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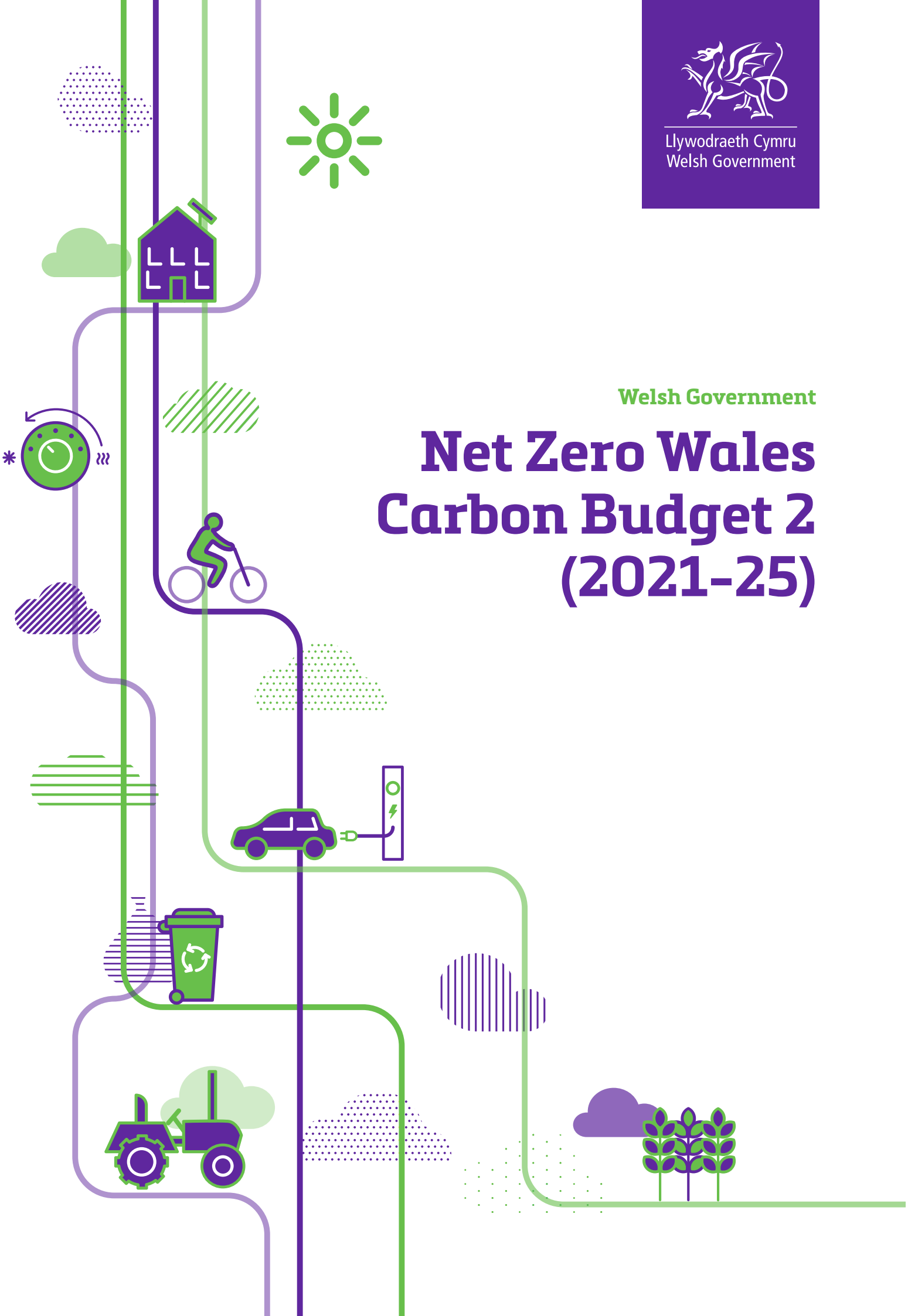

Welsh Government

Net Zero Wales Carbon Budget 2 (2021-25)

Wales' commitment to tackling climate change

Sharing the journey, for a better future

2021

Mae'r ddogfen yma hefyd ar gael yn Gymraeg.
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Cabinet foreword

Wales has a proud history of global impact, from the industrial revolution to being the first Fairtrade nation and of course, having the first parliament in the world to declare a climate emergency in 2019.

This Plan is the next step in our story. With the latest IPCC report now confirming that global warming has irrefutably been caused by human behaviour and that further climate changes are inevitable, we must both brace ourselves for the impacts of more extreme heat and rain, and also shoulder our fair share of the burden to minimise further climatic shifts. We acknowledge that our industrial heritage has left a legacy of climate risk for future generations and it is right that we now set out the next stage of our plan to reduce our greenhouse gas emissions, bringing us onto a net zero by 2050 trajectory.

Following the publication our last Plan, *Prosperity for all: a low carbon Wales*, the issue at hand was to make sure our response to the climate emergency permeated everything we did as Welsh Government. In line with the Wellbeing of Future Generations (Wales) Act (2016) (WFG Act), we are proud to say that this is now a reality.

This Net Zero Wales Plan represents a new phase in our decarbonisation journey with a new net zero target. This Plan sets out 123 policies and proposals, alongside commitments and action from every corner of Wales. However, we know this is just a snapshot in time and collectively we will need to go even further to overcome the following challenges.

- In line with the advice from the Climate Change Committee (CCC), this must be a **decade of action in Wales**. We need to make more progress in the next ten years than we have in the last thirty. In areas such as the public sector we can expect to see emissions reduce quickly, helping us meet our immediate Carbon Budget (2021–2025). In other areas, we are laying the foundations for longer term and systemic change. In revolutionising the way we support and incentivise farmers to manage their land, and in planning for a national energy grid that is fit for a renewable future we will use this period to complete the groundwork that will enable significant emissions reductions in later years.

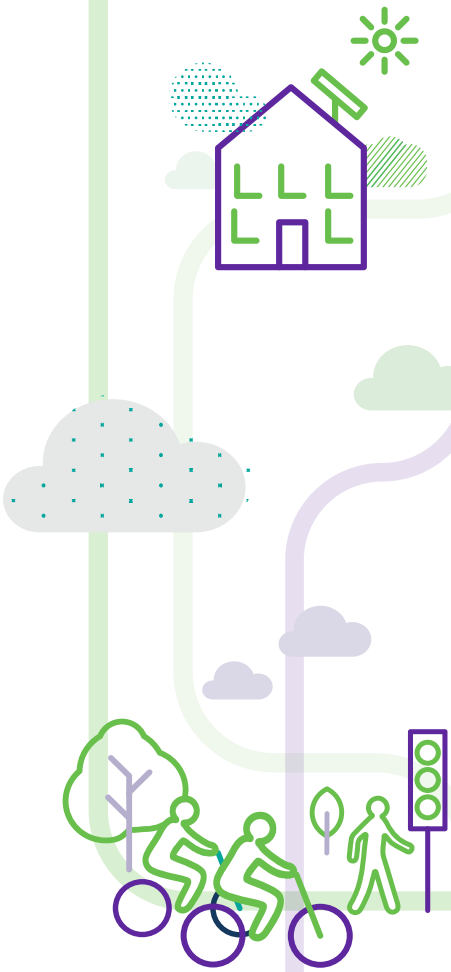
  These actions are not just in the hands of the Welsh Government. **We need every citizen, community, group and business in Wales to embed the climate emergency in the way they think, work, play and travel**. We know there are many barriers to this: cost, the complexity and volume of information that's out there and having the skills and the supply chains to enable the change. The work to overcome these starts now.

- We want to be honest that in some areas we do not yet know what the right path looks like. We want to **work with people across Wales to unlock the trickiest challenges and use innovation to test, learn and scale solutions that work**. This is demonstrated in our buildings chapter, where we are using government investment to try new approaches and technology to provide heat in social homes. This investment will stimulate the market at scale, and provide invaluable learning to unlock the decarbonisation of homes across Wales which are in private hands and for whom, today, moving away from a gas or oil boiler is prohibitively expensive, even if the right solutions were clear and if skilled installers were plentiful. Across this Plan we are committing to work with Wales to solve these knotty challenges.

- We have a much clearer understanding now than we did in 2019 about the extent to which the UK Government must act to enable our net-zero pathway. The CCC assessed that by 2050, around 60% of the changes needed in Wales were influenced by powers mostly reserved to Westminster. **In this Plan, we call on the UK Government to take the action which is needed to unlock a green future in Wales** – for example in supporting our cherished industries to transition to clean and sustainable futures. While the UK cannot reach its targets without Welsh action, we cannot reach our ambition without the UK Government playing its fair part.

