information on recycling and waste disposal, product labelling (e.g. to reflect the carbon footprint of consumer goods), the GHG impact of actions (e.g. aviation, online deliveries), alternatives to high-carbon options and co-benefits of climate action. The use of smart digital technologies (to help people engage with e.g. energy consumption) was also cited as a way of providing information.
- **Financial support.** Grants/subsidies for measures such as energy efficiency retrofits, low-carbon heating solutions, upfront costs of electric vehicles, public investment in infrastructure (e.g. cycling, railways, electric vehicle charging), funding scrappage schemes for high-carbon technologies (e.g. for oil heating tanks).
- **Regulation and standards.** Banning high-carbon products/technologies (e.g. internal combustion engine vehicles, gas boilers) and/or ensuring that new products have to meet standards (e.g. all boilers have to be hydrogen ready, minimum EPC requirements for new-builds). Respondents felt that regulation and standards could also be used to create market-pull for certain products (e.g. low-carbon cement).
- **Carbon pricing and taxation.** Several suggestions of how this could be applied to incentivise behaviour change were made, including an economy-wide carbon price with border adjustment, a tax and dividend scheme, congestion charging, raising VAT on household fuel consumption (with support for fuel poor households), frequent flyer levies, reinstating the fuel duty escalator, removing VAT from carbon-saving activities, tax rebates (e.g. Council Tax, business rates) for energy efficiency upgrades and lower taxes for business producing low-carbon products.
- **Public procurement.** To normalise low-carbon diets, create markets for low-carbon goods.

Many respondents also highlighted that acceptance of the changes required in individuals' daily lives was critical in delivering behaviour change.

In terms of assessing the potential for behaviour change, many felt that the uncertainty around this was too significant for it to be reliably assessed. As such, some suggested that a precautionary approach should be applied in the CCC's scenario analysis, where reliance on behaviour change is minimised.

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?

Eighty-eight responses to this question were submitted. Some of the most widely mentioned uncertainties and suggestions of how Government should address these were:

- **Behaviour change** and the extent to which changes in diets, home insulation and heating, recycling/food waste reduction rates and travel patterns could be relied on:
  - Some respondents felt that there was difficulty in evaluating the potential to do this and often limited evidence on how to incentivise change, although some suggestions were made, most of which have been covered off in the response to question 5.
  - Other respondents suggested that increasing the optionality of how a net-zero target could be achieved (e.g. through GHG removals) could mitigate against the risk of insufficient behaviour change occurring.
- The rate of **technological development and deployment** and its impact on technology costs:
  - Encourage and take part in international collaboration on research, development and deployment of new technologies to increase the speed of roll-out and bring down costs.
  - Longer-term policy reforms to support innovation – e.g. allowing contracts-for-difference (CfD) to support higher-risk innovation (e.g. co-location of renewables with hydrogen electrolysis) or emerging technologies (e.g. floating offshore wind).
  - Focus on rolling out options that are already available and cost-effective (e.g. onshore wind) or expected to be cost-effective soon (e.g. electric vehicles).
- **Financing the transition** and how costs should be split between consumers, businesses and the Exchequer:
  - Evaluate alternatives for funding the transition and trade-offs between cost, competitiveness, effects on consumers and impacts on the taxpayer.
  - Seek to create market mechanisms to provide long-term revenue certainty for low-carbon technologies.
- **Carbon prices** in the UK and internationally:
  - Long-term clarity on UK carbon prices alongside addressing discrepancies in carbon pricing/taxation between different sectors.
  - Seek to ensure a level playing field in international markets where carbon prices may apply, including consideration of carbon border adjustments and coordinating these types of policies internationally.

Some respondents also highlighted uncertainties in particular sectors:

- **Industry**. Uncertainty on the best pathway for industry decarbonisation remain (e.g. which technologies will be most cost-effective, when they will be commercially ready, what infrastructure to support decarbonisation will be needed) and international carbon pricing will affect industry significantly. Suggested mitigating solutions included:

  - Creating product standards and protecting UK industry with carbon border adjustments would allow low-emission markets to develop in the UK and export to other countries once demand for these products increases.
  - Although some technology solutions remain unclear, carbon capture and storage (CCS) will be needed in some form. A clear pathway to deployment of CCS transport and storage infrastructure should be developed as soon as possible, including access to industrial areas outside large manufacturing clusters.
- **Buildings**. Similarly, there is uncertainty on the best solutions for decarbonising buildings. Suggested mitigating solutions to this uncertainty focussed on low-regrets options, including:
  - Incentivise energy efficiency and heat electrification where it is cost-effective to do so (e.g. new builds and properties off the gas grid).
  - Focus on reducing energy demand as much as possible by supporting individuals and businesses to invest in energy efficiency retrofits.
  - Encourage demand-side flexibility by removing barriers to accessing existing flexibility markets and further developing these markets.
- **Aviation**. The success of international mechanisms (e.g. CORSIA) in reducing emissions was highlighted as an uncertainty. Suggested mitigating solutions included:
  - The UK could encourage a coalition of more ambitious nations to push for decarbonisation of aviation emissions beyond what may be achievable through existing international mechanisms.
- **Infrastructure**. Including where new networks will be required (e.g. electric vehicle charging infrastructure) and existing networks will require reinforcements (e.g. power networks) or may become unnecessary (e.g. the gas grid). Suggested mitigating solutions included:
  - Ensuring regulatory frameworks take a longer-term view of these needs and allow for pre-emptive investment in networks.
- **GHG removals**. The precise scale of CCS required and the development pathway are still unclear. Suggested mitigating solutions included:
  - Introduce an investment framework and business models in the 2020s to enable scale-up in later years.

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?

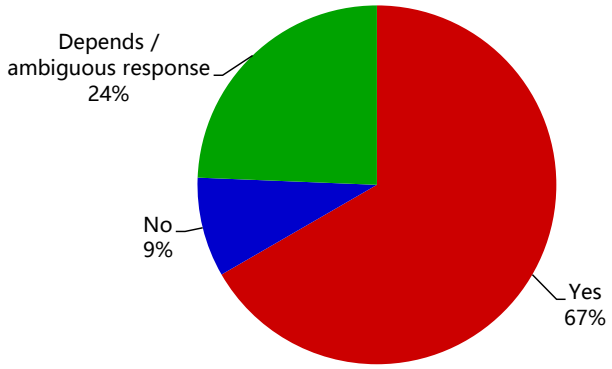
Seventy-eight respondents submitted a response to this question. Most of those who answered the question (52 respondents) felt that the fourth and fifth carbon budgets should be revisited (Figure 4) with the most common justifications for this view being:

- The UK's new net-zero target suggests a different decarbonisation pathway and therefore new budgets are needed.
- The most up to date climate science points to a need for early decarbonisation.

Some respondents provided ambiguous responses or felt that existing carbon budgets should only be changed if:

- It is more cost-effective to do so than to maintain current budgets.
- Policies to support decarbonisation, particularly in industry, are put in place by Government.

Figure 4. Views on revisiting the level of the fourth and fifth carbon budgets



Source: CCC analysis.
Notes: Based on CCC assessment of responses.

Of the small number of respondents who felt that the Fourth and Fifth Carbon Budgets should not be revisited, the rationale provided was:

- Long investment cycles require long-term policy stability which would be undermined by amending existing targets.
- UK climate policy is already more ambitious than other countries and further tightening budgets could present risks to international competitiveness.
- Some technologies/business models needed to decarbonise more quickly are not yet available.
- The UK is off track to meet the current budgets and it would not be credible to tighten these further.

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?

This question received sixty-eight responses. The co-benefits most commonly cited by respondents were (Figure 5):

- **Health benefits**:
  - **Cleaner air** due to a reduction in internal combustion engine vehicles, a move away from fossil-fuel heating systems and reductions in aviation demand.

