

December 2020

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# The path to Net Zero and reducing emissions in Wales

Executive summary

Advice Report: The path to a Net Zero Wales

Climate Change Committee

December 2020

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# The Committee



**The Rt. Hon John Gummer, Lord Deben,**  
Chairman

Lord Deben was the UK's longest-serving Secretary of State for the Environment (1993 to 1997). He has held several other high-level ministerial posts, including Secretary of State for Agriculture, Fisheries and Food (1989 to 1993). Lord Deben also runs Sancroft, a corporate responsibility consultancy working with blue-chip companies around the world on environmental, social and ethical issues.



**Baroness Brown of Cambridge DBE FRS**  
Deputy Chair

Baroness Brown of Cambridge DBE FREng FRS (Julia King) is an engineer, with a career spanning senior engineering and leadership roles in industry and academia. She currently serves as Chair of the CCC's Adaptation Committee; non-executive director of the Offshore Renewable Energy Catapult; and Chair of the Carbon Trust.



**Dr Rebecca Heaton**  
Wales Champion

Rebecca Heaton is responsible for Drax Group's efforts to mitigate climate change, ensuring that sound science underpins climate change policies and business strategy. She is also responsible for developing sustainability and climate change research programmes. Rebecca has a 20-year global career working at the interface between business, science and policy.



**Professor Keith Bell**

Keith Bell is a co-Director of the UK Energy Research Centre (UKERC), a Chartered Engineer and a Fellow of the Royal Society of Edinburgh. He has been at the University of Strathclyde since 2005, was appointed to the Scottish Power Chair in Smart Grids in 2013 and has been involved in energy system research in collaboration with many academic and industrial partners.



**Professor Nick Chater**

Nick Chater is Professor of Behavioural Science at Warwick Business School. He has particular interests in the cognitive and social foundations of rationality, and applying behavioural insights to public policy and business. Nick is Co-founder and Director of Decision Technology Ltd, a research consultancy.



**Professor Piers Forster**

Piers Forster is Director of the Priestley International Centre for Climate and Professor of Physical Climate Change at the University of Leeds. He has played a significant role authoring Intergovernmental Panel on Climate Change (IPCC) reports, and has a coordinating lead author role for the IPCC's sixth assessment report.



**Paul Johnson CBE**

Paul Johnson is Director of the Institute for Fiscal Studies and a visiting professor at University College London (UCL). He is widely published on the economics of public policy, and he co-wrote the 'Mirlees review' of tax system design. He was previously Chief Economist at the Department for Education (2000 to 2004).



**Professor Corinne Le Quéré FRS**

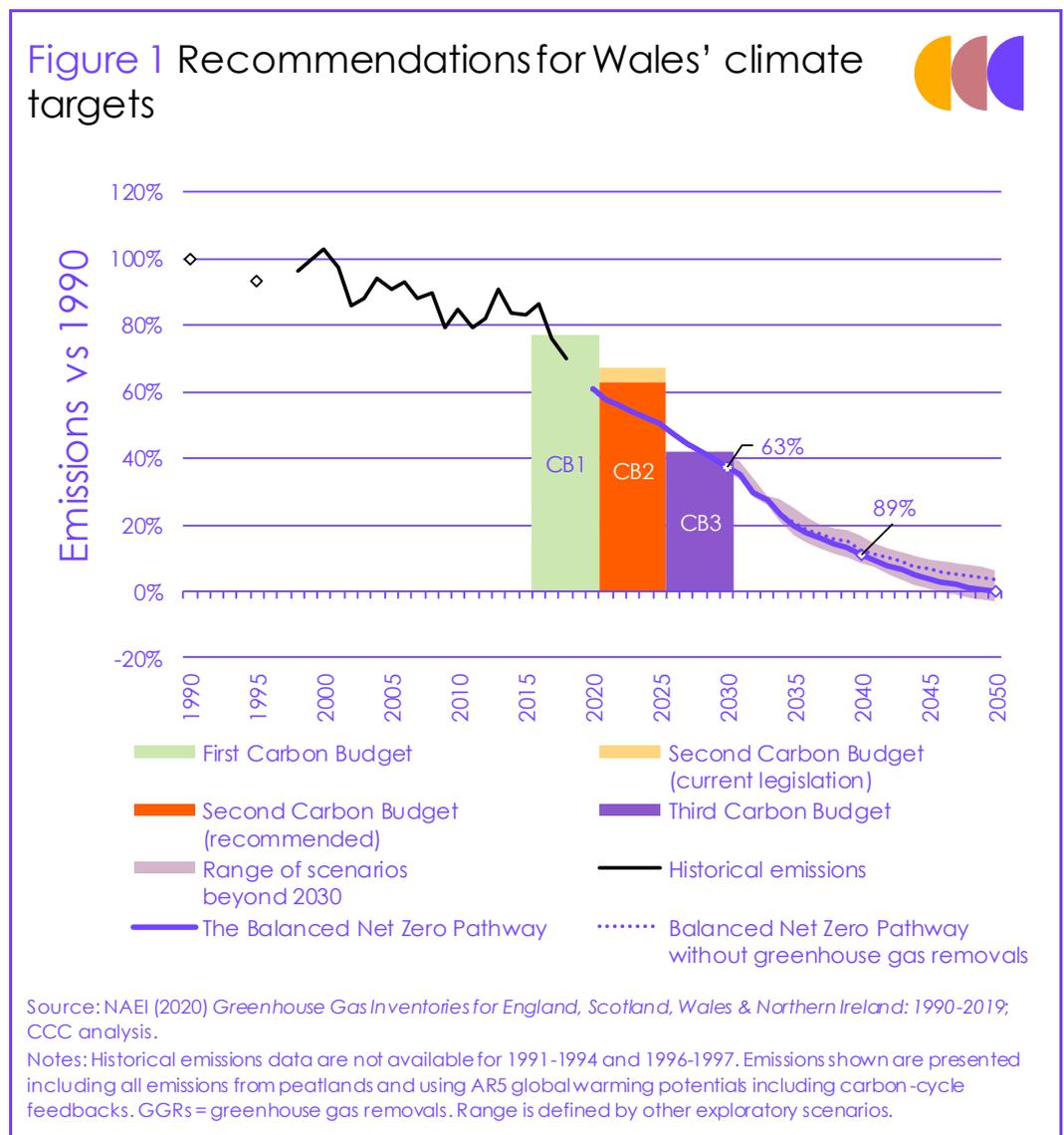
Corinne Le Quéré is Royal Society Research Professor of Climate Change Science at the University of East Anglia (UEA), where she conducts research on the interactions between climate change and the carbon cycle. Corinne is currently the Chair of the French Haut Conseil pour le Climat

# Executive summary

In 2019, the Committee advised the Welsh Government to set a target to reduce emissions by 95% in 2050. The Welsh Government accepted that advice, and declared its intention to bring forward a target for Wales to achieve Net Zero emissions no later than 2050.

The Welsh Government is now in a position to realise that goal. The Committee's updated evidence and analysis now supports a recommendation for Wales to set and pursue an ambitious target to **reduce all greenhouse gas emissions to Net Zero by 2050**, backed up by a stretching set of targets on the pathway to that goal.

This represents Wales' fair and credible contribution to the UK Net Zero goal, and is consistent with our recommendations on the UK's Sixth Carbon Budget and the UK's nationally determined contribution (NDC) for 2030 to the UN process.\*



\* Our Sixth Carbon Budget recommendation for the UK (-78%) includes emissions from international aviation and shipping, but UN convention is to report these separately, so they are not included in our recommended NDC for 2030 (-68%). On an equivalent basis (i.e. including international aviation and shipping), the 2030 NDC would be a 64% reduction relative to 1990.