- A theme in our last Plan was about a **just transition** – how we ensure we leave no-one behind as we move to a cleaner, stronger, fairer Wales. This Plan throws this issue into the spotlight, recognising this decade of action as a pivotal moment to develop green skills for the jobs of the future as well as developing a better understanding of the impacts of change, and how to make sure these are fairly distributed in society. We commit to learning lessons from the past and building a future for Wales that supports a wellbeing economy.

- Directly linked to this, and in light of the recent pandemic, a key challenge for this Plan is about building **economic prosperity** which is fair and built on a wellbeing economy. This will be manifested in the jobs that come from new technologies as well as Wales' ability to keep more benefits flowing to Welsh people, for example in our policy on local energy ownership. It will also manifest itself in a strong and valued foundational economy, developing a diverse, inter-related economic base in places across Wales.



Our values underpin all of this. As set out in our Programme for Government (PfG), this Government is committed to fairness. We don't believe we can consume endlessly and that new technology will bail us out. We don't believe that the worst off in society should shoulder the burden of change while the opportunities go begging elsewhere. We don't believe that government has all the answers.

We believe that by working together and taking collective action we can deliver a stronger, fairer and cleaner Wales for future generations.

Rt Hon Mark Drakeford MS
First Minister of Wales

Mick Antoniw MS
Counsel General and Brexit Minister

Rebecca Evans MS
Minister for Finance and Local Government

Vaughan Gething MS
Minister for Economy

Lesley Griffiths MS
Minister for Rural Affairs and North Wales, and Trefnydd

Jane Hutt MS
Minister for Social Justice

Julie James MS
Minister for Climate Change

Jeremy Miles MS
Minister for Education and Welsh Language

Eluned Morgan MS
Minister for Health and Social Services

Hannah Blythyn MS
Deputy Minister for Social Partnership

Dawn Bowden MS
Deputy Minister for Arts and Sport, and Chief Whip

Julie Morgan MS
Deputy Minister for Social Services

Lynne Neagle MS
Deputy Minister for Mental Health and Wellbeing

Lee Waters MS
Deputy Minister for Climate Change

Plan explanation and statutory duty

This Plan is the start of our journey to net zero and a greener, stronger, fairer Wales. It focuses on our second carbon budget (2021–2025), but looks beyond to start building the foundations for Carbon Budget 3 and our 2030 target, as well as net zero by 2050.

The climate emergency is a global challenge requiring urgent action. The Intergovernmental Panel on Climate Change (IPCC) has concluded further temperature rises are inevitable, but the more we can do to reduce emissions now, the better our chance of limiting the devastating impacts we are already seeing both in Wales and around the world.

This Plan fulfils the Welsh Ministers' statutory duty to prepare and publish a report before the end of 2021 setting out their proposals and policies for meeting Carbon Budget 2. It contains 123 policies and proposals across all ministerial portfolios.

Our statutory duty comes from two main pieces of legislation:

- Well-being of Future Generations (Wales) Act (2016) (WFG Act), which provides a comprehensive framework for sustainable development in Wales. It includes seven long term well-being goals for Wales and a well-being duty on government and specified public bodies to carry out sustainable development and act in a manner, which seeks to ensure that the needs of the present are met without compromising the ability of future generations to meet their own needs.
- The Environment (Wales) Act 2016 requires the Welsh Government to reduce emissions of greenhouse gases in Wales to net zero for the year 2050[1] with a system of interim emissions targets and carbon budgets. Under Section 39 of the Act Welsh Ministers must prepare and publish a report for each budgetary period setting out their policies and proposals for meeting the carbon budget for that period.

[1] Against a 1990 or 1995 baseline, depending on the gas.

This Plan has five parts:

Part 1 – Setting the context – the overall vision for Wales in 2025 and beyond to 2050, an overview of the reduction trajectory, the latest emissions data, and a broader view of our consumption emissions and global responsibilities.

Part 2 – Setting the conditions – capturing those actions and policies which do not reduce emissions on their own, but which enable the transition we wish to see.

Part 3 – The emissions sector chapters – setting out the pathways for each emissions sector, describing what is in scope, where the emissions come from, progress to date, our ambition for the future and then details of the policies and proposals together with the all-Wales approach to drive the changes we need.

Part 4 – Monitoring and reporting – setting out our governance structures, performance indicators, financial costings and finally a section on how the Plan was developed in line with the WFG Act and how it will maximise our contribution to the well-being goals.

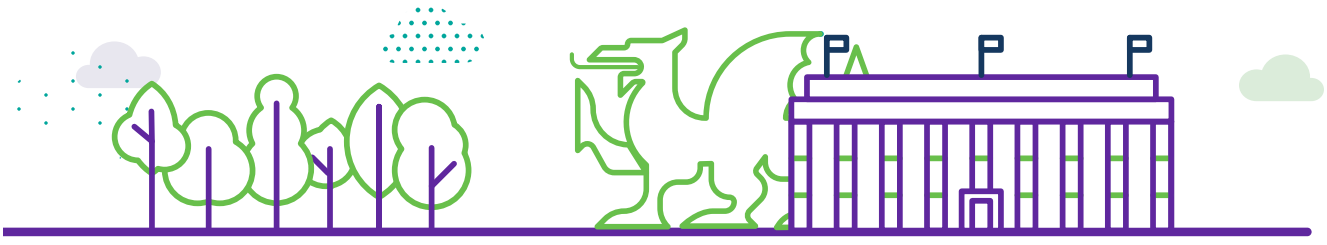
Part 5 – Next steps – highlighting key engagement and emissions reducing deliverables over this carbon budget, and the timeframe for developing our third delivery Plan to meet Carbon Budget 3.

The **Annexes** set out further information on how the sectors have been defined, as well as the collective list of all of the policies and proposals for action.

Alongside this Plan, we are also publishing a Sustainability Appraisal (further details in Part 4) and *Working Together to Reach Net Zero*.

More detail about the Sustainability Appraisal can be found in Part 4.

Working Together to Reach Net Zero recognises it will take more than Government action to deliver Carbon Budget 2 and we need everyone to play their part in achieving Net Zero. While this document contains just some of the examples of commitments and good work already in train, we wanted to share all of the excellent pledges and case studies which we have seen in the development of this Plan. We hope these will inspire others to action.



Part 1 – Setting the context

Introduction

This must be the decade of action for tackling climate change. In the last six years, we have laid the legislative foundations for a cleaner, fairer, stronger Wales, including through the Well-being of Future Generations (Wales) Act 2015 and the Environment (Wales) Act 2016. Wales has consistently followed the science, starting in 2016 with a target for an 80% reduction in our emissions by 2050. In 2019 we accepted the CCC's recommendation to increase our ambition to 95% shortly after the Senedd became the first Parliament in the world to declare a climate emergency in 2019. On accepting the recommendation we were clear our ambition should be in line with the spirit of the Paris Agreement in which richer, developed nations should set in law a net zero target by the middle of this century. We asked the CCC to look again at how Wales might achieve this. Further advice published in December 2020 showed there was a credible route to net zero.

We are proud that in March 2021 the Senedd agreed to set a legally binding net zero target. We are choosing to base our ambition on the evidence as we tackle the climate emergency, making Wales' fair contribution to the UK's obligations under the Paris Agreement.

The targets are now set although we want to get there sooner if possible. We must now collectively work together and focus on delivery. We must reflect Welsh society's commitment to a better quality of life for both current and future generations, building consensus around our shared well-being goals for the future. The challenge of climate change requires the same collective approach.

Whilst we have set a pathway for 2050 (detail below), this plan focuses on the need to "outperform" the second carbon budget of 37% average reduction in emissions, in line with the CCC's recommendation. This is because the third carbon budget (2026 – 2030) requires an average reduction of 58%, reflecting the huge step change we need to make here and now if our actions are to have time to take effect.

We can only achieve this transformation in the way we live by developing evidence, engaging widely and building consensus on how we want to deliver this in Wales. To do this we will need to involve people and businesses from across Wales and from every walk of life. This is what our Team Wales approach means: everyone has a role to play and this plan is just the start of our journey in the decade of action.

2050 Vision

We all need to play our part in taking action to achieve our long term well-being goals for a Sustainable Wales. The seven well-being goals, agreed by the Senedd through the Well-being of Future Generations Act provide us with a comprehensive framework for action to meet the needs of the present without compromising the ability of future generations to meet their needs.