  - **Increase in physical activity** from more walking and cycling.
  - **Less noise** due to reductions in aviation demand and numbers of internal combustion engine vehicles.
  - **Greater thermal comfort** in homes due to better energy efficiency.
- **Environmental and climate resilience benefits** from land-use measures such as afforestation and peatland restoration resulting in:
  - Improvements in **ecosystems** and their **biodiversity**.
  - Better **air, water and soil quality**.
  - Increased **resilience** to flood risk.
- **Economic benefits:**
  - **Job creation.** Development of existing UK industries in certain sectors (e.g. aerospace, renewable energy, low-carbon manufacturing, hydrogen production) could result in the creation of new, often high-skilled, jobs.
  - **Competitiveness and export opportunities.** Early development of industries such as those mentioned above could boost the UK's international competitiveness with benefits for exports and the trade balance.
  - **Energy security.** From reduced reliance on imported fossil fuels.
  - **Lower energy costs and fuel poverty**. For both business and households, from reduced energy demand due to energy efficiency measure and reductions in peak energy demand requirements.
  - **Redistributive effects** from the potential for regional economic rebalancing due to economic opportunities arising from decarbonisation (e.g. hydrogen and CCS) in regions outside of London.
- **Social benefits:**
  - **Recreation.** A shift away from car transport towards walking, cycling and public transport can create new uses for street space and encourage community engagement; increased afforestation will create more green spaces to enjoy.
  - **Well-being**. Arising from other co-benefits such as better health, satisfying employment, etc.

Most respondents (around 60%) provided references to support their views. The most commonly cited references were:

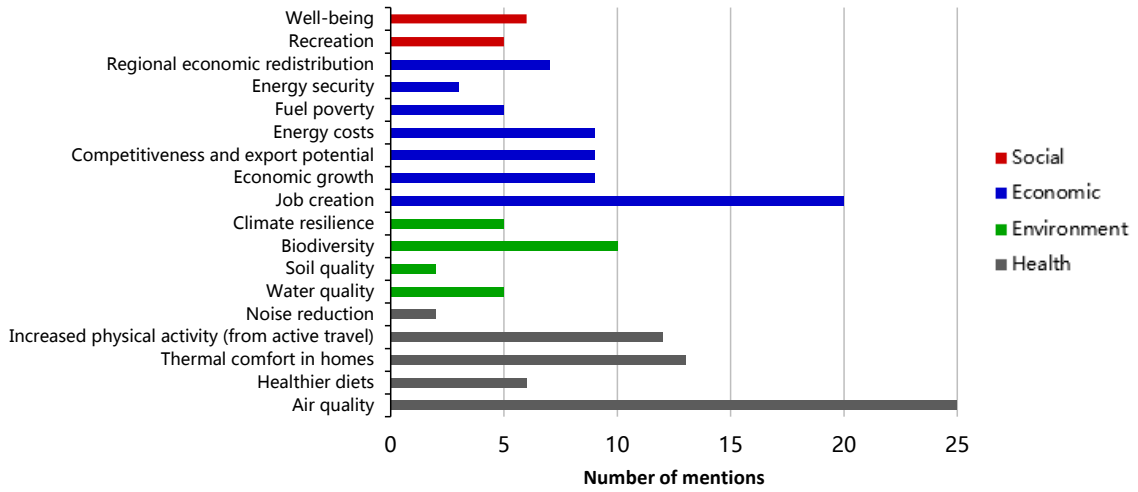
- Jennings, Fecht and De Matteis. (2019) Co-benefits of climate change mitigation in the UK: What issues are the UK public concerned about and how can action on climate change help to address them? *Grantham Institute Briefing Paper No 31*.
- Willett et al. (2019) Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. *The Lancet Commissions*, 393 (10170), 447-492.

- Barnes et al. (2019) Emissions vs exposure: Increasing injustice from road traffic-related air pollution in the United Kingdom. *Transportation Research Part D: Transport and Environment*, Vol 73, 56-66.
- HM Government (2017) Clean Growth Strategy, https://www.gov.uk/government/publications/clean-growth-strategy
- Summit Power (2017) Clean Air, Clean Industry, Clean Growth: How Carbon Capture Will Boost the UK Economy, http://www.ccsassociation.org/news-and-events/reports-and-publications/clean-air-clean-industry-clean-growth/
- Hydrogen Council (2017) Hydrogen scaling up, http://hydrogencouncil.com/wp-content/uploads/2017/11/Hydrogen-Scaling-up_Hydrogen-Council_2017.compressed.pdf
- Centre for Alternative Technology (2019) Zero Carbon Britain - Rising to the Climate Emergency, https://www.cat.org.uk/info-resources/zero-carbon-britain/research-reports/zero-carbon-britain-rising-to-the-climate-emergency/

In terms of prioritising abatement in light of expected co-benefits, most respondents did not directly respond to this part of the question. Views of those who did differed:

- Some felt that as all sectors should be decarbonised as quickly as possible, co-benefits should not be used as a prioritisation criterion.
- Others felt that targeting measures with the greatest co-benefits could be a way of gaining household/consumer buy-in where there is likely to be most resistance to change.

Figure 5. Co-benefits most mentioned by respondents



Source: CCC analysis.
Notes: Only co-benefits mentioned multiple times are included.

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?

This question received ninety-five responses – the most out of any question in the Call for Evidence. Amongst the delivery challenges and priorities for the period out to 2030/35 mentioned by respondents were:

- **Technology and innovation**. Several respondents highlighted the need for early investment (either directly by Government or through harnessing private investment) in research and development of new technologies (e.g. sustainable aviation fuels, innovation in building retrofits, renewable generation, CCS, hydrogen production) as well as deployment of known solutions (e.g. onshore wind, offshore wind) to bring down technology costs.
- **Consumption emissions**. Many respondents highlighted the need to develop a robust approach to addressing consumption emissions (e.g. by adopting explicit consumption emissions targets, technology-adjusted consumption-based accounting, border carbon adjustments) to avoid emissions offshoring and better reflect the UK's impact on global emissions.
- **Local action**. Respondents mentioned the desire of many local areas to address climate change from the bottom up and felt that this was beneficial/crucial in achieving Net Zero. Many respondents also highlighted that there were significant barriers to action by local areas (including lack of funding) and felt that more effective ways of engaging with these actors should be found.
- **Demand reduction**. Several respondents mentioned the need to reduce demand (e.g. road transport, electricity, heat and meat consumption) and felt that encouraging these changes should be an early policy priority.
- **Funding and financing**. Many responses referred to the challenges in both funding the transition and developing appropriate mechanisms and business models to finance it.
- **Public engagement**. The need for public engagement to explain changes during the transition, facilitate buy-in where behaviour change is required and ensure that the public has a role in decision-making (e.g. through community/citizens' assemblies) was also mentioned.
- **Reflecting Net Zero in decision-making**. The need to do this was mentioned both relating to Government decisions, where a cross-departmental assessment of existing policies and strategies and their compatibility with the net-zero target should be undertaken (e.g. new road infrastructure decisions) and by business and industry, to ensure climate change is factored into financial decision-making.
- **Just transition**. Multiple respondents highlighted the need for Government to plan for a just transition, supporting fuel poor consumers and managing the transition for workers. The need for reskilling and retraining, both to ensure the UK has the required skills to decarbonise and to protect workers in declining industries, was mentioned.

As in question 6, some sector-specific priorities and challenges were also mentioned in response to this question, including:

- **Agriculture and Land Use**. Increasing tree planting rates and ensuring the Agriculture Bill is utilised to create economic conditions which financially support farmers for adopting climate mitigating practices.
- **Power**. Significant deployment of low-carbon power using proven technologies out to 2030/35 including renewables (e.g. offshore wind and onshore wind) and firm low-carbon power (e.g. nuclear).
- **Industry**. Priorities in the sector mentioned by respondents included announcing pathways and policies well in advance to allow businesses to plan, providing carbon leakage prevention policy commitments (e.g. carbon border adjustments, creating markets for low-carbon steel and other currently emissions-intensive products) and development of low-carbon industrial clusters in the UK.
- **Buildings**. Important issues highlighted for respondents for the period out to 2030/35 included ensuring all new buildings are Net Zero (in their build and use) which includes phasing out installation of high-carbon fossil fuel heating, mandatory installation of hydrogen-ready boilers to replace gas boilers at the end of their lifetimes, widespread energy efficiency improvements in homes (with several respondents highlighting the need to rethink the EPC rating system), investment in hydrogen trials and subsidising low-carbon heat solutions (e.g. heat pumps).
- **Removals**. Respondents highlighted the need for Government to finalise business frameworks for CCS and support industry in paying for it to maintain international competitiveness. This should include providing support to deliver 2-3 CCS projects by 2030 to ensure the technology is available for sectors that need it to decarbonise.
- **Infrastructure**. Many respondents highlighted the need for investment in enabling infrastructure for decarbonisation, including:
  - **Vehicle charging/refuelling infrastructure**. This includes charge points for cars and vans (with vehicle to grid capabilities) and refuelling infrastructure for heavy goods vehicles (HGVs) and buses.
  - **Electricity network reinforcements**. Ensuring electricity distribution networks can accommodate electrification of heat and transport and transmission networks can accommodate renewables.
  - **CO_2 transport and storage**. The pace and scale of network development will be important in encouraging timely investments.
  - **Gas grid and heat networks**. Developing district heat networks where needed and research to determine whether alternatives to natural gas (e.g. biomethane; hydrogen) can work with existing gas infrastructure and taking steps to enable it to occur.