Our recommended targets for Wales would achieve nearly two-thirds of the required emissions reduction from 2020 to 2050 in the next 15 years (Figure 1). This early action is vital to support the required increase in global ambition, especially ahead of the UK hosting the next UN climate talks. It can feasibly be achieved at low overall cost and would bring multiple benefits and opportunities for the UK.

Achieving Net Zero requires average annual reductions in Welsh emissions of 1.3 MtCO<sub>2</sub>e from 2018, similar to those achieved since 2008 (1.2 MtCO<sub>2</sub>e per year). The analysis in this report shows this is clearly feasible, provided effective policies are introduced across the economy without delay.

Our advice to the Welsh Government this year is set out in two parts:

- **Advice Report: The Path to a Net Zero Wales** sets out recommendations for the actions that are needed in Wales, including the legislation of a Net Zero target and package of policies to deliver it.
- **Progress Report: Reducing emissions in Wales** looks back at the progress made in Wales since the 2016 Environment (Wales) Act was passed, and assesses whether Wales is on track to meet its currently legislated emissions reductions targets.

This report has been developed in conjunction with our advice to the UK Government on the Sixth Carbon Budget. More detail on the analysis that has informed this advice to the Welsh Government are available on the in the *UK Sixth Carbon Budget Report* and accompanying material on the CCC website.

Box 1 set out the Committee's recommendations on Wales' targets. The rest of this summary is set out in four parts:

- a) Net Zero in 2050 is right for the climate and right for Wales
- b) How the Net Zero goal can be met in Wales
- c) Recommendations for action
- d) Progress towards Wales' existing targets

## Box 1

### CCC recommendations on Wales' climate targets

- **Net Zero in 2050.** Wales should legislate as soon as possible to reach Net Zero greenhouse gas emissions by 2050. The target can be legislated as a 100% reduction in greenhouse gases (GHGs) from 1990 and should cover all sectors of the economy.
- **Climate targets on the path to Net Zero.** Wales should legislate a stretching series of targets on the pathway to Net Zero:
  - **The Third Carbon Budget (2026-2030)** should be set at an average 58% reduction compared to 1990 levels.
  - **Interim targets for 2030 and 2040** should be set on the Balanced Pathway to Net Zero at 63% and 89% respectively compared to 1990 levels.
  - **The Second Carbon Budget (2021-2025)** must be tightened to a 37% reduction compared to 1990 levels as an absolute minimum to account for the early closure of Aberthaw power station (as set out in our 2017 advice). Emissions will likely have to fall more quickly than this to meet the Third Carbon Budget. However, it is extremely difficult to identify precisely the appropriate level of emissions reduction over this period:
    - Future performance of the economy – and hence the level of economic activity that could cause emissions – is always uncertain to some degree. However, uncertainty over emissions in the next few years is much greater than usual, relating to how the economy will recover after the COVID-19 pandemic, together with any lasting societal and behavioural changes.
    - Much of the emissions reduction that we expect in Wales over the next few years, which could take Wales significantly beyond the 37% reduction in our previous advice, is anticipated to occur in the power sector (i.e. through reduced gas-fired generation) and is not in the control of the Welsh Government.
    - These two factors are likely to make a considerably bigger difference to emissions in Wales than new policies developed and implemented by the Welsh Government, especially given the lead-times to do so. Strong policies to reduce emissions should be developed and implemented by the Welsh Government over a timeframe that enables them to make a significant difference (i.e. aimed at the ambitious reduction of 58% for the Third Carbon Budget).
  - We therefore recommend that as a minimum the level of the Second Carbon Budget is revised in line with our 2017 advice to require a reduction of 37%, but that the clear aim of the Welsh Government is to outperform this on the way to meeting the ambitious Third Carbon Budget and 2030 target.
- **A Net Zero delivery plan.** We recommend that the next low-carbon delivery plan in Wales sets out a long-term vision for meeting the Net Zero goal, with a particular focus on the Third Carbon Budget and the 2030 target. Policies and proposals to reduce emissions take time to implement and to have impacts in the real world; the focus of Wales' should not be limited to emissions targets in the next five years. The expected impact of policies, including those in early planning, should be clearly quantified and in sum be enough to meet the third carbon budget.
- **Engineered removals.** We recommend that engineered CO<sub>2</sub> removal is allowed to contribute to meeting Welsh carbon targets under the Environment (Wales) Act. Achieving Net Zero will require sustainable, verified greenhouse gas removals.
- **Domestic action.** The aim should be to meet the target through domestic effort in Wales, without relying on international carbon units (or 'credits'). Emissions trading – including potentially within a UK scheme – can be a useful policy lever to reduce actual Welsh emissions (net of removals) as required to meet the recommended targets.

## a) Net Zero in 2050 is right for the climate and right for Wales

### A globally responsible Wales: supporting global climate action

Our recommended targets for Wales – alongside our recommendations for the UK Sixth Carbon Budget and the newly-set UK Nationally Determined Contribution (NDC) (Box 2) – reflect the goals and requirements of the Paris Agreement, recognising Wales' responsibility as a richer developed nation and its respective capabilities:

- Our recommended pathway has been explicitly designed to reflect Wales' **'highest possible ambition'** within Wales' particular capabilities, as required by the Paris Agreement.
- It would reduce Wales' annual **per-capita emissions** to under 3 tCO<sub>2</sub>e per person before 2040, in line with global pathways consistent with meeting the Paris 1.5°C goal (Figure 2).
- The **actions** required to meet the recommended targets – including full decarbonisation of the power sector, full switchover to electric vehicle sales and installation of low-carbon heating, and decarbonisation of manufacturing – would go beyond those required from the world on average, in line with Wales' responsibility as a richer nation with larger historical emissions. The timing of these actions would align to that required from the rest of the UK and other climate leaders.
- Comparable action from other developed countries with developing countries following slightly later (i.e. where they generally adopt low-carbon measures later, achieve lower percentage reductions to 2030 and reach Net Zero emissions after 2050) would limit warming well below 2°C. The emissions pathways set out in this report for Wales contribute to a **'leadership-driven' global pathway**.
- We have highlighted where policies and actions have important crossovers with the need to **adapt to climate change**, which is also included as a key part of the long-term response to climate change in the Paris Agreement.

Our pathways have been developed to support the required pathways for reducing global emissions.

While many countries have followed the UK in adopting Net Zero as a long-term emissions target, global ambition to 2030 remains far short of what is required. As President of the next UN climate talks (and of the G7) in 2021, the UK is in a position to influence others, but to do so must itself adopt an ambitious 2030 goal. Reducing emissions early matters as it is global cumulative emissions that drive climate outcomes.

The UK's climate goals cannot be met without the right action in Wales. The Welsh Government can support UK action by setting equally stretching targets into Welsh law and pursuing ambitious devolved policies that are well aligned to both Wales' Net Zero goal and the UK's path to Net Zero via the Sixth Carbon Budget.

## Box 2

### The UK's Nationally Determined Contribution (NDC) for 2030

The UK will host the next UN climate talks – the 26<sup>th</sup> Conference of the Parties (COP26) – in Glasgow in November 2021. The period leading up to these talks is vital for increasing global ambition. It was of vital importance that the UK set a world-leading NDC that reflects best practice under the Paris Agreement.

On 3 December, following advice from the Committee by letter,<sup>1</sup> based on the advice on the UK Sixth Carbon Budget published the following week,<sup>2</sup> the Prime Minister announced that the UK NDC would follow the Committee's advice for it to require at least a 68% reduction in territorial emissions from 1990 to 2030 (excluding emissions from international aviation and shipping, IAS, in line with UN convention), to be delivered through domestic action.