Climate change threatens all these goals. However, getting our collective approach to climate change right will not only diminish this threat, it will boost our progress towards them. For example, we can create local economic opportunities retrofitting homes, improve houses so they are healthier places to live and make communities more resilient to climate and economic change.

We published our PfG in June 2021. It demonstrates to the people of Wales that they can have absolute confidence that their Government is moving quickly and purposefully to turn the commitments made during the election into action.

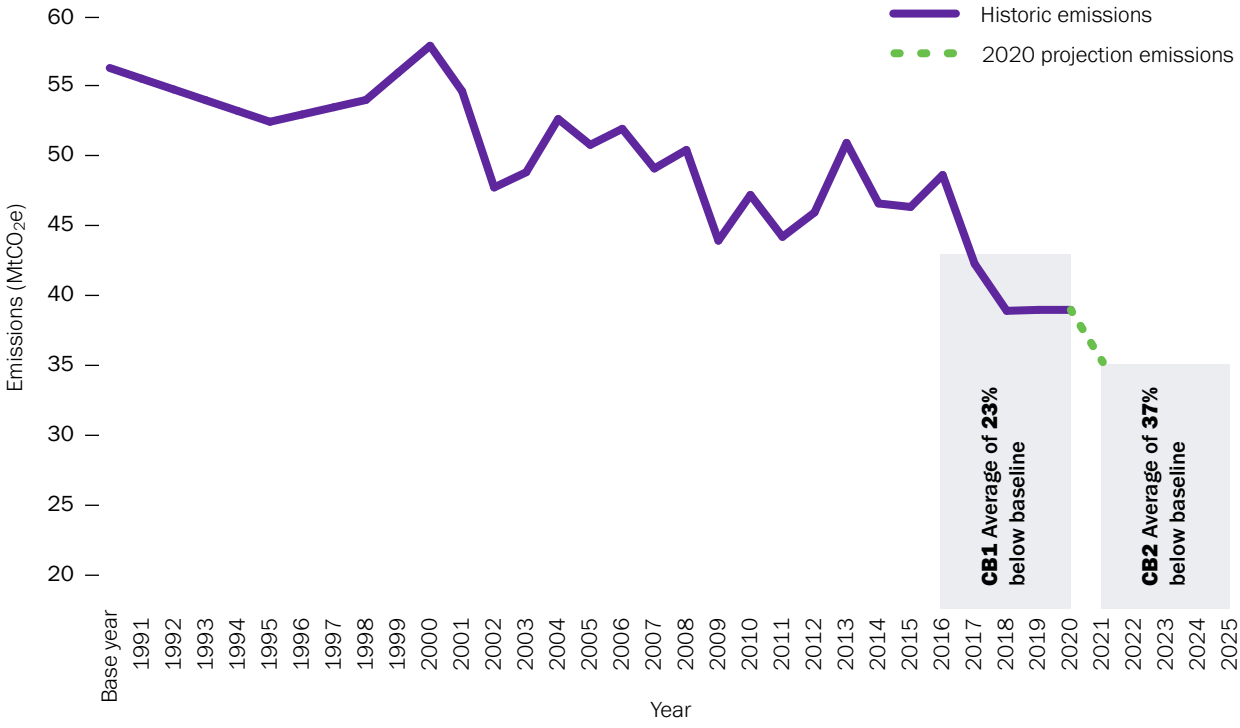
It sets out how we will rebuild our economy and develop a modern and green infrastructure that acts as an engine for inclusive and sustainable growth. Over 50 of the commitments made in the PfG will have a direct effect on tackling climate change. We have pledged to embed our response to the climate and nature emergencies in everything we do.

The benefits of tackling climate change will be felt widely and contribute to many of our other actions, leading to improved health, well-being and opening up new economic opportunities.

Wales' greenhouse gas emissions to date

The latest data, published in 2021, covers the period to 2019. It shows we have maintained our progress towards our 2020 target, estimating emissions within the scope of the Environment (Wales) Act targets totaled 39 million tonnes of carbon dioxide (CO_2) equivalent, a fall of 31% compared to base year emissions. Continued emission reductions in the 2020 data will be required to ensure we meet our 2020 target. It is anticipated that the impacts of the COVID-19 crisis are likely to provide the dominant impact on the Welsh economy until the close of our first budget period. It is yet to be seen if many of the emissions reductions as a result of the economic impact of Covid will endure.

Figure 1: Total Welsh emission – historic data and future targets and budgets



Wales' decarbonisation pathway

Emissions targets and carbon budgets

The pathway to the 2050 net zero target is set through five-yearly carbon budgets[2] and decadal targets. These cover all territorial emissions in Wales. This means they cover emissions arising from both devolved and non-devolved policy areas, including Wales' share of emissions from international aviation and international shipping.[3]

In March 2021, the Senedd passed a suite of regulations to increase Wales' decadal emissions targets from those set in 2018 and to set Carbon Budgets 2 and 3 in line with them. The targets and budgets set in law followed the CCC's recommendations:

- Carbon Budget 2 (2021 – 2025): 37% average reduction with a 0% offset limit[4].
- Carbon Budget 3 (2026 – 2030): 58% average reduction[5].
- 2030: 63% reduction.
- 2040: 89% reduction.
- 2050: at least 100% reduction (net zero).

The CCC found that this pathway is in line with global pathways consistent with meeting the Paris Agreement 1.5 °C goal.[6] However, despite being more ambitious, there is still a very significant degree of risk. We will continue to see the impact of rising temperatures, intense weather events and extreme pressures on the natural environment for decades to come.

We are going to meet Carbon Budget 2 entirely through domestic action. However, if we use offset schemes towards our future targets and budgets, they will be used in a limited way and we will only use those that are considered robust and recognised by international reporting guidelines.

The CCC's advice was based on a series of models, which made different assumptions about the level of behavioural change and technological innovation we can expect to see. A blend of these approaches resulted in the Balanced Pathway, which the CCC used to generate their recommended targets and carbon budgets outlined above.

We have accepted the recommendations from the CCC about **what** the targets should be, but we are setting out our own path about **how** to get there. This means that while we have taken the CCC's advice very seriously and it has informed our thinking in developing this Plan, we have generated a set of ambitions and actions which are different from their model and which better reflect the geography, culture and economy of Wales.

Our modelling shows we are on track for Carbon Budget 2 (37%) and will achieve a 44% reduction against the baseline.

2 Carbon budgets put a cap on emissions for over each 5-year period to 2050, starting in 2016 – 2020. Carbon budgets are expressed in terms of an average reduction against the baseline. The Welsh Ministers must limit how many traded carbon units ("offsets") can be used during each carbon budget.