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?

Sixty-five responses to this question were submitted, with over 60% (40 responses) coming from business and industry. Amongst suggestions given for taking account of local targets/ambitions:

- **Reflect local ambition in the Sixth Carbon Budget**:
  - Several respondents highlighted the significant ambition of local areas – many of which recently declared climate emergencies and/or set their own net-zero targets – and felt that national policies should not undermine the ability of local areas to go further and faster in pursuing decarbonisation.
  - Respondents felt that the CCC's advice on the Sixth Carbon Budget should reflect this ambition and appetite for tackling climate change at the local level (i.e. accounting for the fact that many local areas may be aiming to achieve Net Zero before 2050 and consider what that means for national targets).
- **Recognise differences in local conditions** which may enable different solutions, for example: differences in network reinforcement costs between rural/urban areas; offshore wind potential; geological CO_2 storage potential; proximity to industry which may require CCS/hydrogen infrastructure.
- **Providing guidance** to local areas on:
  - How to best enact policy to deliver action against targets/climate emergency declarations, highlighting policies which local authorities and mayors have direct power over (e.g. standards on new buildings; local public transport systems).
  - National standards that can be followed to ensure consistency while enabling local areas to meet their ambitions.
- **Assessing local strategies** for their emissions reduction potential and ensuring they **fit into the national picture** and are consistent with a net-zero target of 2050 or earlier. Respondents suggested that this could be done by:
  - Summarising local strategies and using case studies to exemplify how progress is achieved at local scales and how this could integrate with national targets.
  - Assessing strategies against a consistent set of metrics (e.g. expected decarbonised heat deployment between electrification and hydrogen, CCS deployment, electric vehicle rollout).
  - Assess the differential between local ambition and national policies and targets, including how many local targets are underpinned by roadmaps for action and where additional support may be needed to deliver action (e.g. local authorities which may not have the resources to implement the necessary measures).

Some respondents also highlighted concerns relating to differing local ambitions, for various reasons:

- There is currently a lack of consistency in Net Zero dates chosen by local areas, presenting a risk that decarbonisation plans do not align with the national strategy.
- A lack of coordination between local areas, especially where solutions cross area boundaries, could increase the cost and difficulty of delivering Net Zero across the UK.
- Standards are not consistent – e.g. local authorities are pursuing a range of emission and congestion zone measures each with different parameters, which could present difficulties for freight fleet operators to reconfigure their fleets, as well as confusion for vehicle owners.

Many respondents also noted the pressure local areas face from their constituents to do more on the climate and their limited technical capability and ability to act, given historic cuts to local authority funding. Respondents highlighted the need for central Government to strengthen local government's analytical capacity and ensure additional tools and resources are available for local authorities to contribute to climate action, from planning through to delivery stages, e.g.:

- Developing climate-related skills/awareness across local government departments.
- Developing best practice frameworks for local areas (e.g. urban planning and civil engineering guidelines).
- Providing longer-term support/funding to develop sustainable projects.

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?

Sixty-eight responses were submitted to this question. Several respondents felt that it was possible to manage any impacts from carbon budgets if policy was well-designed. However, most respondents did not directly address this part of the question and some stated that they did not feel they could respond, for example:

- "This is a very important question (in two key parts) and not one that can be effectively answered at this time. Climate change/energy policy research has simply not been directed to date to address these types of questions in a cross-cutting way." – Centre for Energy Policy Research, University of Strathclyde

Many respondents did, however, provide views on critical elements of policy design to mitigate negative impacts. Amongst the most mentioned were:

- **Applying a whole systems approach**. By undertaking economy-wide, multi-sectoral analyses (e.g. which account for relationships between energy, transport, buildings, heat, industry etc.). Respondents highlighted the need to do this at both sector and project level and suggested that policy and fiscal decisions could not be made by a single Government department without consulting other relevant departments.
- **Collaborating with the private sector**. Several respondents felt there was a strong case for private sector involvement in delivering net-zero solutions and that Government should develop policy mechanisms that encourage businesses to invest in and deploy solutions.
- **Incentivising cost reductions**. By, for example, creating market mechanisms capable of boosting competition such that the lowest-cost solution is brought forward. Several respondents referred to the experience with contracts-for-difference in bringing down costs of renewables as an example of a policy which succeeded in achieving this.
- **Recognising wider benefits**. Policy design should focus on unlocking benefits (e.g. health and well-being, energy savings, economic opportunities, job creation potential).
- **De-risking**. Innovation (e.g. providing seed funding to kickstart decarbonisation projects); low-carbon infrastructure projects to bring down costs (e.g. via regulated asset base arrangements).

- **Affordability**. Targeting funding for policies with lower abatement costs using metrics such as tonne of CO_2 abated or future abatement potential to gauge where limited funding should be targeted to ensure maximum abatement for a given level of investment.
- **Long-term certainty**. Both fiscal and regulatory, through mechanisms such as the Energy White Paper.
- **Fairness and equity**. Provide intra-generational and spatial equity; support the least able to pay (e.g. by delivering energy efficiency via a national programme funded through generation taxation).
- **Polluter pays principle**. Ensuring carbon-emitting activities are penalised (e.g. via carbon pricing) and carbon-sequestering ones supported, which should encourage businesses to respond quickly and innovatively to deliver decarbonisation cost-effectively.

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?

Eighty-one respondents submitted answers to this question. Responses covered two broad – and linked – elements of the just transition: how costs of decarbonisation are distributed and impacts of decarbonisation on employment. Several respondents provided suggestions which encompassed both elements:

- Establish a **Just Transition Commission** (akin to the Scottish Just Transition Commission) or several similar bodies looking at each UK region to ensure that costs are shared and opportunities brought by the transition maximised, whilst taking account of sub-national contexts. Related suggestions included developing an economy-wide **Just Transition Strategy**.
- Ensure the process for allocating costs and managing employment impacts is **open and deliberative** by e.g. working with citizens' assemblies.
- **Mapping sectors, places, communities/social groups** at risk, to develop targeted interventions for a just transition.

Relating to the distribution of **costs**, respondents highlighted several factors which should be considered to deliver a just transition, particularly in sectors which are most likely to elicit high transition costs for **households and consumers** (e.g. buildings, electric vehicles):

- **Consider differences in circumstances**. Including in income (which will affect e.g. the ability to pay for upfront energy efficiency retrofits, more expensive electric vehicles, etc.) and in location (e.g. living in urban or rural areas will influence dependence on cars or public transport).
- **Avoid regressive policies.** So far much of the funding for decarbonisation has been levied onto energy bills, but policies that increase household energy prices tend to burden low-income households more than other groups. Future costs should be carefully managed to avoid further regressive impacts.
- **Provide support where upfront costs are high.** Many households are capital-constrained which means solutions with high upfront costs, even if cheaper over their lifetime, will be out of reach. Many people, not just low-income households, will need help investing in e.g. energy efficiency retrofits, new heating systems, electric vehicles.

- **Correct the imbalance between gas and electricity prices**. The cost of decarbonisation currently falls largely on electricity rather than gas bills. Costs should be allocated across fuels to recognise their function in delivering decarbonisation. This change should be managed to ensure alternatives are available to consumers or support mechanisms are in place to avoid negative impacts where e.g. gas prices are increased.
- **Consider new business and funding models** to generate the levels of investment needed to achieve Net Zero. Investment to the levels required will need new and enhanced private market incentives and Government support (e.g. by incorporating low-carbon energy and infrastructure assets on Government balance sheets).
- **Consider co-benefits**. The co-benefits of Net Zero could justify increases in public spending/higher allocation of spending to decarbonisation measures with large co-benefits. These benefits should be considered in cross-departmental Government budgets (e.g. ensuring health budgets can be used to improve air quality and reduce carbon emissions).

Many respondents also addressed the significant **cost** of decarbonising **industry** which could result in offshoring of manufacturing if support were not provided. Views on how to mitigate negative impacts included: public investment in a CCS cluster and funding research and development into new technologies.