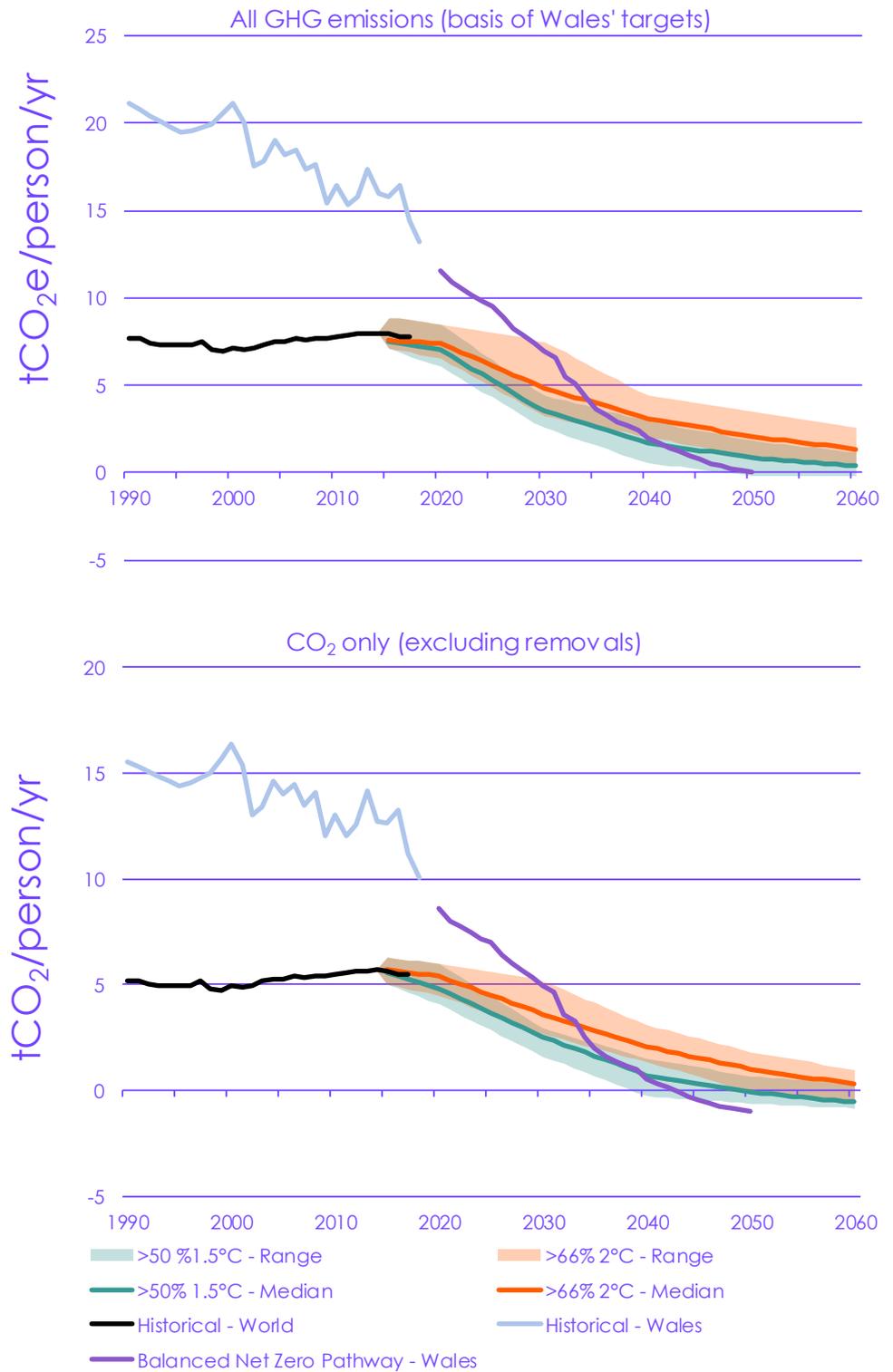
- This is a clear progression from the UK's pre-existing commitments: its expected effort share of the EU's existing NDC (-53%), the existing fifth carbon budget (-57%), and the expected reduction in actual emissions under the fifth carbon budget (-61%).\*
- It is world-leading compared to existing NDCs, and amongst the front-runners for proposals for increased ambition. For example, if the EU adopts its proposed 55% reduction for 2030, the UK's NDC would be towards the top of the range that we estimate for the UK's possible effort share had it still been a Member State.
- It aligns with the published pathways from the Intergovernmental Panel on Climate Change (IPCC) for a 1.5°C goal. UK emissions would fall by 54% from 2010 to 2030, compared to the 45% that the IPCC identifies for the world as a whole.
- It is equivalent to a 64% reduction including international aviation and shipping emissions, the basis of our recommended Sixth Carbon Budget.

The Committee made further recommendations alongside the headline reduction in emissions:

- **International aviation and shipping.** While these emissions are treated separately by the UN, they must be addressed if the temperature goal of the Paris Agreement is to be met. The UK's NDC should include clear commitments to act on emissions from international aviation and shipping, including both long-term and interim targets.
- **Adaptation.** Even if the Paris goals are delivered in full and global temperature rise is limited to 1.5°C, there will be further impacts from climate change beyond those already occurring today. If the Paris goals are missed, the global impacts will become much more severe. The UK needs to increase its ambition on climate change adaptation, as it is not even prepared even for the 1.5-2°C world. The UK's NDC should signal how national adaptation plans will be strengthened, as well as highlighting how the UK is supporting climate adaptation overseas.
- **International collaboration.** The UK has been a strong contributor to international climate finance, recently doubling its commitment to £11.6 billion in aggregate over 2021/22-2025/26. The UK's NDC should highlight this commitment, along with other UK contributions to technology development and capacity building.

\* The existing EU ambition is for a 40% reduction by 2030 relative to 1990; an increase to 55% is being considered. The fifth budget goal of -57% refers to the net carbon account, which adjusts for emissions trading in the EU Emissions Trading System.

Figure 2 Global emissions pathways (per person) consistent with the Paris Agreement



Source: CCC analysis. Huppmann, D, et.al. (2018) A new scenario resource for integrated 1.5°C research. *Nature Climate Change*, 8 (12), 1027; Olivier, J. & Peters, J. (2019) *Trends in global CO<sub>2</sub> and total greenhouse gas emissions*. Notes: Aggregation of greenhouse gas emissions is done using the global warming potential metric at time horizon of 100 years. Values from the IPCC 5<sup>th</sup> Assessment report (with climate-carbon feedbacks) are used. Minimum and maximum ranges are used across the global emissions scenario categories used by the IPCC Special Report on Global Warming of 1.5°C. These figures do not include the uncertainty of COVID-19 on 2020 emissions. CO<sub>2</sub> figures do not include any greenhouse gas removals technology in Wales. Emissions data are not available for 1991-1994 and 1996-1997; we have interpolated emissions in Wales for these years based on the levels in 1990, 1995 and 1998.

## Supporting UK ambitions for Net Zero

Under the 2008 Climate Change Act, Wales is required to contribute to the UK 2050 Net Zero target and the UK's carbon budgets. The Act assigns to Welsh Ministers the duty to report on the Welsh Government's objectives, actions and future priorities regarding the impacts of climate change to the Welsh Parliament.