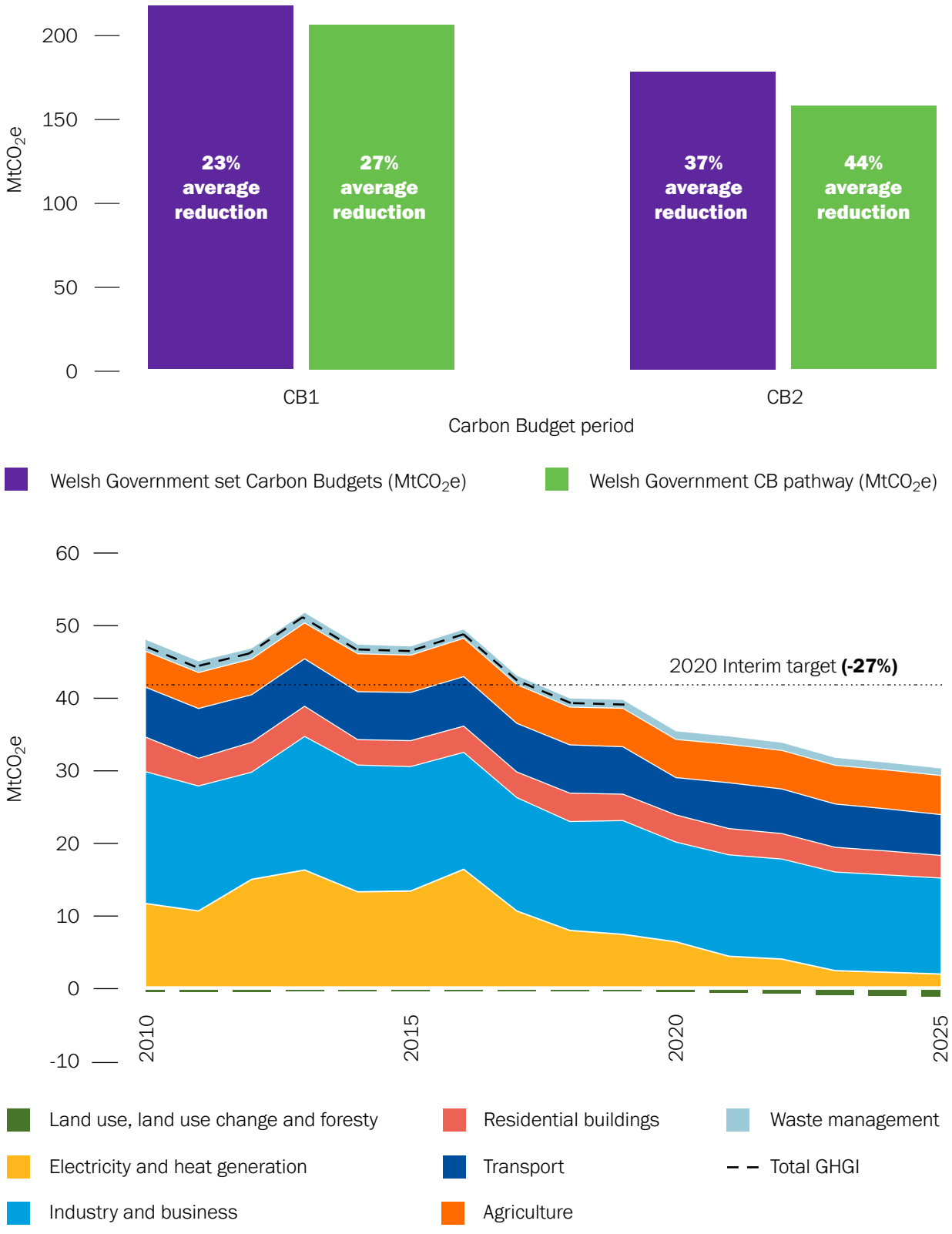
3 The Senedd agreed to this when passing The Climate Change (International Aviation and International Shipping) (Wales) Regulations 2018 (www.legislation.gov.uk/wsi/2018/1302/contents/made). Emissions from flights within Welsh borders and shipping within Welsh waters were already included as domestic aviation and domestic shipping.

4 The CCC's recommendation for CB2 was a 37% average reduction in law with a commitment to outperform it. This is the minimum required to meet the CCC's Balanced Pathway. The Senedd has legislated for a 0% offset limit for Carbon Budget 2. This means that all emissions reductions between 2021 – 2025 must take place in Wales.

5 There is no statutory deadline for setting each offset limit. We will set the CB3 offset limit no later than 2025.

6 Advice Report: The path to a Net Zero Wales (CCC, 2020), p.9

Figure 2: Welsh Government Carbon Budget 2 Pathway



The decline in emissions between 2015 and 2020 was dominated by the end of coal-fired power generation. In the first half of the 2020s, we must develop the foundational policies for net zero aligned decarbonisation whilst still driving down emissions in all sectors. We must also adapt as UK Government policy, impacting emissions in Wales, is also developed.

This work is captured in our Wales 2050 model, which you can read about in more detail in Part 4 of this plan.

The pathway also means we are playing our part in the UK's decarbonisation approach, addressing our fair share of the challenge. This pathway aligns with the UK's statutory carbon budgets, including Carbon Budget 6 (2033–2037), and the Nationally Determined Contribution[7].

International context

International momentum to tackle the climate emergency is building. In February 2021 we saw the United States of America rejoin[8] the landmark Paris Agreement. Signatories to this agreement commit to making pledges to reduce emissions (Nationally Determined Contributions or NDCs) and to review these pledges every five years to steadily increase ambition over time. China and Russia have both committed to net zero ambitions for the first time, and in the run up to COP26 a record number of countries set out new, ambitious targets for climate mitigation. However, global emissions are still going up. While the COVID crisis in 2020 triggered the largest annual drop in global energy-related carbon dioxide emissions since the Second World War, early data shows emission levels are already rebounding.

We are committed to working with other like-minded States and Regions through our engagement with international networks and organisations, such as Regions4SD and the Under2 coalition.

Under2 Coalition

As well as Nation States coming together, States and Regions around the world are also taking action. Wales was a founding member of the Under2 Coalition, which provides a global forum for sub-national governments to work together to limit emission reduction and to keep global warming to under 2°C by the end of this century. In 2021 the coalition had 206 jurisdictions, from 43 countries, collectively representing 1.3 billion people and nearly $30 trillion in GDP, equivalent to nearly 40% of the global economy.

Under2 has a key role at COP, and especially COP26 where the role of states and regions will be in the spotlight.

UN

The UN sets out how all sectors of society need to mobilise for a decade of action on three levels:

1) **Globally**, to secure greater leadership, more resources and smarter solutions for the Sustainable Development Goals;

2) **Locally**, to embed the transitions we need to see in the policies, budgets, institutions and regulatory frameworks of governments, cities and local authorities; and

7 The UK communicated its new Nationally Determined Contribution (NDC) (www.gov.uk/government/publications/the-uks-nationally-determined-contribution-communication-to-the-unfccc)under the Paris Agreement to the United Nations Framework Convention on Climate Change (UNFCCC). The NDC commits the UK to reducing economy-wide greenhouse gas emissions by at least 68% by 2030, compared to 1990 levels. It also includes information on how this target was developed and is quantifie

8 www.state.gov/the-united-states-officially-rejoins-the-paris-agreement/

3) **Through people**, including action by youth, civil society, the private sector, unions, academia and others, to generate an unstoppable movement for change.

This plan brings together these three aspects, showing how all of Wales is playing its part and coming together in collective action and making sure we leave no-one behind as we transition to a cleaner and more sustainable future.

COP26

The UN's Climate Change Conference of the Parties (COP26) in Glasgow on 1–12 November 2021 provides the opportunity for the world to respond to the growing alarm bells and act as a locus for collective action. As a country that was once at the forefront of the industrial revolution, Wales is playing our part, committing to take action and calling on others to join with us through our international coalitions (see below), through our domestic engagement campaign (see Part 2) and through committing to the Race to Zero and Net Zero Futures initiatives.

Building our evidence base to inform our pathway

This Plan is focussed on demonstrating how we will meet our legal commitment to net zero. This commitment concerns our territorial emissions.

In developing a plan of action to reach net zero, we need to use the evidence available to understand the likely intended and unintended effects of meeting Carbon Budget 2.

Our evidence base is wide-ranging and supplemented by a range of sources, not least from the work of the CCC. However, we will need to develop and refine further evidence in both developing the strategic pathway to net zero and the policies required to meet our targets. In constructing our pathway to 2050 we have further developed our Wales 2050 calculator, building on the work undertaken in preparation for our first statutory decarbonisation plan, *Prosperity for All: A Low Carbon Wales*. The calculator has allowed analysis of different pathways based on different shares of effort across society. We will continue to develop our calculator to ensure it remains current to policy developments and emerging evidence.

The calculator shows that this Plan will deliver against the statutory carbon budget, and should see emissions fall to 44% against the baseline.

The further out the model goes, the less certain things are. The step between Carbon Budgets 2 (37% average reduction) and Carbon Budget 3 (58% average reduction) should be a call to action for every person, community and business in Wales. Government cannot make this leap on its own. This Plan therefore sets out not only the collective action in Wales to deliver Carbon Budget 2, but also our approach to engage and to work in social partnership across the country as we work out how best to prepare for the work which will be required in Carbon Budget 3.

Consumption emissions

Consumption emissions are a combination of those emissions that occur in Welsh households (heating and driving, for example), emissions that occur in Wales to produce goods and services consumed in Wales, and 'imported' emissions that occur in other countries to produce goods and services consumed in Wales.

Our statutory emissions targets and carbon budgets measure our territorial emissions, taking the emissions that occur within our national boundaries into consideration. It is also important to measure our consumption emissions, as action to reduce emissions in Wales could potentially lead to increased emissions in other parts of the world. We use these two ways of accounting for our emissions as national indicators in making progress towards the seven well-being goals.[9]

Overseas production may not have the same environmental or social standards as we have in Wales, so there are potential additional risks to the environment and communities of those countries. This does not accord with our commitments in the Well-being of Future Generations (Wales) Act to be a globally responsible Wales. Therefore, when reducing our emissions, we will consider a number of wider issues to avoid "carbon leakage". Measuring our consumption emissions helps us to think about how to discourage the offshoring of emissions that could occur as a result of production moving abroad. For instance, activities we committed to support in our PfG such as repair cafés, re-use hubs and bike repair facilities help to reuse products rather than importing new ones.