High costs and significant changes faced by industry, as well as other sectors (e.g. agriculture and land use, oil and gas), could also result in negative employment impacts unless managed. Amongst the key issues cited in delivering a just transition for workers were:

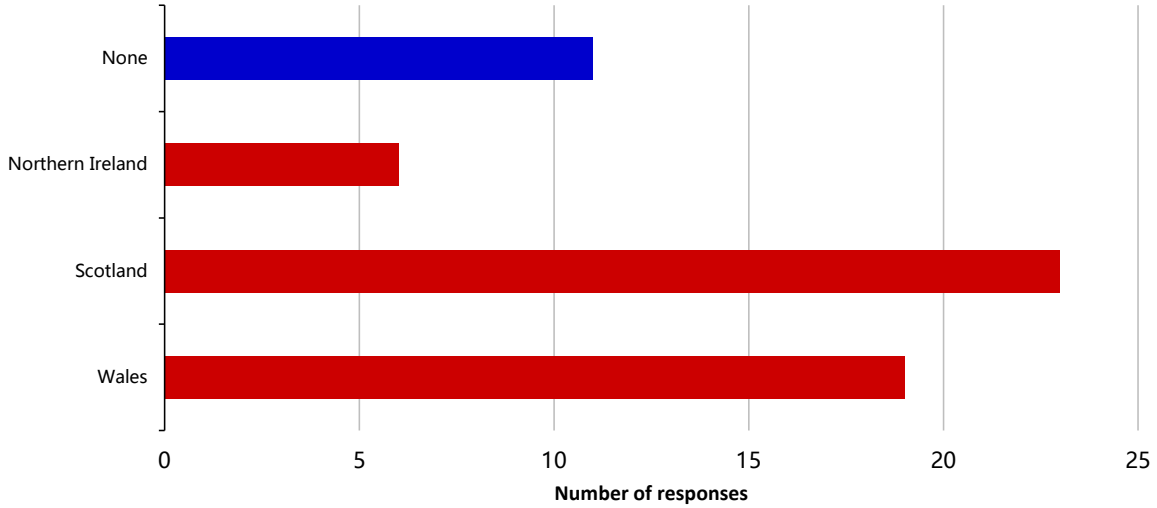
- **New industries** can play a major role in providing new investment and reliable employment. Expertise from related industries that may decline can be transferred to these new industries (e.g. North Sea oil and gas industry expertise can benefit CCS; gas boiler engineers can be redeployed to address skill shortages in the design and installation of low-carbon heating systems).
- For the above to be possible **public funding to retrain/reskill** will be needed to support workers in all industries that may decline/change.
- **Companies have a role to play**. This could involve identifying continued employment within the business, working with unions and employees to provide opportunities for staff based on their specific circumstances, pulling together external opportunities (e.g. job fairs, links to local recruitment agencies).

D. Wales, Scotland 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?

Forty-four responses to this question were submitted. Most respondents provided answers which mentioned one or more of the devolved administrations (DAs), with 23 responses referencing Scotland, 19 referencing Wales and 6 referencing Northern Ireland (Figure 6).

Figure 6. Responses mentioning each of the devolved administrations



Source: CCC analysis.
Notes: 'None' refers to responses which mention issues to be taken into account across all of the devolved administrations without mentioning a particular one.

A quarter of responses (11) did not reference any of the DAs in particular, but rather mentioned circumstances that should be taken into account in all of them:

- **Coordination and consistency**:
  - Ensure UK legislative/regulatory frameworks in areas the DAs are reliant on do not present a barrier in pursuing greater climate ambitions, by providing additional flexibility and support.
  - Encourage similar targets across the UK, where possible, as different rules and obligations increase costs and administrative burdens for businesses operating throughout the UK and could lead to competitive distortions between the DAs.
- **Land use and geographical characteristics**. Including subsurface geology, access to feedstocks for anaerobic digestion, access to the grid (e.g. harder for rural areas), land use characteristics, proximity to industry/potential CCS clusters.
- **Socio-economic characteristics**. Including fuel poverty, availability of skills and supply chains, and housing market conditions.

- **Industrial composition**:
  - Varying contribution of industry to national emissions between the DAs set against the need to coordinate elements of industrial policy at UK level (e.g. replacement to the EU ETS after Brexit).
  - Emissions from offshore oil and gas production count against the UK-wide targets but DAs will be affected differently by policies which affect the sector.

The specific circumstances mentioned by respondents, for each DA, were:

- **Wales:**
  - **Institutions and current ambition.** Many responses pointed to Wales' ability to increase its ambition in light of several factors, such as:
    - The Wellbeing of Future Generations Act suggests political appetite for strong action and long-term, sustainable thinking across public bodies in Wales. It can also help to work against siloed decision-making that occurs elsewhere in Government.
    - Strong communities and networks in Wales can facilitate behaviour change; expertise such as at CAST, based at Cardiff University, can be easier to deploy in a smaller country with close connections across civil society.
    - Wales has committed to end fossil fuel extraction and the last remaining coal-fired power station (Wales' largest single emitter) is about to close.
    - The Welsh Government has declared an ambition to achieving Net Zero by 2050, which goes further than the CCC's recommendation for Wales. The CCC should provide pathways in the Sixth Carbon Budget to achieve this ambition (as well as to achieve the CCC's recommended target).
  - **Surface transport:**
    - Rural transport issues and lack of public fuelling infrastructure for hydrogen and electric vehicles means significant investment is needed to enable operators to transition to alternative fuels and power.
    - Some respondents also mentioned the lack of compressed natural gas (CNG) refuelling infrastructure, but we note that CNG does not feature in CCC scenarios as it still involves significant CO_2 emissions.
  - **Industry.** The industrial makeup of Wales, which is more dominated by hard-to-abate industrial sectors than England and Scotland, will heavily impact on the ability to decarbonise.
  - **Power:**
    - Significant onshore wind potential.
    - Need to consider planning and grid adequacy to support onshore wind potential (particularly pertinent in mid-Wales which is not well served by the high voltage national electricity transmission network) – i.e. by ensuring access to proximate and robust transmission and distribution grid infrastructure.
    - Onshore wind in Wales is more expensive than e.g. offshore wind in Scotland. It is suggested that Wales is penalised by being the location that balances the intermittency of renewable supply with flexible generation for Scotland and

England. Wales' targets should reflect interconnection with England – regionalising carbon emissions is not appropriate and drives expensive local policy and decisions.

  - **Agriculture and Land use:**
    - Wales has large areas of land which would be suitable for forestry and natural regeneration, which also offer scope for productive forests and woodlands and opportunities for use of wood in construction.
    - Wales has 30% of Britain's sheep population and the environment is increasingly over-burdened with methane, ammonia and other pollutants. Large reductions in stock numbers are required and through other use of the land would also allow rural areas to contribute to Net Zero with additional potential benefits (e.g. no dependency on bioenergy with CCS (BECCS); reducing food imports; carbon sequestration).

- **Scotland:**
  - **Institutions and current ambition.** Respondents pointed to several differences in resources and ambition between the Scottish and UK governments which can benefit climate action in Scotland:
    - Scotland has made good progress on decarbonisation so far and is further down the path to Net Zero than the UK as a whole. Its targets for 2030, 2040 and their Net Zero target date of 2045 are also more ambitious than the UK as a whole.
    - Scotland is in a position to move relatively more quickly due to further developed discussions about the just transition. There is an opportunity to utilise the existing structure of the Just Transition Commission to monitor progress and provide recommendations to Government on decarbonisation policies that also improve social inclusion.
  - **Surface transport:**
    - Challenging geography for zero emissions logistics as the country has relatively low population density, increasing mileage per tonne of goods transported.
    - Electric vehicle charging infrastructure is well developed compared to the UK average and there is a strong commitment to electrifying the entire public sector car fleet by 2025.
  - **Industry:**
    - Scotland has a higher exposure to employment sectors at risk during the energy transition (e.g. oil and gas, chemical industries) than the rest of the UK.
    - These are high value industries which also support competitive supply chain activity. The value delivered by these industries in creating/retaining jobs, as well as the quality of these jobs, needs to be considered in developing decarbonisation policies.
  - **Buildings:**
    - Several respondents mentioned the composition of homes in Scotland as a factor to consider, namely: a higher proportion of 'hard to treat' homes, extensive tenement areas in cities, 260,000 domestic customers using high-carbon fuel sources (e.g. coal, oil and liquefied petroleum gas (LPG)) for heating. These factors point to different solutions being deployed in Scotland for improving domestic energy efficiency,

decarbonising home heating systems and making provision for charging electric vehicles.