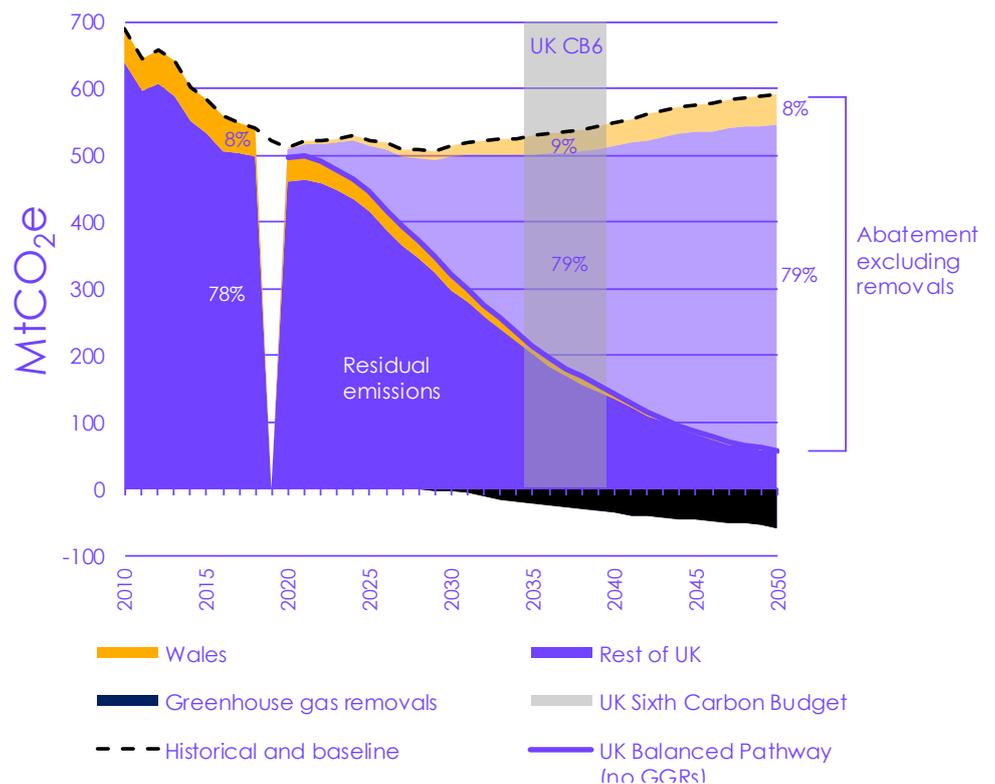
The credibility of the UK's Sixth Carbon Budget (covering 2033-37) and Net Zero rests on action in all parts of the UK, including Wales. Around 9% of the action in our Balanced Net Zero Pathway for the UK during the Sixth Carbon Budget period will be delivered in Wales (Figure 3).

The technical and behavioural challenges and solutions to tackling greenhouse gas emissions are broadly similar across the UK. This does not mean that Wales will follow the exact same emissions reduction pathway as the rest of the UK, nor does it lessen the need for policies that are tailored for national, regional and local needs.

Equal effort towards UK Net Zero will lead to different emissions pathways. The balance of activity across different sectors - particularly aviation, agriculture and land use, manufacturing and construction, fuel supply and greenhouse gas removals - means different levels of emissions reduction are possible in different parts of the UK through the Sixth Carbon Budget period and by 2050.

Our pathways for each part of the UK entail consistent amounts of effort, but lead to different overall reductions in emissions.

**Figure 3** Wales' share of UK emissions and abatement during the Sixth Carbon Budget period and by 2050



Source: BEIS (2020) *Provisional UK greenhouse gas emissions national statistics 2019*; NAEI (2020) *Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019*; CCC analysis.

## The context for Net Zero in Wales

When the Committee provided its 2019 advice, we demonstrated that any negative economic impact of achieving very deep emissions reductions in Wales was likely to be small and the overall impact could turn out to be positive. Our analysis of the full pathway to Net Zero in Wales for this report reinforces that finding. An ambitious budget is preferable to an unambitious one, given the range of risks and costs from unchecked climate change, and in some cases could even be cost-saving (e.g. with an earlier switch to electric vehicles).

The economic and social context for climate action has changed in important ways since our 2019 advice:

Low-carbon investment can support the economic recovery.

- **The COVID-19 pandemic** and measures taken in response to it have sharply changed the economic backdrop in Wales, across the rest of the UK, and globally. These effects imply considerable spare capacity in the economy and therefore that increasing investment could support Wales' recovery.
- **UK Net Zero and NDC.** The UK Government has formally adopted a Net Zero target into law and set an enhanced NDC for 2030, strengthening the case for Wales' existing targets to be tightened in line with the UK goals.
- **Wider Net Zero commitments** by other countries and businesses clearly demonstrate momentum building towards more climate action. This should drive down low-carbon technology costs that themselves can enable further commitments to action. These commitments are a demonstration that future markets lie with low-carbon products. Business models that are not compatible with a Net Zero future are increasingly risky.
- **Costs of key low-carbon technologies** have continued to fall. For example, the contracted price for electricity generated by offshore wind fell again in the latest auction round by around a third compared to the previous auction two years earlier. These cost reductions are driven by scale manufacturing, investor confidence and 'learning-by-doing' during deployment within an effective low-risk policy framework. These effects can be replicated in other areas of the economy, as markets scale up globally and the costs of low-carbon technologies continue to fall.

Costs of low-carbon technologies continue to fall.

This background favours a decisive transition for the UK and for Wales, quickly switching resources away from high-carbon activity and into low-carbon investments with lower operating costs than high-carbon alternatives. This is reflected in our proposed pathway, which transitions as rapidly as possible within constraints of stock turnover, supply chain capacity and time required to design effective policy.

## Investment and cost estimates

The Balanced Pathway to deliver our recommended targets in Wales involves a large sustained increase in investment in Wales, adding around £3 billion annually by 2030, as part of UK-wide required investments of around £50 billion by 2030 (compared to current UK-wide investment of nearly £400 billion). The largest increases are for low-carbon power capacity, retrofit of buildings and the added costs of batteries and infrastructure for electric vehicles.

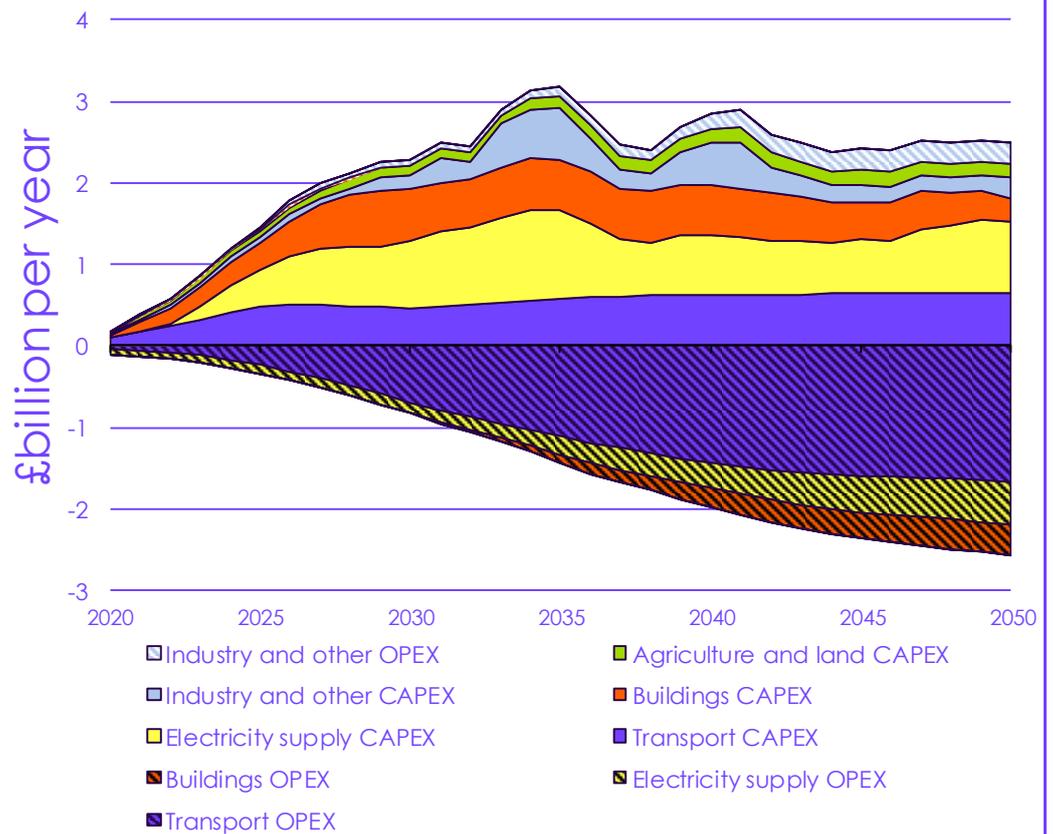
This required increase in investment can, and should, be delivered largely by the private sector. These investment costs should not be interpreted as capital expenditure that would be delivered solely through the Welsh Government budget, nor as costs that only Welsh businesses and consumers have to bear. Many of the actions to reduce emissions will likely be paid for at UK level and/or socialised across the whole of the UK.