Wales also produces goods which are consumed by others. For example, Wales produces much more power than we consume and exports it to other parts of the UK. Whilst we do not consume this power in Wales, we account for the emissions from power generation in our territorial emissions reporting. However, the businesses which produce goods for export create much-needed jobs for local communities, and may generate products with lower embodied carbon than those which are produced overseas. This serves to illustrate the complexity of measuring emissions and our efforts to reduce them.

The Environment (Wales) Act (2016) requires us to publish an estimate of "Welsh consumer emissions". These are emissions that may reasonably be attributed to the consumption and use of goods and services in Wales whether they were produced in Wales or elsewhere in the world. We are required to report on our consumption emissions in the final statement laid before the Senedd after the end of each carbon budget period. **Next year, we will publish the first of these statements on our consumption emissions for the Carbon Budget 1 period, covering 2016 – 2020**.

Throughout this plan we have highlighted where we are taking a circular economy approach, to help deal with consumption emissions.

9 Wellbeing of Wales: national indicators | GOV.WALES (https://gov.wales/wellbeing-wales-national-indicators)

Part 2 – Setting the conditions

Introduction

Our government programme sets out the ambitious and radical commitments we will deliver over the next five years in order to tackle the challenges that we face, set the foundations for future decarbonisation and improve the lives of people across Wales. The Programme shows how we will act decisively to tackle the climate and nature emergency so that people can go on treasuring Wales' rich natural resources for generations to come.

It is not just what Wales does which is important, it is how we do it that matters too. As part of our holistic and comprehensive approach to delivering net zero, we know we have to do more than just the actions described in Part 3. We know we have to enable the change, setting the conditions to drive down emissions and build the foundations for net zero by 2050 in a way that makes sure no one is left behind.

This section explains why we should be concerned with 'how' we tackle the climate emergency, and what we are already doing to join up action and generate robust, sustainable solutions that work for Wales in line with our commitments to the WFG Act. It also sets out how we will take these actions forward in this carbon budget period, working to tackle the core issues described by the Cabinet in their introduction.

We are committed to ensuring the policies, proposals and investment set out in this Plan are used to accelerate progress towards a greener, fairer and stronger Wales.

Why is our approach so important?

The distributional impacts of the change

The Covid pandemic illustrated the unequal impact rapid change can have on society. We are committed to responding to our climate ambitions in ways which create greater equality and better outcomes in our communities, alongside nurturing economic health and international competitiveness. Doing so requires us to understand how communities and businesses will be affected by the changes and put in place the mechanisms to ensure both positive and negative effects are distributed fairly.

The pandemic had a significant impact on the way we think, behave and engage. It brought sadness for many people, and the full implications for health, economic and educational outcomes will not be known for many years. Economically, the impact of the pandemic adversely affected the labour market and led to an unprecedented reduction in economic output (GDP) in Wales. According to the latest statistics[10], quarterly GDP in Wales fell by approximately 18% in the second quarter of 2020, compared to the same quarter in the previous year. The impact on the labour market has also been severe. The Welsh economy has subsequently recovered somewhat but there is still some uncertainty about the future path of the pandemic. Assuming no further short-term shocks, there is evidence to suggest that Welsh GDP may be back at its pre-crisis level late in 2021. However, with our departure from the European Union likely compounding a cautious investment landscape, the challenge of meeting our net zero targets is more difficult than ever.

However, a positive change is achievable. Through the pandemic, many people were able to embrace benefits for their families and communities, such as cleaner air, a fitter and healthier lifestyle and better work-life balance. Societally, we seem to have accepted 'new normals' and in many cases, shifted to new ways of living and working. From a climate perspective, these include an increased number of people with the ability to work from home, an increase in local shopping, remote service delivery, a decrease in traffic, and an increasing awareness of how important resources are, including our natural environment.

We are acutely aware these positive changes are fragile – they may not endure – and they have not been equally shared. The Wellbeing of Wales report[11] provides further detail.

Changes as a result of leaving the European Union, the pandemic and the impacts of climate change all risk disproportionately disadvantaging the most vulnerable in society. We recognise the potential impact of policies to decarbonise both internationally and at national level could have on our citizens and businesses. Achieving a **just transition** requires us to approach decarbonisation as a means to deliver our commitment to social and economic justice, consistent with our commitment to fair work and Social Partnership. It recognises the technological, social and economic challenges of decarbonisation, and works to identify ways in which we can redress existing inequalities across communities and the Welsh workforce, and prevent new ones from forming. It adopts the spirit of the Paris Agreement and the Silesia declaration, with regards to collectively finding a way to fairly transition to a greener future.

10 Data published by the Office for National Statistics on 05 May 2021, and may be subject to revision.
11 Wellbeing of Wales: 2021 | GOV.WALES

Since the publication of *Prosperity for All: A Low Carbon Wales* we have worked with key stakeholders to develop our approach and have reached out internationally to share our experiences of post-industrial change, as well as learning lessons and hearing insights from other governments and regions, including those in Baden-Württemberg and Canada. Closer to home, stakeholders include the Wales Centre for Public Policy (WCPP), the Grantham Institute in Partnership with UK Finance and Place-Based Climate Action Network (PCAN) and the Institute for Public Policy and Research. We have co-chaired the Powering Past Coal Alliance's Just Transition Taskforce which is made up of expert partners, such as Trade Unions and academics, to provide assistance to other nations in transitioning workers and communities. We have also worked closely with Scottish colleagues as their Just Transition Commission reported earlier this year, collaborating with them on areas of shared challenge, and funded initiatives such as the Blaenau Gwent Climate Assembly.

This work has been invaluable in helping us to develop our understanding of the task at hand, the details of which are reflected across the emissions sector chapters in Part 3.

Over this Government term, we will build on the progress we have made. We will embed the concept of a 'Just Transition' in the Social Partnership approach that brings together government, trade unions and employers, recognising the importance of early engagement.

As part of the new Programme for Government commitments, we will support Wales TUC proposals for helping union members to become Green Representatives within their workplace and we are encouraging employers to support them. The TUC are working with these representatives and workplace management on a range of initiatives to support workplaces to become green and contribute to the Net Zero Wales agenda.

Policy 1 – Just Transition

We need to ensure the transition to a cleaner, fairer future in Wales is carefully managed. The changes driven by the need to decarbonise our economy will have impacts on industries, sectors of the workforce and socio-economic groups in different ways, depending on the pathways, policies and actions we choose. It could help to resolve existing inequalities, but there is a risk it could also exacerbate them. Over the period of CB2 we will work closely with our key partners such as the Well-being of Future Generations Office and Wales TUC to develop our evidence base and further improve our understanding around the transition.

We will also continue to strengthen our understanding of the impact of climate policy through our internal integrated impact assessment processes. We will use our existing partnerships (such as our Social Partnership approach) and new engagement approaches across Wales to improve our evidence, understanding and addressing the concerns of our workforce and communities and incentivising change. This multi-faceted and integrated approach takes forward and improves on our proposal to form a Just Transition Advisory Group in Prosperity for All: A Low Carbon Wales by integrating fairness across all levels of governance and decision making.

What are we already doing?

Joining up action to realise multiple benefits from our actions

Delivering policies to ensure a fair and prosperous transition to net zero will be largely dependent on our ability to identify and maximise connections between policies, so that we maximise the contribution towards the seven well-being goals of the WFG Act. Our net zero pathway requires us to decarbonise across all sectors, and therefore it is important we make the most of every policy and action. We need to think about a joined-up system and integrate our work, continuing to seek multiple benefits from every action we take, embedding our response to the climate and nature emergency in everything we do.

The Sustainable Development principle in the Well-being of Future Generations Act will continue to steer our policy responses so that we look to the long term; involve people in the decisions that affect them; collaborate with partners to deliver; integrate our thinking to drive multiple benefits; and seek out opportunities to address the underlying causes of change.

Examples of joined up action:

› **Integrate our responses to the nature and climate emergencies**

Policy 2 – Nature emergency

Nature is declining globally at rates unprecedented in human history and the rate of species extinctions is accelerating. Recent reports[12] indicate biodiversity loss and natural capital/ecosystem services degradation in Wales continues, despite some of the positive interventions made in recent years.

The inter-connectedness of the nature and climate emergencies has never been clearer: by limiting changes to the climate by reducing emissions we will support biodiversity and well-functioning ecosystems, which in turn provide natural solutions and build resilience to climate risk.

In June 2021 the Senedd declared a nature emergency, believing there should be parity between actions we take to tackle climate change and those taken to tackle biodiversity loss.