- The characteristics of Scotland's gas network and its geography suggests it has scope to be one of the first regions of the UK to convert to hydrogen for heating.
- Many respondents highlighted areas of decision making which are reserved or where Scottish actions/pathways will rely on UK Government policies and decisions, for example: the Scottish government decision to ensure new build homes use renewable or low carbon heating from 2024 requires financial support and action to ensure supply chain readiness, installer training and consumer awareness; decisions on how to decarbonise heat at scale can only take place after the UK Government's enabling decisions expected in the mid-2020s on the long term role of the gas network.

– **Power:**

- Significant potential for wind (onshore, offshore, floating offshore) power, tidal power, wave power and further large pumped storage facilities. Renewable potential could also provide opportunities for production from both curtailed and dedicated hydrogen electrolysis.
- Respondents had diverging views on utilising renewable potential in the Islands of Scotland. Some highlighted that connecting them to the mainland grid could enable significant renewable resources (e.g. floating offshore wind and emerging ocean energy technologies). Others raised concerns that developing renewables in these areas, via existing CfD mechanisms, will increase pressures on wildlife and habitats whilst excluding the opportunity for mainland onshore wind to be deployed in less ecologically sensitive locations.[2]
- Renewables are progressing well in Scotland where market rules allow, but support for new renewables should be boosted, which relies on the UK government policy - e.g. allowing established renewable technologies, including onshore wind, into CfD auctions.
- Not all areas of Scotland have access to proximate and robust transmission and distribution grid infrastructure that enables the deployment of renewable energy technology. New infrastructure in these areas will be necessary.

– **Agriculture and Land use**:

- Greater potential for nature-based mitigation solutions (e.g. restoring peatland, forestry, marine habitats like kelp and seagrass).
- Specific rural context – e.g. more than 80% of land is defined as Less Favoured area; land is dominated by a small number of very large land owners; higher relative proportions of livestock and arable farming. Recognition that food production involves emissions which cannot be reduced to zero and there will be a need to ensure that changes in land use are offset by suitable payments/do not damage farm incomes.

[2] Note, this call for evidence ended before the UK Government announced that future CfD auctions would allow entry from onshore wind and solar projects.

- **Northern Ireland:**
  - **Institutions and current ambition:**
    - The Northern Ireland Assembly has just returned, which provides an opportunity to make the low-carbon transition a priority.
    - The CCC has not set out a pathway to Net Zero for Northern Ireland and there is considerable disparity in emissions reduction progress with the rest of the UK. This is a critical moment for the CCC to recommend a robust net-zero pathway for Northern Ireland.
  - **Surface transport**:
    - Northern Ireland has no public fuelling infrastructure for CNG (which we again note is not considered to be necessary in the CCC's net-zero scenarios) or hydrogen and limited electric charging points, progress must be made to provide this for potential users before they invest in such vehicles.
    - Plans should consider cross-border road networks, air quality zones and supply chains between the Republic of Ireland and Northern Ireland, as commercial vehicles routinely operate across borders.
    - Society is very car dependent due in part to public transport limitations.
  - **Buildings.** Northern Ireland has a large number of off-grid homes where rapid roll-out of heat-pumps could be prioritised.
  - **Power:**
    - Northern Ireland is part of the whole of Ireland electricity grid which means decarbonisation rates are influenced by decisions made in Ireland. The UK's departure from the EU changes the operating context of the Single Electricity Market and the CCC's advice should take this into account.
    - Northern Ireland's Strategic Energy Framework expires at the end of 2020 and there is currently no route to market for new renewable installations.
  - **Agriculture and Land use**. The land use and agriculture sector in Northern Ireland is a net carbon emitter rather than a carbon sink. Woodland expansion should be enabled to make a meaningful contribution to achieving the UK's net-zero target.

Questions on Welsh emissions targets

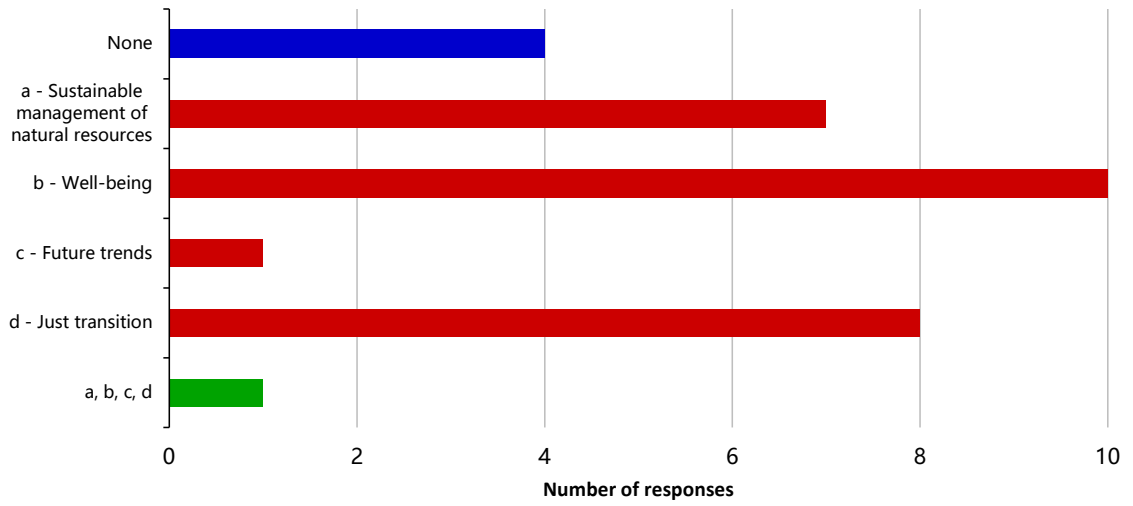
Question 14: The Environment (Wales) Act 2016 includes a requirement that its targets and carbon budgets are set with regard to:

- ***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).***

Views were requested on each element of these requirements and about achievement of a just transition in Wales. Nineteen responses were submitted to this question. Proportionately more responses were received from NGOs (32%) and individuals (11%) than in the Call for Evidence as a whole. Most respondents (63%) did not cite particular pieces of evidence.

Section b) of the question (which relates to well-being) received the most responses. Only one respondent addressed all four parts of the question (Figure 7).

Figure 7. Responses to each section of question 14



Source: CCC analysis.
Notes: 'None' refers to general responses which do not address any section of the question in particular.

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?

Responses to this section ranged from suggested areas of work the CCC should look into, stakeholders to reach out to, as well as pieces of evidence to consider:

- **Evidence** cited by respondents included Natural Resources Wales' State of Natural Resources Reports from 2016, 2019 and the Interim Report for 2020.

- **Stakeholders** that respondents suggested the CCC should reach out to included National Trust (who are large landowners in Wales and may have carried out/have plans to carry out climate impact assessments on their properties) and the NGO Wood Knowledge Wales (which has a work stream on biodiversity and submitted a response to this Call for Evidence).
- **Areas of work** to look into mentioned by respondents included:
  - Flood alleviation by catchment area and the impact of sea level rise on coastal communities.
  - Where Wales' natural resources (existing and potential, through nature restoration) can provide emission reduction and adaptation to make up Wales' contribution to the sixth carbon.
  - The possibility to promote silvopasture as a means of enhancing economic opportunities in Less Favoured Areas whilst delivering carbon sequestration and biodiversity gains.

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?

For this section, answers included suggested pieces of evidence as well as views on risks/opportunities for well-being from acting on climate change in Wales:

- **Evidence** cited by respondents included:
  - The Active Travel (Wales) Act 2013
  - Welsh Government (2019) The impact on health of the Welsh Government Warm Homes Schemes, https://gov.wales/impact-health-welsh-government-warm-homes-schemes-html
- Views on **opportunities** to improve people's well-being from emissions reducing activities in Wales included:
  - Providing people with stable employment (e.g. in green industries; through localised efforts to conserve/restore natural ecosystems) and generating local economic benefits.
  - Improving health (from e.g. better air quality, more access to green space, more tree cover on streets).
- Views on **risks** to well-being from emissions reducing activities included:
  - Afforestation and reduced ruminant production could impact the well-being of farmers and rural communities in Wales.
  - Risk of carbon leakage in industry (particularly due to the Welsh Government's approach to measuring carbon budgets on a net rather than gross basis).

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?

Only one response to this section was provided which suggested as useful evidence the National Infrastructure Commission for Wales' first Annual Report (2019) and accompanying baseline data.

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?