This level of investment is well within the range of historical changes in UK total investment. The sectoral increases have broadly been seen before, for example, in the transport sector as car-buyers shifted towards larger cars, in the power sector as renewable investment increased in the last decade, and in the housing sector as spending on refurbishments increased. It can be financed at low cost if policies are constructed to give long-term clarity to consumers and confidence to investors.

We are now able to demonstrate that savings in fuel costs (Figure 4) will very largely offset the investment costs in later years. As a result, our central estimate of the annualised resource cost (which measures the net additional cost each year to deliver the same services with lower emissions) has fallen to less than £1.5 billion per year in Wales through to 2050. This is a reduction since our 2019 estimate (of £3-5 billion) for Wales to meet the Net Zero 2050 target, reflecting our more detailed modelling and further falls in the costs of low-carbon technologies.

This added resource cost will not necessarily reduce GDP by an equivalent amount, particularly given the spare capacity in the economy following the COVID-19 pandemic. Modelling commissioned for this report suggests that the level of UK GDP would be around 2% higher than it would have been by 2035 as resources are redirected from fossil fuel imports to UK investment.

Figure 4 Capital investment costs and operating costs savings in the Balanced Pathway for Wales



Source: CCC analysis.

Notes: Costs of electricity are included in the energy supply sector, whereas costs of other low-carbon fuels such as hydrogen and bioenergy are included in the sectors that use these fuels. Wales' share of UK electricity costs is allocated based on electricity consumption rather than where generation takes place. The 'Industry and other' category includes manufacturing, construction, fuel supply, waste and F-gases. CAPEX refers to additional annual capital investment. OPEX refers to costs and savings due to operational cost changes.

## Improving well-being for current and future generations

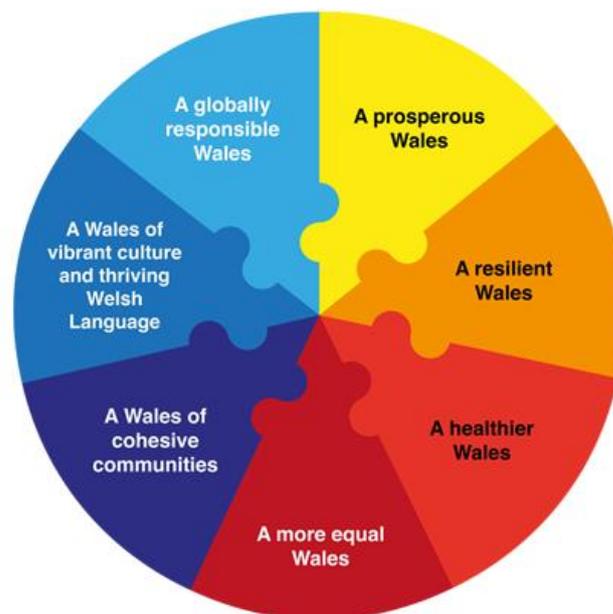
In addition to supporting Wales' global responsibilities, the pathway to Net Zero in Wales is well-aligned to the other Well-being Goals (Box 3) under the Well-being of Future Generations (Wales) Act 2015:

- A prosperous Wales.** Legislating our recommended targets would send a clear signal that Wales is open for low-carbon investment. This will help to encourage private investment at low cost at a time when it is needed to support Wales' economic recovery from the COVID-19 health crisis. It could also help Wales secure competitive positions in growing global markets for low-carbon goods and services. Our pathway involves considerable opportunities for job creation. An important challenge for both UK and Welsh Government is to identify where jobs may be lost in Wales (for example in fossil power generation and refining) and to support workers to transition to being a part of the new low-carbon workforce (e.g. energy efficiency retrofits in buildings or industrial carbon capture and storage).

- **A healthier Wales.** The near-term benefits to health of taking action on climate change are manifold, but good policy is needed to ensure those benefits can be experienced by all. Meeting Net Zero in Wales can bring improved air quality, healthier ways of travelling, more comfortable and efficient homes and workplaces, and better-quality diets.
- **A resilient Wales.** The changing climate poses risks to meeting Wales' economic, social and environmental goals. Efforts to move to a Net Zero economy should be supported by actions to strengthen focus on climate adaptation and prepare for the climate change. Accelerating action on climate change now can help to support the recovery from COVID-19 and rebuild the Welsh economy to be more resilient to the changing climate and future economic shocks.
- **A just transition to support other well-being goals.** Fairness is fundamental to public support and must be embedded throughout policy. Only a transition that is perceived as fair, and where all people, places and communities in Wales are well-supported, will succeed. A just transition to Net Zero can support a **more equal Wales, a Wales of cohesive communities, and a Wales of vibrant culture and thriving Welsh language.** UK and Welsh Government policy, including on skills and jobs, must join up with local and regional policy on the just transition. Vulnerable people must be protected from the costs of the transition and the benefits must be shared widely.

**Box 3**  
Wales' Well-being Goals

The Well-Being of Future Generations (Wales) Act 2015 puts in place seven well-being goals, which should guide public sector bodies in their decision making. They are not to be taken individually but as a holistic set of goals that all public sector bodies should work towards achieving.



Source: Future Generations Commissioner (2020) The Well-being of Future Generations Act.

## b) How the Net Zero target can be met in Wales

Emissions in Wales primarily result from the burning of fossil fuels (mostly oil and gas) to run vehicles, heat buildings, produce electricity, and for energy use in industry. Further emissions arise from other industrial and agricultural processes, changes in land use, waste disposal and leakage from various sources.

Net Zero requires a transformation across these areas. No single solution or single sector can meet the budget alone; action is required across all areas and all sectors, without delay. The 2020s are the crucial decade: with effective action starting now, by 2030 Wales will be firmly on track to Net Zero.

A large part of meeting Net Zero is a technological and investment challenge. But it also requires a fundamental response from *people*: as consumers, workers, homeowners, tenants and landlords, motorists, farmers, citizens and families. The UK and Welsh Governments should lead that response and will have most success where proposals are seen to be fair and where people have been involved in developing the proposed solutions. The UK Climate Assembly provided useful insights on the priorities of a representative cross-section of the UK population. These priorities are reflected in this report.

At the core of our advice for this report are multiple scenarios exploring the actions required in each area and every year in order to reduce Welsh and UK emissions to Net Zero by 2050 at the latest. The scenarios for Wales are compatible with our UK scenarios, and represent Wales' fair contribution to the UK's obligations under the Climate Change Act and Paris Agreement.

These pathways, which feed directly into our UK-level analysis, are based on specific factors that determine the rate and overall level of decarbonisation achievable in each nation. This includes:

- different levels of activity and emissions in each sector today;
- existing usage of land, and opportunities for land-based removals;
- existing infrastructure;
- opportunities to remove CO<sub>2</sub> from the atmosphere; and
- existing policies.

The detailed scenarios explore uncertainties, particularly over how far people will change their behaviours, how quickly technology will develop and the balance between options where credible alternatives exist.

All the scenarios are ambitious while bounded by realistic assumptions over the speed at which low-carbon technologies can be developed and rolled out, allowing time for supply chains, markets and infrastructure to scale up. They are self-consistent and recognise other priorities – for example, our energy analysis maintains security of supply, our housing analysis considers the need for flood protection and to avoid over-heating, our land analysis supports the natural environment.