The PfG states that Welsh Ministers will act decisively to tackle the climate and nature emergency, embedding the response to the climate and nature emergency in everything we do. This includes ensuring that nature and the climate are on the agenda of every public service and private sector business, and integrating positive action for nature into more of our economic activity (please see the Public Sector Chapter).

Natural Resources Policy[13] sets out the government's priorities for managing natural resources and will be subject to a full review in 2022 to reflect the urgency of the climate and nature emergency.

12 The State of Natural Resources Report (SoNaRR) published by Natural Resources Wales (NRW)
13 Natural resources policy | GOV.WALES (https://gov.wales/natural-resources-policy)

This policy drives action across Welsh Government and also through Natural Resources Wales' area statements, which delivers the policy in a local context. Action to tackle biodiversity loss is taken across the Welsh Government, but rooted in the actions set out in the *Nature Recovery Action Plan* (NRAP)[14], our National Biodiversity Strategy and Action plan. The NRAP will be revised in light of the post 2020 global framework agreed at the UN Biodiversity Conference, COP15 this year.

Specifically we will:

- Act to tackle the drivers of biodiversity loss, including pollution, climate change and unsustainable consumption.
- Restore the damage done to our protected sites, habitats and species, and future proof them against further decline.
- Change behaviour at all levels to support more sustainable management of natural resources (e.g. Circular Economy).

Examples of current actions, which tackle biodiversity loss and climate change, are explored further in the LULUCF and Agriculture chapters.

› **Integrate our approach to climate and health**. The impacts of climate change are one of the great threats to public health in the 21st Century but while there are significant risks, tackling the climate emergency also has potential to improve health equity.

The UK Health Expert Advisory Group convened by the CCC in 2020 advised on the health impacts of setting the UK's sixth Carbon Budget, as well as the associated advice for Welsh Ministers. The Group's headline recommendations for the UK Government to maximise the positive health impacts of meeting the sixth Carbon Budget and net zero target are equally applicable to Wales[15].

Some of these impacts come directly from changes required to achieve net zero (e.g. more active travel and dietary changes) and some indirectly from the implications of those changes (e.g. better air quality from reduced burning of fossil fuels and better building fabric as insulation is improved). We will build the Health Impact Assessment process into policy development across all areas of emissions. We want to identify areas where policies can be strengthened to have the maximum possible impact to address health inequalities and identify areas where benefits to public health can be expanded.

Over the next 20 years the ambition is to shift the population's diet closer to the Eatwell Guide. This will mean a substantial increase in fruit and vegetables, a decrease in red and processed meats and dairy products and a decrease in foods high in fat and sugar (see Proposal 1, at the end of Part 2). Our national Healthy Weight: Healthy Wales strategy focuses on the prevention of obesity. A biennial 22-24 Plan is being published in early 2022, which will outline work to support the delivery of net zero. This will also include work to encourage an increase in daily physical activity.

14 Nature recovery action plan | GOV.WALES (https://gov.wales/nature-recovery-action-plan)
15 www.theccc.org.uk/wp-content/uploads/2020/12/Advice-Report-The-path-to-a-Net-Zero-Wales.pdf (page 139)

Beyond this we will continue to build our understanding of the public health and wellbeing risks from the climate emergency by reviewing the evidence from the Climate Change Risk assessments. The initial focus is on the evidence of public health impacts from extreme heat, cold, flooding and vector-borne pathogens. We will work with partners to update public health adaptation advice and guidance to take account of the latest evidence.

› **Integrate our approach to climate and clear air**. Air pollutants can have a cooling or a warming effect on the atmosphere and can also affect the concentrations of greenhouse gases through their impact on ecosystems, for example, nitrogen deposits increasing plant growth and therefore carbon uptake, and ozone having the opposite effect. Conversely, changes in the climate can affect air quality. For example, hot summers may lead to a higher frequency of summer pollution episodes, such as smog.[16]

Some of the main sources of air pollution also contribute to climate change (e.g. vehicles, buildings, domestic combustion, power generation, agriculture and industry). Actions taken to reduce greenhouse gas emissions can address emissions of air pollutants.

Policy 3 – The Clean Air Plan, decarbonisation and Natural Resources Policy

As we deliver the *Clean Air Plan for Wales*[17] and this Plan, we will maximise these synergies whilst minimising the trade-offs. We will ensure air quality, decarbonisation and natural resources policies are closely integrated to achieve complementary outcomes, consistent with our well-being goals and our Sustainable Development and Socio-Economic Duty.

› **Recognise and proactively manage the interdependency between decarbonisation and managing climate risk.** Whilst this Plan is predominately concerned with climate change mitigation, i.e. the reduction of greenhouse gas emissions, adaptation seeks to lower the risks from climate change.

Significant and irreversible changes to our climate and weather patterns are predicted to continue to develop over the next few decades, even as we reduce greenhouse gas emissions. These changes include hotter drier summers, with an increased frequency of droughts and wild fires, and warmer, wetter winters, and an increased frequency of storms and flooding events. These changes bring with them risks and impacts across all sectors that we need to address and prepare for.

Crucially, the changing climate could itself also put at risk some of the measures needed to achieve net zero emissions. Integration of our adaptation and mitigation policies is therefore essential.

16 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69340/pb13378-air-pollution.pdf
17 Clean Air Plan for Wales: (https://gov.wales/sites/default/files/publications/2020-08/clean-air-plan-for-wales-healthy-air-healthy-wales.pdf)

The CCC's third Climate Risk Independent Assessment[18], published in June 2021, assesses the urgency of adapting to climate risks and opportunities across the UK. The assessment considers risks across all sectors, in relation to the natural environment and natural resources, infrastructure, health, communities, the built environment, business and industry, and international dimensions.

Nearly 60% of all the risks and opportunities assessed have been given the highest urgency score by the CCC with the most urgent areas identified as:

1. Risks to the viability and diversity of terrestrial and freshwater habitats and species from multiple hazards.
2. Risks to soil health from increased flooding and drought.
3. Risks to natural carbon stores and sequestration from multiple hazards, leading to increased emissions.
4. Risks to crops, livestock and commercial trees from multiple climate hazards.
5. Risks to the supply of food, goods and vital services due to climate-related collapse of supply chains and distribution networks.
6. Risks to people and the economy from climate-related failure of the power system.
7. Risks to human health, wellbeing and productivity from increased exposure to heat in homes and other buildings.
8. Multiple risks to the UK from climate change impacts overseas.

Some of the most direct risks to achieving net zero arising from climate change relate to the natural environment and infrastructure. However, there are potential benefits and trade-offs to be considered across policy areas, which are summarised below but covered in more detail in Part 3:

- Land use – where risks to soil quality, plant productivity, the impact of disease and pests and a climate, which compromises the productivity of Welsh agriculture, could jeopardise our net-zero ambitions.
- Extreme weather events – could impact Wales' ability to generate renewable electricity, compromise public transport infrastructure and increase flood risk to electric vehicle charging sites – all of which are key enablers on the road to net zero.

Policy 4 – Building climate resilience and reducing emissions in complementary ways

We will think holistically about the climate challenge and update our current 5-year climate change adaptation plan[19], in light of the CCC's third Climate Risk Independent Assessment published in June 2021.

18 CCC's 3rd Climate Risk Independent Assessment, Advice Report to Government, June 2021
19 https://gov.wales/prosperity-all-climate-conscious-wales (gov.wales)

Well-being Goal Spotlight – Resilient Wales

The Welsh Government's Sustainable Management Scheme can contribute towards a resilient Wales through collaborative, landscape scale, sustainable land management. The scheme seeks to implement nature based solutions to tackle the challenges of climate and nature emergency and to improve our natural resources for the benefit of the people in Wales. For instance the **Farming the Gwent Levels Sustainably** project is a collaborative initiative bringing together RSPB Wales, Natural Resources Wales and the Gwent Wildlife Trust, working closely with farmers and other partners, to develop the understanding, knowledge, skills and experience needed to deliver the sustainable management of natural resources within the Gwent Levels.

Participating farmers and project partners will take action to improve the natural resources in the area, particularly water and soil management. This will be done by habitat improvement and creation, offering significant potential to improve soil condition, and establishing habitat strips for pollinators, which will also act as buffers alongside watercourses. Taking advantage of the flat geographical nature of its area, the project seeks to maximise opportunities for traffic free cycling, as well as existing access and recreation facilities on farms, and creation of new facilities.