Evidence cited by respondents in relation to this section included:

- European Environment Agency (2011) Air pollution impacts from carbon capture and storage, https://www.eea.europa.eu/publications/carbon-capture-and-storage
- Liquid Gas UK (2019) A Practical Approach: Analysis of Off-Grid Heat Decarbonisation Pathways, https://www.liquidgasuk.org/resources/a-practical-approach-analysis-of-off-grid-heat-decarbonisation-pathways
- Liquid Gas UK (2019) Biopropane: Feedstocks, Feasibility and our Future Pathway, https://www.liquidgasuk.org/uploads/DOC5DA5B52BBA49F.pdf

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?

Eleven responses to this question were submitted, the vast majority of which (82%) did not submit evidence to support their views. Amongst the comments made relating to the appropriate level of Wales' third carbon budget and interim targets:

- **Emissions trajectories and budget level**. Respondents had differing views on the level of ambition that may be possible in Wales:
  - Some respondents felt that decarbonisation in Wales may be more challenging than elsewhere in the UK (e.g. because of the role of the agricultural and industrial sectors in Wales) and that this needs to be reflected in the UK-wide Sixth Carbon Budget.
  - Others consider that the Committee has taken too negative a view on the possible emissions trajectory in Wales and steeper reductions than for the UK as a whole are possible (e.g. due to the Wellbeing of Future Generations Act, commitment to end fossil fuel extraction).
- **Industry**. The share of burden put on energy intensive industries in Wales should not go beyond the UK as a whole so as not to risk putting Welsh industry at a disadvantage.
- **Power**:
  - There is scope to increase the Welsh Government's target to meet 70% of Welsh electricity demand from renewables by 2030 in light of the new long-term target (of 95% reduction in emissions relative to 1990 levels by 2050).
  - Wales is well interconnected with the rest of UK and generates more power than it consumes. Wales' renewable ambition should be set as a share of total generation (not just Welsh demand) to reflect its renewable potential relative to other areas of the UK.
- **Agriculture and Land use.** Carbon budgets for Wales must take into account the importance of the agricultural sector and policy proposals must take care not to impact food security and disproportionately impact rural and farming communities.

The pieces of **evidence** suggested were:

- Government Office for Science (2011) Foresight. Future of Food and Farming Report, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/288329/11-546-future-of-food-and-farming-report.pdf
- National Grid's Zero2050 Project which aims to speed up progress in decarbonising South Wales, https://www.zero2050.co.uk/
- Wales and West Utilities' Hybrid-Hydrogen (HyHy) Project, https://www.smarternetworks.org/project/nia_wwu_060

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

Fourteen respondents submitted answers to this question. Just under half of all respondents (six) suggested references to consider (with some suggesting multiple references). These were:

- **Scottish Government policies**:
  - Scottish Government (2019) Draft Offshore Wind Policy Statement, https://consult.gov.scot/energy-and-climate-change-directorate/draft-offshore-wind-policy-statement/
  - Scottish Government (2015) Decarbonising heat: policy statement, https://www.gov.scot/publications/heat-policy-statement-towards-decarbonising-heat-maximising-opportunities-scotland/
  - Transport Scotland (2020) National Transport Strategy, https://www.transport.gov.scot/our-approach/national-transport-strategy/
- **Buildings**:
  - SGN's Aberdeen Vision Project, https://sgn.co.uk/about-us/future-of-gas/hydrogen/aberdeen-vision
  - Scottish Renewables (2019) Piping hot: Building heat networks to tackle the climate emergency, https://www.scottishrenewables.com/publications/527-piping-hot-building-heat-networks-to-tackle-the-climate-emergency
- **Power**:
  - Marine Scotland (2019) Sectoral Marine Plan for Offshore Wind Energy 2019 - draft Plan Options, http://marine.gov.scot/information/sectoral-marine-plan-offshore-wind-energy-2019-draft-plan-options
  - HM Government (2020) Offshore wind: Sector Deal, https://www.gov.uk/government/publications/offshore-wind-sector-deal
  - Crown Estate Scotland's upcoming ScotWind Leasing cycle
- **Agriculture and Land use**:
  - Organic Policy, Business and Research Consultancy (2019) Delivering on net zero: Scottish Agriculture, https://www.wwf.org.uk/updates/new-report-scotlands-agriculture-can-cut-emissions-nearly-40-2045-0

- **Other reports commissioned or prepared by NGOs**:
  - Tyndall Centre and Upsalla University (2018) Quantifying the implications of the Paris Agreement: What role for Scotland?, https://foe.scot/wp-content/uploads/2018/11/Scotlands-role-in-the-Paris-Agreement_-Tyndall-Centre-research.-May-2018.pdf
  - Vivid Economics and WWF Scotland (2019) Delivering on net zero: next steps for Scotland, https://www.vivideconomics.com/casestudy/delivering-on-net-zero-next-steps-for-scotland/
  - Climate Emergency Response Group (2020) Funding the 12 immediate actions for Scotland's Climate Emergency Response, https://www.changeworks.org.uk/sites/default/files/CERG_budget_briefing.pdf

Many respondents also provided **views** on issues like the appropriateness of the existing Scottish interim targets, need for policy action and balancing devolved and reserved powers:

- **Existing targets**. Several respondents provided views on Scotland's current interim targets. Most of these felt that existing targets were appropriate, although not all agreed:
  - "The targets were set on the basis of bottom-up technical feasibility, rather than an equitably apportioned share of the global carbon budget for 1.5ºC. As a wealthy nation with greater historic responsibility for contributing to climate change, Scotland must deliver our fair share of emissions reductions. Using a Fair Shares analysis which takes into account Scotland's historical responsibility for contributing to the climate crisis and our higher capacity to tackle emissions, it is clear that Scotland needs to be on a much steeper trajectory and reaching 100% emissions reductions earlier." – Friends of the Earth Scotland
  - "We are therefore of the view that the ambitious targets set for Scotland – 75% by 2030 – are right and achievable. It is only by setting such ambitious targets and supporting them with the right policy frameworks that the net zero ambition. To achieve it, however, will require a step up in heat policy and support." – Vatenfall
- **Policy**:
  - Several respondents highlighted the need for strong and early policy action to deliver against targets, in addition to policies that have already been committed, particularly in areas like buildings, transport and agriculture and land use (where targets will be more challenging given expected emissions inventory changes).
  - Some respondents also considered key strategic decisions/implementing measures to be as important as interim targets.
- **Balancing reserved and devolved powers**. Points made on this issue included:
  - Scotland is reliant in a number of areas on UK-wide frameworks:
    - It is important to understand what proportion of Scottish interim targets are contingent on actions delivered via reserved powers.
    - There should be scope for additional flexibility on policy and regulatory frameworks in these areas to help Scotland reach its more ambitious targets.

  - In sectors where the Scottish Parliament has the majority of powers (e.g. buildings, agriculture, transport, and land use) new policy implementation will be required on top of existing policy.

Respondents also provided views on a number of sector-specific issues:

- **Buildings**. Targets must take into account the expected timeline for key decisions on how heat will be decarbonised which are reserved to the UK Government and not expected until around 2024.
- **Industry**. Scotland should ensure it does not put more burden on its energy intensive industries compared to the rest of the UK.
- **Power:**
  - Progress in the offshore wind sector and potential for further deployment of onshore wind and offshore wind at scale may enable more ambitious targets for Scotland.
  - Scotland has interim targets in the Scottish Energy Strategy which were set prior to the adoption of a 2045 net-zero target, which should be reviewed in the light of the new target.
- **Agriculture and Land use**. Some respondents felt that targets in the sector are already extremely ambitious. More stretching targets could create problems should expected developments not emerge (e.g. in technology). Ambition should be realistic and targets that might not be deliverable should not be set.
- **Aviation**:
  - Aviation is a reserved matter which means the potential to reduce flights between the central belt and London has not been considered by Scottish Government.
  - However, the Scottish Government has been supportive of the potential of an extension of high speed rail which could have the effect of reducing aviation demand.
  - Policies should consider the contribution of tourism to Scotland's economy (which may be affected by aviation demand management policies in UK and beyond).

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?

Thirty-seven responses to this question were submitted, the majority of which (nearly 70%) came from business and industry.

Amongst the areas most mentioned where devolved and UK decision making need to be coordinated:

- **Defining budgets**. Welsh and Scottish budgets are defined on a gross basis whilst UK budgets are on a net basis. Several respondents felt that if decision making between the UK and the DAs were not coordinated effectively to account for this, there could be a risk of leakage of activity, jobs and emissions within the UK.
- **Environment**. Although much is devolved in this area, a common framework and approach to environmental regulation is needed to ensure coordination of aims between the UK

government and the DAs on matters of environment, emissions reduction and biodiversity and environmental net gain.