Based on the insights of these scenarios, we have developed a Balanced Net Zero Pathway as the basis for our recommended targets for Wales. This pathway makes moderate assumptions on behavioural change and innovation, and takes actions in the coming decade to develop multiple options for later roll-out (e.g. use of hydrogen and/or electrification for heavy goods vehicles and buildings). While it is not a prescriptive path that must be followed exactly, it provides a good indication of what needs to be done over the coming years.

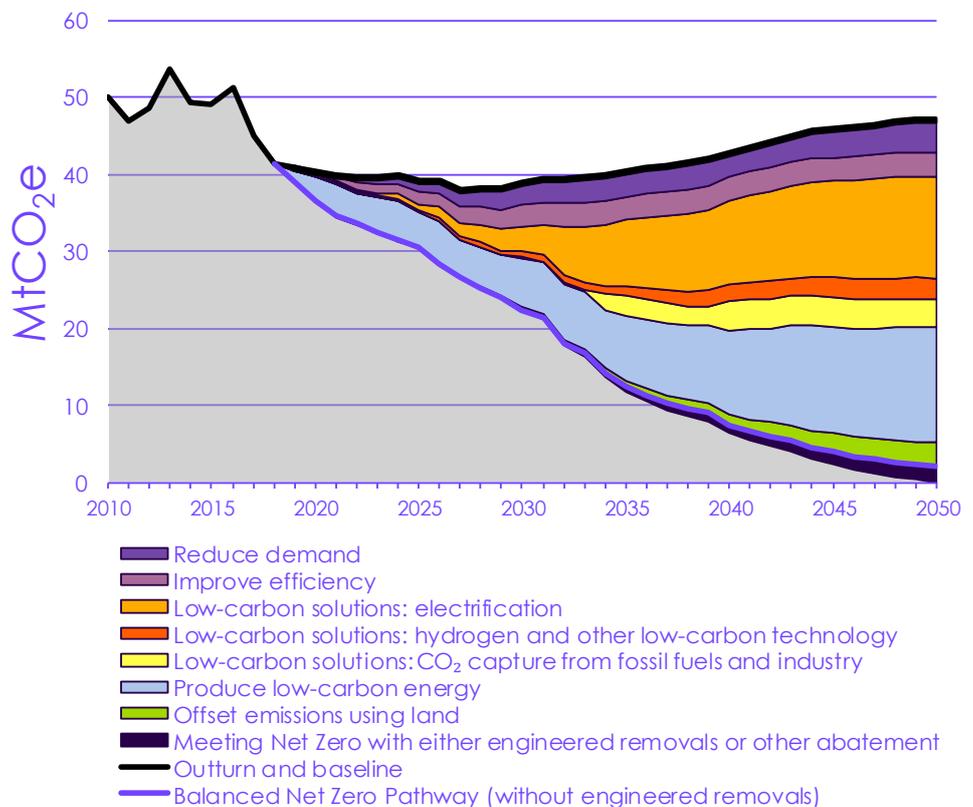
Meeting the Net Zero target in Wales requires action across four key areas in line with those from our Balanced Net Zero Pathway (Figure 5, Table 1):

- **Reducing demand for carbon-intensive activities.**
  - *Reduced demand.* Around 9% of the emissions savings in our Balanced Net Zero Pathway for Wales comes from changes that reduce demand for carbon-intensive activity. Particularly important in our scenarios are an accelerated shift in diets away from meat and dairy products, reductions in waste, slower growth in flights and reductions in travel demand. While changes are needed, these can happen over time and overall can be positive for health and well-being.
  - *Improved efficiency.* A further 7% comes from improving efficiency, in use of energy and resources, especially by better insulation of buildings, improving vehicle efficiency and improving efficiency in industry.
- **Take-up of low-carbon solutions.** Around 40% of the emissions saving is from people and businesses adopting low-carbon solutions as high-carbon options are phased out (Table 1). By the early 2030s all new cars and vans and all boiler replacements in homes and other buildings must be low-carbon – we expect largely electric. By 2040, all new heavy goods vehicles should be low-carbon. The South Wales industrial cluster (as well as other industrial sites in Wales) must either switch away from fossil fuels to low-carbon alternatives and/or install carbon capture and storage (CCS) at scale from the mid-2030s.
- **Expansion of low-carbon energy supplies.**
  - *Low-carbon electricity* can now be produced more cheaply than high-carbon electricity in the UK and globally. In our Balanced Pathway the low-carbon share of generation in Wales increases from 27% now to 100% by 2035, cutting Welsh emissions by more than 95% compared to our baseline. We are not prescriptive about where in the UK new low-carbon generation is located or the precise mix of generation that is used in Wales, but all unabated gas-fired generation should cease in the whole of the UK by 2035. New demands from transport, buildings and industry (moderated by improving energy efficiency) mean electricity demand in Wales doubles by 2050.
  - *Low-carbon hydrogen* scales up to 90 TWh by 2035 at UK level (i.e. nearly a third of the size of the current power sector), produced using electricity or from natural gas or biomass with carbon capture and storage. It is used in areas less suited to electrification, particularly shipping and parts of industry, and is vital in providing flexibility to deal with intermittency in the power system. It may also have a material longer-term role in buildings and other transport, such as heavy goods vehicles.

- **Land.** A transformation is needed in Wales' land while supporting Welsh farmers. By 2030, our Balanced Pathway involves planting a cumulative 43,000 hectares of mixed woodland in Wales to remove CO<sub>2</sub> from the atmosphere as they grow, increasing to a total of 180,000 hectares by 2050. A further 56,000 hectares of agricultural land can shift to bioenergy production (including short rotation forestry) by 2050. Peatlands must be restored widely and managed sustainably. Low-carbon farming practices must be adopted widely, while raising farm productivity.
- **Flexibility to meet Net Zero,** Alongside the nature-based removals, by 2035 the UK should be using bioenergy (largely grown in the UK) with CCS to deliver engineered removals of CO<sub>2</sub> at scale – though these technologies may not necessarily be located in Wales. Wales can credibly meet Net Zero either with a 4% share of total UK engineered removals, or through increased action in other areas including land use and behavioural changes.

The Balanced Pathway (Figure 6) sees the most rapid emissions reductions over the period 2025 to 2035. Before 2025, newer markets (e.g. for electric vehicles and low-carbon heating) are still scaling up from low levels, so potential for large-scale deployment and therefore rapid emissions reductions is more limited. Beyond 2035 some opportunities have been exhausted, so progress slows down (e.g. all power generation is low- or zero-carbon by 2035).

Figure 5 Types of abatement in the Balanced Net Zero Pathway for Wales



Source: CCC analysis.

Notes: 'Other low-carbon technology' includes use of bioenergy and waste treatment measures. 'Producing low-carbon electricity' requires the use of CCS in electricity generation.