› **Embed a holistic approach to managing our resources**

Policy 5 – A circular economy

How we manage resources has never been more important. The pandemic has shown us that the materials we use cannot be taken for granted. To effectively tackle the climate emergency and nature crisis we must address the unsustainable consumption of resources as a root cause. Given 45% of global emissions come from the goods and products made and used every day, we need an approach, which keeps resources in use and avoids all waste: a circular economy. This means accelerating actions to increase resource efficiency, re-use, repair and re-manufacture across all sectors of the economy, seeking to retain and increase good quality jobs across Wales, and where appropriate, substitute high carbon, energy intensive materials with sustainable ones, including natural materials.

Over the last 20 years, Wales has become a world leader in recycling and waste management transforming into a high recycling society. In 1999, less than 5% of municipal waste was recycled and in 2020, this has reached over 65% supported by a billion pound investment in collections infrastructure and wide-ranging action by the Welsh Government. Every household in

Wales has played their part in this success meaning that the foundations are in place to develop a circular economy.

The PfG has committed to progress our transition to a zero waste, net zero carbon circular economy through using resources more efficiently. The actions include introducing Extended Producer Responsibility to reduce waste and supporting repair and reuse hubs and community recycling facilities in town centres. These sit among wider actions to increase resilience and to spark a cultural change akin to the one we have experienced on recycling, where in future we all consider the materials we need and use every day. This is underpinned by a reduction in demand: for materials, for energy and for things we just don't need, which end up in the bin.

Our ambition is to implement systemic change in consumption emissions and to make the circular economy a reality. This is set out *Beyond Recycling*[20], which states we will increase resource efficiency across all sectors, moving away from high carbon, non-recyclable materials and continuing to reduce waste.

By 2050, we aim to use only our fair share of the planet's resources and have 100% recycling (zero waste). The global biodiversity and climate systems will be the key beneficiaries, but the environment of Wales itself will also benefit, for example, from reductions in direct plastic pollution.

Developing a new radical approach to resources, which sees us use less virgin materials and reduce consumption, is going to require cross-government action as well as changes in approach from citizens and stakeholders (See Working with People Section). Local authorities are the key delivery partners in driving higher recycling and their collection of materials not only for recycling, but increasingly for re-use. In the waste chapter we discuss working with governments across the UK on Extended Producer Responsibility for plastic packaging and a Deposit Return Scheme for drinks containers.

The concept of a circular economy is closely linked to the foundational economy. We will build on our innovative approach to aggregate demand and support resilient supply chains to maximise the economic benefits the transition presents, in areas such as electric buses, low carbon homes and heat pumps. We will use our understanding of supply opportunities associated with future investment plans to establish what is required for local businesses to engage in associated supply chains and deploy support, such as the Backing Local Firms Fund, to enable businesses to develop future, green skills and attain relevant accreditations, generating the well-paying jobs of a greener future.

Community action has an important role to play too. Our Eco-schools programme has inspired a young generation who have only ever known a Wales that recycles and places an emphasis on caring for our environment. Initiatives that work to tackle social issues and bring communities together are also very important such as FareShare Cymru who redistribute surplus food to those in need and Benthyg Cymru (Library of Things) who encourage repairing and sharing.

20 Beyond recycling | GOV.WALES (https://gov.wales/beyond-recycling-0)

Throughout this document we will return to the Circular Economy describing how multiple actions will support its delivery. Moving towards a circular economy will have significant, long-term positive impacts on the natural environment, the economy, and the people, communities and culture of Wales. Moving to a circular economy can benefit our economy by retaining value in more resilient and shorter supply chains and enabling people and communities to come together through taking collective action on resources like running repair cafes or redistributing surplus food.

Taking a place based approach

Different communities will experience policies and changes differently, depending on their local context. We must continue to engage and work with people in all parts of Wales to understand regional issues, opportunities and interests for communities and the Welsh workforce.

For example, rural agricultural communities will see changes to agricultural practices and land use. These communities have a high proportion of homes that are challenging to decarbonise. People living in these areas, where more dispersed patterns of settlement mean public transport and digital infrastructure are less concentrated, tend to have to travel greater distances for essential purposes than those living in urban areas. The changes we make in agriculture, transport, buildings, the public sector and land use will all affect these communities and need to be integrated and coherent.

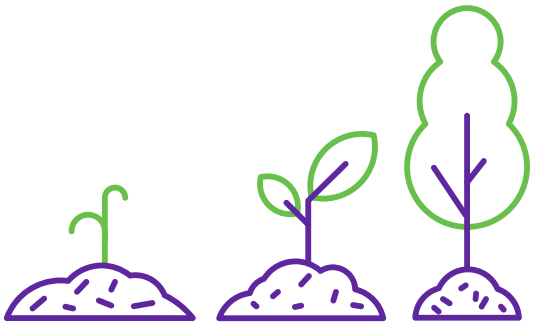
We have a series of frameworks to help us take a consistent, coherent approach across Wales, which takes account of the needs of each place.

- **Future Wales**[21] was published in February 2021. It provides a place-based approach for the future development of Wales with a 20-year time horizon. It sets a clear planning policy context for decarbonisation by both preventing and mitigating carbon emissions.

  In this carbon budget period (2021 – 2025) we will make significant progress towards the creation of a hierarchy of consistent development plans from Future Wales at the national scale, to Strategic Development Plans at the regional level down to Local Development Plans, thus establishing a clear planning framework for decarbonisation

Policy 6 – Planning Policy

Planning Policy Wales will also facilitate decarbonisation. Our national planning policy is set out in Planning Policy Wales (PPW)[22]. It puts emphasis on people and places and ensures developments built today leave a legacy of well-designed, sustainable places which improve lives. PPW has a firm focus on 'placemaking' – an approach to development which ensures communities have all the services they need within easy reach and development is of high quality. This includes planning policies, which are designed to help Wales lower its carbon emissions at the same time as creating places where people can live well.



21 Future Wales: the national plan 2040 | GOV.WALES (https://gov.wales/future-wales-national-plan-2040)
22 Planning policy Wales | GOV.WALES (https://gov.wales/planning-policy-wales)

During Carbon Budget 2 PPW will continue to facilitate decarbonisation through the planning system by providing an ambitious and comprehensive policy framework to address the causes and effects of climate change. It will help to shape development plans, including Future Wales, Strategic Development Plans and Local Development Plans, to ensure they are maximising the opportunities to decarbonise through a place based approach to sustainable development.

The Wales National Marine Plan provides a framework to ensure our natural resources are used in a way and at a rate that maintains and enhances ecosystem resilience and the benefits they provide. A resilient and biodiverse marine environment contributes to our well-being, cultural identity and sense of place. Building resilience into our marine ecosystems and recognising the benefits they provide when managed sustainably is integral to the WNMP's vision for the sustainable development of our seas.

Regional Economic Frameworks (REFs) are a key component of our approach to regional economic development and are being developed in partnership with key regional stakeholders, including local authorities. REFs are intended as a vehicle to help promote collaborative regional planning and delivery amongst public, private and third sector partners, setting a shared vision and a set of common economic development objectives in relation to their areas. Tackling climate change and decarbonisation is central to the ambitions of the REFs.

Policy 7 – Regional Economic Frameworks

The portal for the development of the REFs for Mid and South West Wales can be found at:

Towards a Regional Economic Framework for Mid Wales and South West Wales – https://businesswales.gov.wales/mid-wales-and-south-west-wales-economic-frameworks

By 2025 all new City and Growth Deals will have carbon reduction at their core and will contain carbon reduction outputs as key metrics for monitoring and evaluation.

The City and Growth Deals offer Wales and our regions an opportunity to unlock additional funding to support interventions that can deliver sustainable economic growth, bespoke to each region and providing a framework for collaborative working across the public private and third sectors. City and Growth Deals in Wales will fully incorporate carbon reduction into their planning and delivery and while each of the Deals is at a different stage of development and delivery, the deal partners are committed to promoting the net zero carbon delivery agenda.

North Wales Growth Deal

The North Wales Growth Deal partners have committed to the national drive towards sustainable development, net zero emissions and mitigation of biodiversity loss. To drive these ambitions, all Growth Deal projects in north Wales will aim to:

- Deliver to net zero operational carbon
- Deliver 40% less embodied carbon
- Deliver a 10% net benefit for biodiversity
- Projects will be encouraged to deliver above these aspirations.

The Deal is intended to:

- Enable the deployment of newly installed low carbon energy generation capacity and to enable carbon savings throughout the deal;
- Educate businesses on the benefits of decarbonisation, diversification and sustainable business models.