Many sector-specific issues were also mentioned:

- **Surface transport**:
  - Consistency on HGV refuelling stations across the UK will be important to enable nationwide journeys. Businesses should be able to purchase vehicles that can be used throughout the UK.
  - Emissions standards should be consistent across the DAs. Given the need for consistency also between Northern Ireland and the Republic of Ireland, emissions standards will have to consider both UK and EU rules. Consistent policies are also important to avoid consumer confusion on vehicle technologies.
- **Buildings**:
  - Although regional solutions may emerge due to characteristics of particular areas, an uncoordinated approach to the decarbonisation of heat could put the net-zero target at risk if the different infrastructure requirements are not in place to support different solutions.
  - A piecemeal approach could also increase costs (e.g. reducing economies of scale, resulting need to invest in multiple infrastructure networks).
- **Industry**. Decarbonising industry relies on policies on CCS, hydrogen, electricity prices, and carbon border mechanisms, which are designed on a UK basis. Lack of coordination also increases the risk of increased administrative burdens for industry and competitive distortions within the UK.
- **Power**:
  - Land availability and renewable generation potential differ across the DAs. Coordination will be critical to maximise opportunities and minimise costs. Ambitions of the DAs on this area also differ and UK-level decisions and mechanisms will be needed to ensure the delivery of these ambitions.
  - Coordinating electricity transmission and distribution requirements between the DAs will be important. The DAs have different decarbonisation ambitions but a single settlement for electricity distribution via RIIO-2.
- **Agriculture and Land use**. Devolved and UK decision making in land use should be coordinated across the UK as a whole to achieve targets, as the DAs have different mitigation options available.
- **Infrastructure**. Some industrial clusters (e.g. South Wales) do not have nearby CO_2 storage availability. CCS policy and utilisation of strategic resource should be coordinated.

Respondents also suggested ways in which decision-making could be coordinated to ensure the best outcomes:

- **Central Government planning and coordination**:
  - The UK Government should set the overall trajectory to Net Zero through strong long-term policy and be well attuned to requirements of devolved regions and how they can be incorporated into a national strategy.

  - Central Government should consult with the DAs to help to achieve targets and provide funding to supplement local and private funding and ensure all parts of the country are in a position to deliver on Government policy.
  - Institutional fora can provide platforms to coordinate climate change plans and actions – e.g. COP26, the existing Joint Ministerial Committee.
- **Devolution**. Several respondents highlighted the need for greater devolution of powers to deliver against decarbonisation ambitions:
  - "We recognise that different geographies have different demands and can therefore a 'one size fits all' approach is not sufficient to address climate change issues. Devolved and local government should be given the ability (through funding and relevant powers) to better support growth in specific areas – for example heat and the electrification of transport – to meet local needs (albeit within a national framework)." – Vatenfall
  - "Devolution to regional bodies will be an important mechanism to drive decarbonisation at a regional level and focus the decarbonisation pathway to best suit the industries and communities in those regions." – The Carbon Capture and Storage Association
- **Standards and consistency**:
  - Decarbonisation pathways chosen by DAs must be consistent with national pathways.
  - Agreeing shared or mutually-recognised standards across DAs (e.g. from the International Standards Organisation, product standards, competence schemes) where these are crucial challenges to decarbonisation (e.g. relating to heat pumps, building retrofit works).
  - Standards will also be important in relation to trade. Commonly agreed frameworks are required (particularly with respect to food) to avoid regulatory divergence, preserve integrity of the internal UK market and enable trade deals post Brexit.
  - Local and devolved administrations have power over planning process and regulation. These processes can add significantly to project timelines. Streamlined, coordinated and transparent processes will encourage projects to progress and facilitate decarbonisation.

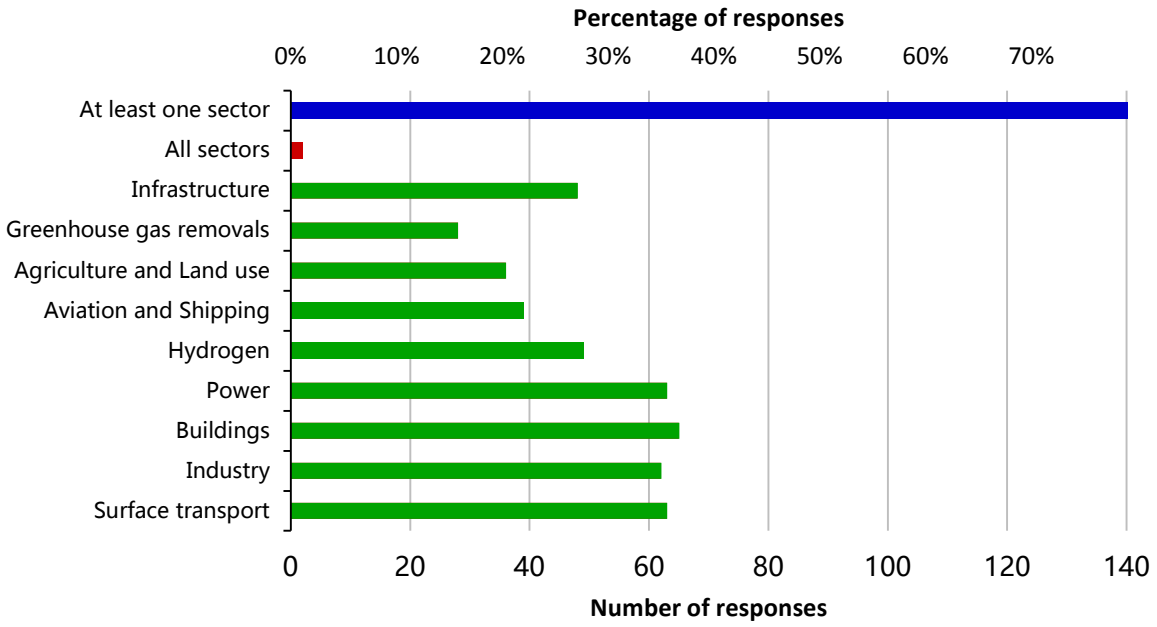
E. Sector-specific questions

Most respondents (nearly 80%) answered at least one sector-specific question (Figure 8). The sector which received answers from the most respondents was Buildings (65 respondents) followed by Surface transport (63 respondents) and Power (63 respondents).

The evidence submitted in response to questions in section E was considered by the CCC's sector teams and reflected in our Sixth Carbon Budget scenarios, where relevant. We will also reflect them in developing our advice on policy and progress in each sector. Although the sector-by-sector evidence is not summarised in this document, many of the key themes are already picked up in the earlier sections (especially sections B-D).

A table of respondents alongside the sectors questions they provided answers to and their full responses are available on the CCC's website.

Figure 8. Number of responses by sector



Source: CCC analysis.
Notes: Percentage of responses corresponds to responses by section proportionate to total responses received.

Annex - Call for Evidence respondents

Annex - Call for Evidence respondents

The table below shows every respondent to the Call for Evidence along with the sections they provided answers to. For section E we also show the sectors that were addressed by each respondent. A table of respondents alongside the questions they provided answers to and their full responses are available on the CCC's website.

Table A.1. Complete list of respondents and sections of the Call for Evidence they responded to

Respondent	A. Climate science and international circumstances	B. The path to the 2050 target	C. Delivering carbon budgets	D. Wales, Scotland and Northern Ireland	E. Sector-specific questions								
					Surface transport	Industry	Buildings	Power	Hydrogen	Aviation and shipping	Agriculture and land use	Greenhouse gas removals	Infrastructure
Academia, think-tanks and research centres													
Active Building Centre	X	X	X	X	X	X	X	X		X			X
Addressing Value of Energy and Nature Together Programme (UKERC)		X										X	
Andy Gouldson, University of Leeds		X	X							X			
Ben Anderson, University of Southampton		X					X	X					X
British Geological Survey		X	X	X		X		X	X			X	X

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Centre for Alternative Technology (CAT)	X	X	X	X		X	X	X	X		X		X
Centre for Climate Change and Social Transformations (CAST)		X											
Centre for Energy Policy, University of Strathclyde		X	X	X		X							
Centre for Research into Energy Demand Solutions		X								X			
Centre for Sustainable Road Freight, Cambridge University					X								
Climate Econometrics Research Program, University of Oxford	X	X	X			X		X					
David Reay, University of Edinburgh	X	X	X	X							X		