**Table 1**

Key metrics for actions in the Balanced Pathway to meet the Sixth Carbon Budget

		2018	2025	2030	2035	2050	Trend
<b>Wales greenhouse gas emissions</b>	Wales greenhouse gas emissions (MtCO <sub>2</sub> e)	41	31	22	12	0	
	Wales greenhouse gas emissions per person (tCO <sub>2</sub> e/capita)	13.2	9.5	6.9	3.7	0	
<b>Demand reduction (UK average)</b>	(UK) Weekly meat consumption (g) (includes fresh and processed meat)	960	880	770	730	630	
	(UK) Weekly dairy consumption (g)	2,020	1,840	1,620	1,620	1,620	
	(UK) Plane-km per person	11,700	11,000	11,000	11,400	13,700	
	(UK) Average car-km per driver	12,900	12,600	12,400	12,200	11,700	
	(UK) remaining waste per person, after prevention & recycling (kg)	490	400	310	280	300	
<b>Efficiency (UK average)</b>	(UK) Average carbon-intensity of a new HGV (gCO <sub>2</sub> /km)	680	580	420	20	0	
	(UK) Increase in longevity of electronics	0%	30%	80%	120%	120%	
<b>Electrification, hydrogen and carbon capture and storage</b>	(UK) Carbon intensity of electricity (gCO <sub>2</sub> e/kWhe)	220	125	45	10	2	
	(UK) Offshore wind (GWe)	10	25	40	50	95	
	(UK) Share of BEVs in new car sales	1%	48%	97%	100%	100%	
	Wales heat pump installations (per year, includes replacements)	2,000	21,000	52,000	68,000	75,000	
	Manufacturing energy use from electricity or hydrogen in Wales	22%	22%	32%	58%	71%	
	Low-carbon hydrogen demand in Wales (TWh)	<0.1	0.1	1.6	6.5	11.5	
	CCS in manufacturing in Wales (MtCO <sub>2</sub> )	0	<0.1	0.1	1.6	1.9	
	CCS in other sectors in Wales (MtCO <sub>2</sub> ) (Excludes use in hydrogen production)	0	0	1	3	4	
<b>Land</b>	Cumulative trees planted in Wales (kha)	2	21	43	69	180	
	Cumulative energy crops planted in Wales (kha)	<1	1	8	20	56	
	Peat area restored in Wales	38%	45%	55%	64%	84%	
	Land-based carbon sinks (MtCO <sub>2</sub> )	1.1	1.2	1.5	2.0	4.2	
<b>Removals</b>	(UK) Greenhouse gas removals (MtCO <sub>2</sub> )	0.0	<1	5.0	23.0	58.0	

Notes: Metrics in orange rows are specific to Wales, grey rows are either the average or total values for the whole of the UK.

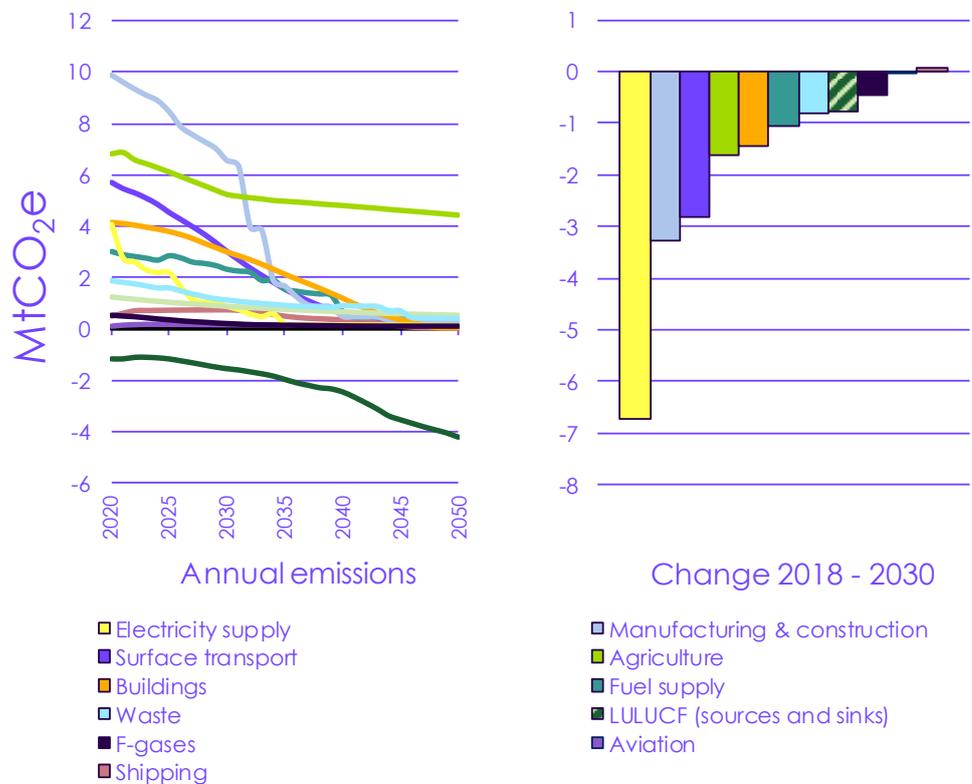
**Table 2**

Phase-out dates of high-carbon activities under the Balanced Pathway in Wales and the UK

Technology/behaviour	Phase out date (sales)	Backstop date (operation)
New fossil-fuelled cars and vans	2032	2050
Gas boilers	2033 (in residential homes) 2030-33 (in commercial properties)	2050
Oil boilers	2028 (in residential homes) 2025-26 (in commercial properties)	2050
Unabated gas power generation	2030 (no new build of unabated gas plants)	2035
HGVs	2040	Beyond 2050
Biodegradable waste sent to landfill	N/A	2025 ban on all municipal & non-municipal biodegradable waste going to landfill
Unabated energy-from-waste plants	From today, new plants and extensions should be built with CCS or CCS ready	2050

Different sectors decarbonise at different rates, reflecting the relative opportunities.

**Figure 6** Sectoral emissions under the Balanced Net Zero Pathway in Wales



Source: CCC analysis.  
Notes: LULUCF = Land-use, land-use change and forestry

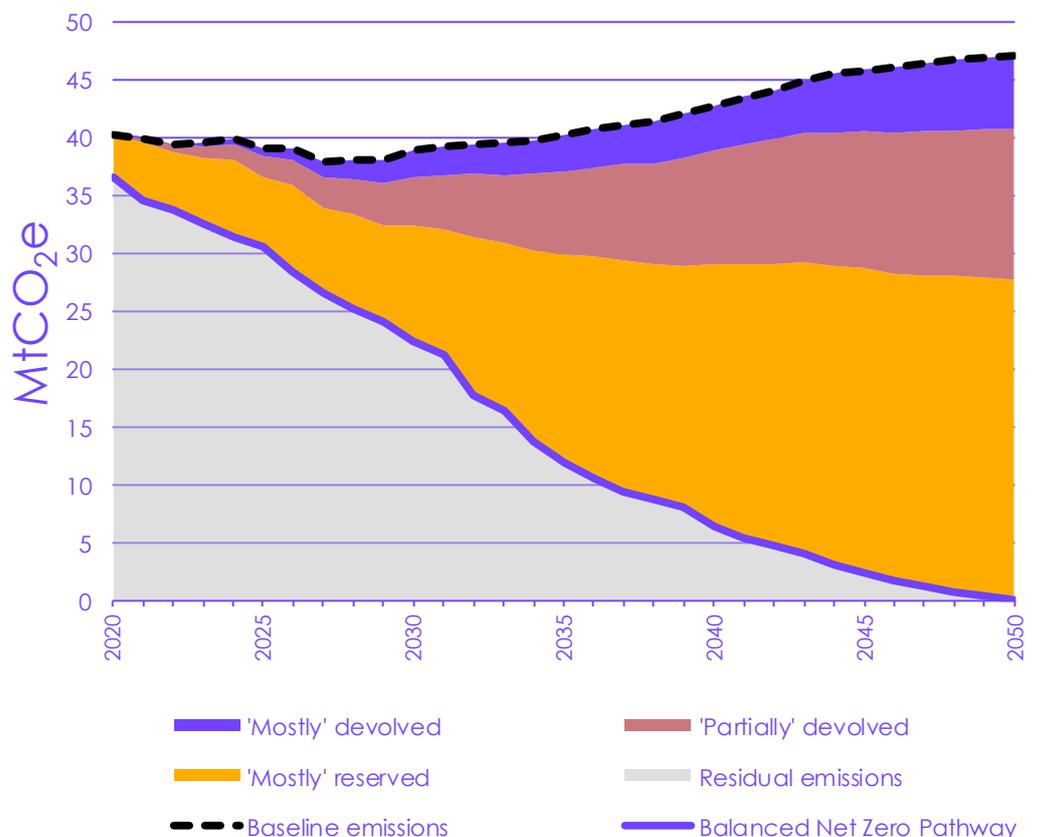
## c) Recommendations for action

The next year will be crucial for policy in Wales. Following elections in May 2021, the next Welsh Government will face the challenge to deliver an ambitious plan for Net Zero by the end of 2021.