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Energy Policy Group, University of Exeter		X	X				X		X				X
Energy Systems Catapult					X		X	X					
EPSRC Freight Traffic Control Project					X								
European Marine Energy Centre	X	X											
European Marine Energy Centre	X	X			X	X	X	X	X	X			X
Grantham Institute - Climate Change and the Environment		X	X		X	X	X			X		X	
Institute for Transport Studies		X			X								
Kevin Anderson and Isak Stoddard	X	X	X							X		X	
Living Well Within Limits Project, University of Leeds		X	X										

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National Centre for Atmospheric Science	X	X	X		X								X
Nixon Sunny, Imperial College London		X					X		X				X
Priestley International Centre for Climate	X	X	X		X		X	X		X	X	X	X
Stephen Salter, University of Edinburgh	X												
Stockholm Environment Institute (Oxford Centre)	X		X			X						X	
Supergen Bioenergy Hub		X				X		X			X	X	
Business, industry and trade body													
ABB		X	X		X	X		X	X	X			
ADS Group	X	X	X	X		X							
AECOM								X					

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Agricultural Engineers Association						X							
Agricultural Industries Confederation	X	X				X					X		
Aldersgate Group	X	X	X		X	X	X	X	X	X		X	X
Anaerobic Digestion and Bioresources Association	X	X	X	X	X	X	X	X	X	X	X	X	X
Anglo American					X				X	X			
Arcadis			X		X		X	X					
Arup	X	X	X	X			X						
Atkins		X	X					X					
BEAMA					X	X	X	X	X				
British Ceramic Confederation	X	X	X	X		X		X	X				
British Hydropower Association			X					X					
British Industrial Truck Association						X			X				

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British Vehicle Rental and Leasing Association					X								
Calor Gas			X				X						
Carbon Intelligence	X	X	X		X	X	X			X			
Chartered Institution of Building Services Engineers	X	X	X	X		X	X		X	X	X		X
Chartered Institution of Highways and Transportation		X	X		X								
Chemical Industries Association	X	X	X			X		X	X				
Confederation of Forest Industries		X	X	X		X	X	X			X		
Confederation of Paper Industries	X	X	X	X	X	X	X	X	X		X		X
Confederation of Passenger Transport					X								

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Construction Equipment Association						X							
Country Land and Business Associations	X	X	X	X	X		X						
Decarbonised Gas Alliance	X	X	X	X	X	X	X	X	X	X		X	X
Deloitte	X	X				X		X	X	X		X	X
Drax	X	X	X		X	X		X	X	X	X	X	X
E.ON	X	X	X	X	X	X	X	X					X
EDF		X	X	X	X	X	X	X	X	X		X	X
Energy and Utilities Alliance		X	X		X		X		X				X
Energy Intensive Users Group	X	X	X	X		X		X					X
Energy Networks Association		X	X	X	X		X		X				X
Energy UK		X	X	X	X	X	X	X				X	X
Equinor		X	X			X		X	X				
Flogas		X	X				X						X

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Freight Transport Association		X	X	X	X	X				X			
Greenbackers Investment Capital	X		X	X	X	X		X		X	X		X
Halsette Energy Consulting		X	X				X	X	X				
Heat Pump Association							X						
High Speed Rail Group	X	X	X	X	X	X	X						
HS2 Limited					X								
Intelligent Innovation		X											
Intelligent Land Investments Group			X					X					
Jacobs								X	X				
Liquid Gas UK		X	X	X		X	X						
Logan PM			X					X					
Manchester Airports Group	X	X	X		X	X				X			

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Meat Promotion Wales											X		
Mineral Products Association	X	X	X	X	X	X	X	X	X		X	X	X
Morecambe Bay Conservation Grazing Co											X		
National Express		X	X		X				X				
National Farmers Union	X	X				X				X	X	X	X
National Farmers Union Cymru	X	X		X		X				X	X	X	X
National Farmers Union Scotland	X	X		X							X		
National Federation of Roofing Contractors							X						
National Grid			X		X	X	X	X	X			X	X
Natural Gas Vehicle Network					X								
Nuclear Industry Association	X	X	X					X	X				
Oil and Gas UK	X	X	X	X	X	X	X	X	X	X	X	X	X

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Orsted		X						X	X				
Passivhaus Trust							X						
ProPERLA UK							X						
Renewable Energy Association	X	X			X	X	X	X	X		X		X
RenewableUK								X	X				
Road Haulage Association					X								
Royal Institute of British Architects		X	X				X						
Royal Town Planning Institute		X	X	X	X		X						
RWE and Innogy		X	X	X				X	X				X
Sandgate Enterprises													
Scotch Whisky Association		X	X	X	X	X			X				X
Scottish Power	X	X	X	X	X	X	X	X	X				X
SGN	X	X	X	X			X		X				X
Solar Trade Association							X	X					

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SSE	X	X	X	X	X	X	X	X	X	X		X	X
Storelectric	X	X	X	X	X	X	X	X	X				X
Sustainable Energy Association							X						
Tata Steel	X	X	X	X	X	X			X	X		X	X
Tech UK		X	X		X		X	X	X				
The Association for Decentralised Energy		X	X	X			X	X					X
The Carbon Capture and Storage Association	X	X	X	X	X	X	X	X	X	X		X	X
The Carbon Mark project		X	X										
The Society of Motor Manufacturers & Traders		X	X	X	X								
Tidal Lagoon Power													
UK Chamber of Shipping										X			

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UK Hydrogen and Fuel Cell Association			X		X	X		X	X				X
UK Onshore Oil and Gas	X	X	X	X	X	X	X	X	X				X
UK Power Networks		X			X		X	X					X
UK Steel		X	X	X		X							
Vatenfall	X	X	X	X		X	X	X	X				X
Veolia	X	X	X				X	X			X		X
Wales and West Utilities		X	X	X	X		X	X	X	X		X	X
Non-governmental organisations (NGOs)													
Arundel Bypass Neighbourhood Committee					X								
Aviation Environment Federation	X	X	X						X	X			
Bedfordshire Climate Change Forum	X	X	X										

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Beicio Bangor	X	X	X		X								
Bellona Foundation	X	X	X		X	X			X				X
Biofuelwatch, Dogwood Alliance, the Natural Resources Defense Council and the Southern Environmental Law Center	X	X	X			X		X				X	
Campaign to Protect Rural England			X		X		X	X		X	X		X
Carbon Free Group	X	X	X				X						
Christian Aid	X	X	X	X	X	X		X	X	X	X	X	
ClientEarth		X											
Friends of the Earth	X	X	X	X	X	X	X	X	X	X	X	X	X
Friends of the Earth Scotland	X	X	X	X		X			X			X	X

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Game and Wildlife Conservation Trust	X	X	X	X			X				X		
Global Witness	X		X			X							
Green Alliance	X	X	X		X	X	X			X	X		
Joan Pye Project			X					X					X
National Energy Action		X	X				X						
Platform London			X			X							
Royal Horticultural Society	X		X								X		
RSPB	X	X	X	X			X	X			X	X	X
Sheffield Climate Alliance			X										
Size of Wales	X	X	X	X							X		
Stay Grounded Network										X			
Stretton Climate Care		X	X		X		X	X		X	X		
Sustainable Food Trust	X	X	X	X						X	X		

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Trees and Design Action Group	X	X	X	X	X		X		X	X	X		
Woodknowledge Wales		X	X	X		X	X	X			X		X
Other and individuals													
Alexandra Phillips	X	X	X		X	X	X						
Allan Samuel	X	X									X		
Amalie Fisher		X											
Bill Thicknes	X	X	X										
Brian Drummond	X	X	X					X				X	X
Charles Stirling													
Chris Lowe										X			
Crown Estate Scotland			X	X			X	X	X	X	X		
David Dwyer		X			X								
EU Energy and Environment Sub-Committee, House of Lords	X		X	X		X							
Glenn Strachan	X	X	X	X			X				X		

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Historic Environment Scotland							X				X		
John Bacon					X						X		
Michael Jenkins													
Michael Lomotey	X	X	X	X						X			
Paula Klaentschi					X		X			X			
Richard Ebley	X	X	X	X	X	X	X	X					
Robert Palgrave												X	
Richard Vere Compton													
Rupert Fausset		X			X				X				
Steve Ketteringham	X	X	X	X			X				X		
Timothy Rickman			X					X					
Tina Irving													

Source: CCC analysis.
Notes: 'Business, industry and trade body' includes consultancies. Some respondents did not answer specific questions, but submitted general views/evidence. Many academics are individuals rather than research groups. These individuals have been listed in the 'Academia, think-tanks and research centres' section.