**Wales' next Low Carbon Delivery Plan must set out a long-term vision for meeting the Net Zero goal**, with a particular focus on the Third Carbon Budget and 2030, and the path to Net Zero by 2050. Policies and proposals to reduce emissions take time to implement and to have impacts in the real world; the focus of Wales' climate strategy should not be limited to emissions targets in the next five years. The expected impact of policies, including those in early planning, should be clearly quantified and in sum be enough to meet the third carbon budget.

Nearly 40% of all abatement required in Wales in the next thirty years will take place in sectors where key powers are 'partially' or 'mostly' devolved (Figure 7). Priority sectors for Welsh policy include agriculture and land use, buildings efficiency and heat, demand-side transport measures and waste management. Key enabling policies that cut across sectors – such as public engagement, education and skills, planning and consenting, public sector operations, and measures to enable a just transition – will also be crucial.

Figure 7 Abatement in the Balanced Pathway for Wales is shared by the UK and Welsh Governments



Source: CCC analysis.

Notes: The significant portion of abatement in the early 2020s is abatement of electricity supply that falls under 'mostly' reserved policy.

The Committee's key recommendations for Wales are:

- **Legislate ambitious targets for a whole-economy transition to Net Zero by 2050.** The shift from a target of 80% reduction to Net Zero will require significant effort from all sectors of the Welsh economy. Legislating a set of ambitious long-term targets for Wales is the first step, providing a clear signal to Welsh people and businesses. Policies must then be implemented to target all sectors of the economy.
- **The full range of devolved and reserved policy levers must be used together.** Delivering the transition in Wales will require effective collaboration between the Welsh and UK governments, and a strong policy framework that works across all levels of government. The UK cannot achieve Net Zero in 2050 without strong policy from Wales across key areas – including planning, agriculture, land use, housing regulations, and local government – and the Welsh Government cannot meet its target without the right policy and financial commitments from Westminster.
- **Net Zero and adaptation are the responsibility of all ministers and public bodies.** Historically, climate action has been led by the parts of government which deal with energy and the environment. Increasingly, action on reducing emissions to Net Zero and ensuring policies are resilient to climate change will need to be led by all parts of Welsh Government and driven from the centre.
- **Support a resilient recovery from COVID-19.** There is evidence that a range of low-carbon and climate adaptation 'green stimulus' measures fulfil both the short-term and long-term requirements of policies to support an economic recovery from COVID-19, while also building resilience to climate change and driving the transition to Net Zero.
- **Deliver a just transition for Future Generations.** Climate policies that fail to consider the need for a just transition and the fair distribution of costs in their formulation, announcement and delivery, risk being derailed due to public concern over regressive impacts (either real or perceived).

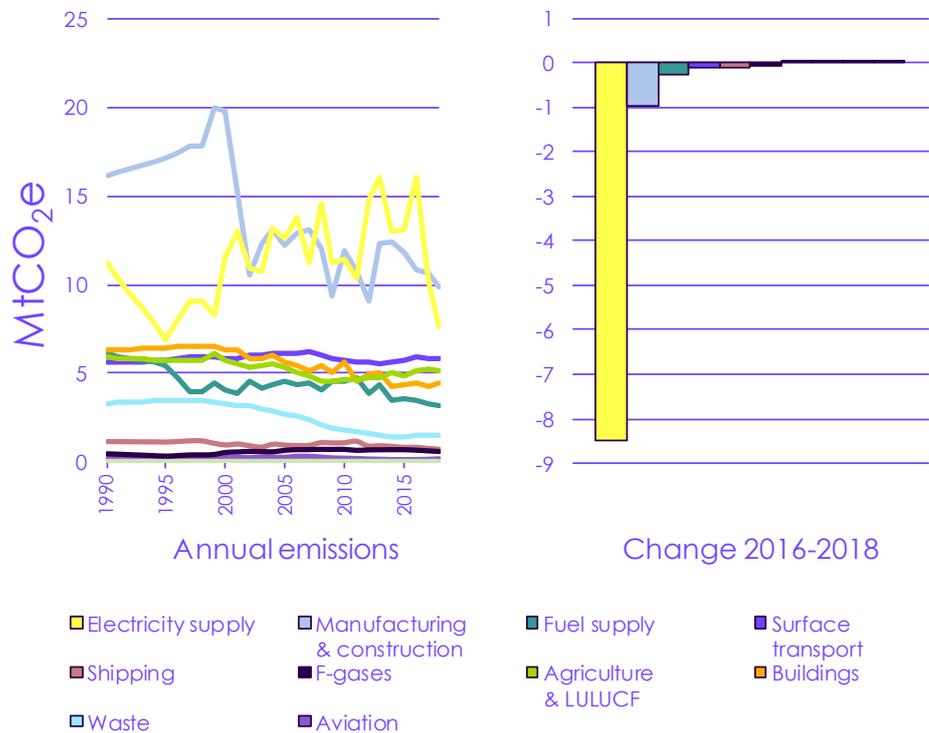
## d) Progress towards Wales' existing climate targets

Our Progress Report monitors progress towards Wales' existing targets using the latest available emissions data for Wales, with a focus on trends in emissions across Wales' First Carbon Budget period from 2016 to 2020 (Figure 8).

We cannot say for certain whether Wales is on track to meet the first carbon budget. There are no published emissions data for 2019 and 2020, and there is great uncertainty associated with emissions in the budget period due to both the impacts of COVID-19 and forthcoming methodological changes in estimating emissions under the emissions inventory.

On the current inventory basis, average emissions for the period 2016 to 2018 were 23% below the 1990 baseline – already meeting with the average reduction required to meet the budget. Wales is therefore on track to meet its First Carbon Budget on the current inventory basis, as long as emissions do not increase in 2019 and 2020.

**Figure 8** Changes in sectoral emissions in Wales since 1990 and in the First Carbon Budget period



Source: NAEI (2020) *Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019*; CCC analysis.

Notes: LULUCF = land use, land-use change and forestry. Emissions data are not available for 1991-1994 and 1996-1997; we have interpolated emissions in Wales for these years based on the levels in 1990, 1995 and 1998.

The key messages from the Progress Report are:

- **Emissions are falling in Wales.** Emissions have fallen by 31% since 1990. Since 2016, during Wales' First Carbon Budget period, emissions fell by 20%. This was almost entirely due to reductions in fossil-fired power generation.
- **Policy progress has been made.** The Welsh Government has made significant policy improvements since 2017 and it is clear it is taking the climate challenge seriously. This includes:
  - A low-carbon delivery plan for the First Carbon Budget.
  - A draft Transport Strategy that includes a clear focus on the provision of accessible active travel and public transport while supporting the transition to electric vehicles.
  - Achieving the UK's highest recycling rate, with food waste collection in all parts of Wales, and setting very ambitious long-term targets to further reduce waste and increase recycling.
  - Support for large low-carbon electricity generation projects in Wales.
  - The inclusion of 'green recovery' principles in the Welsh Government's response to the pandemic.
- **Gaps remain.** Underlying indicators and the lack of a cohesive, economy-wide strategy for 2050 – at both UK and Welsh Government level – mean that Wales is not currently on track for the existing 80% target, let alone Net Zero.

# Endnotes

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<sup>1</sup> CCC (2020) *Letter to The Rt Hon Alok Sharma MP: Advice on the UK's 2030 NDC*

<sup>2</sup> CCC (2020) *The Sixth Carbon Budget: The path to Net Zero*

December 2020

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# The path to Net Zero and progress reducing emissions in Wales

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