Cardiff Capital Region City Deal (CCR)

CCR, with our support, has developed an Energy Vision and Strategy which has been modelled to set out a decarbonisation route that will put the region on track to achieve a net zero energy system by 2050. The vision is guided by three core principles, which seek to:

1. Act as an enabler to a sustainable regional economy: deliver inclusive employment, profits and skills, lower costs, open up markets, and stimulate public and private investment.
2. Contribute wider benefits to the region: including alleviating fuel poverty, sparking innovation and developing local training and skills.
3. Decarbonise the energy system to meet national targets as a minimum: carbon reductions across all sectors, energy efficiency as a core focus, and to have a multi-vector system.

Mid Wales Growth Deal

Growing Mid Wales is taking forward the development of the Deal in the mid Wales region. Heads of Terms were agreed in December 2020 between Welsh Government, the UK Government and the region's local authorities (Ceredigion and Powys) and the region are now working to develop further their proposal based around a number of themes, which include energy and environment.

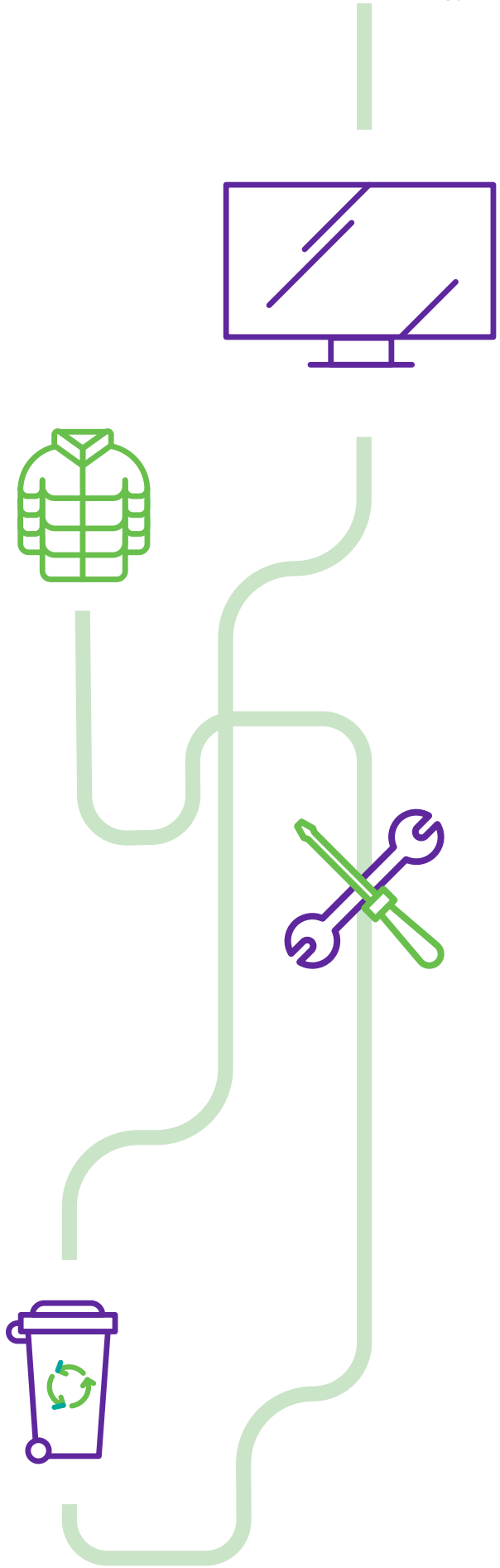
Growing Mid Wales will be required to demonstrate to both governments not only how their Growth Deal proposal delivers economic growth but also how it addresses climate change objectives, including decarbonisation. We will insist on a carbon impact assessment being undertaken on any proposals received.

Swansea Bay City Deal (SBCD)

SBCD has pledged to work together significantly contribute to the Swansea Bay City Region Economic Regeneration Strategy 2013 to 2030. Key projects are delivering outputs aligned to the decarbonisation agenda focusing on energy savings, tackling fuel poverty and carbon reduction. SBCD will respond directly to improve energy efficiency and the transition to a net zero carbon economy, enabling more businesses to become carbon light or free.

Specific actions include:

- Improve business and industry efficiency: Enhancing business energy efficiency through next generation and mobile broadband. Development of the SWITCH and Technology Centre to promote innovation and low carbon growth.
- Improving the energy efficiency of our homes – Homes as Power Stations Programmes (HAPS) will deliver the rollout of innovative energy efficiency homes throughout the Region
- Accelerate the shift to low carbon transport – directly through the Supporting Innovation and Low Carbon Growth Programme



Investment in the net zero economy

The costing of this plan and an assessment of longer term costs is described in Part 4 of this plan. Here we focus not on what the costs might be, but how they might be met.

Public Sector investment. In those areas where evidence suggests public investment by Welsh Government can make the greatest impact we have invested. In 2020-21 our Budget provided a specific package of £140m of capital funding to help combat the climate emergency. In 2021-22 on top of maintaining the majority of this funding in departmental baselines, we allocated nearly £80m in additional capital to deliver interventions that promote decarbonisation and further enhance biodiversity, alongside an additional £17m of revenue funding to support these interventions.

Of course, these figures do not capture the totality of Welsh Government investment to date. In line with the WFG Act, we try to make the most of every pound that we spend is used to maximise the contribution towards the seven well-being goals, of which sustainability is the underpinning theme.

The UK Government must also meet its fair share of the costs of decarbonisation in Wales, reflecting the extent to which the decisions and investment needed to unlock a cleaner and greener Wales remain in Westminster.

Private investment. While government has a crucial role to play, the scale and pace of transition cannot be funded by the public purse alone. We will continue to support Welsh businesses to create new jobs, find new export markets and invest in sustainable industries. We will also mobilise private sector and personal investment at the scale and pace required so Wales can maximise the economic benefits from the low carbon global economy, as well as meeting our emissions targets.

What more will happen in Carbon Budget 2?

Additional investment in the net zero economy

Our approach continues to be led by evidence, helping us to understand where Welsh Government spend can have the greatest impact in delivering our carbon budgets. We then need to consider how we will focus our financial resources to deliver these actions.

At the time of writing, the Welsh Government had not received its financial settlement beyond 2021-22, and was pending the outcome of the UK Spending Review. As such, dependent on the level of funding made available to Wales through the spending review, we will demonstrate our commitment to delivering this carbon budget as part of the forthcoming 2022-23 Draft Budget.

We call on the UK Government to recognise the gravity of the climate emergency, and make funding available which reflects the seriousness of the task at hand.

All parts of Wales have benefited from EU funding, with the European Structural Funds in particular supporting investments to support the transition to a zero-carbon economy. This includes investments in marine renewable energy, public transport, making our infrastructure more environmentally sustainable, and improving energy efficiency in our homes.

The EU funding programmes (2014 – 2020) are now tailing off, with the Welsh Government having committed 100% of its funding allocation and projects ending in 2023. To prepare for this, over the last three years we have worked with our partners across Wales and the Organisation for Economic Co-operation and Development (OECD) to develop a Framework for Regional Investment (https://gov.wales/sites/default/files/publications/2020-11/regional-investment-in-wales-framework.pdf) to replace EU funding in Wales. This work was undertaken based on long-standing commitments from the UK Government that leaving the EU would mean no loss of funding or devolved powers to Wales.

The UK Government is yet to hold a public consultation or publish its framework for the UK Shared Prosperity Fund to replace EU funding despite leaving the European Union more than 18 months ago. UK replacement funding through a temporary pilot scheme, called the Community Renewal Fund, in the financial year 2021-22 falls significantly short, by around £365m annually, compared to what Wales would have received through new EU funding programmes starting in January 2021.

We believe it is essential for the UK Government to provide Wales with adequate replacement funding and for that funding to be allocated directly to the Welsh Government to invest on priorities, including the transition to a zero-carbon economy, which have been developed and agreed with our Welsh partners from the higher and further education, local government, business and third sectors, and will benefit all parts of Wales.

Further commentary about the high levels of capital investment, which will be needed across society and the economy over the years to 2050, and about where these costs are likely to be borne, can be found in Part 4.

Assessing the carbon impact of our investment. The process to assess relative contributions of different kinds of spend to decarbonisation is complicated in many cases. We are committed to further developing the suite of methods we use to assess these contributions and supporting the skills development needed to apply them consistently.

Policy 8 – Updated Budget Improvement Plan

Through our Budget Improvement Plan[23], we have set out the actions we are taking to consider how the assessment of the carbon impact of our spending programmes can be made more robust. This work, which is informing our 2022-23 budget preparations, is considering the incremental impact of Welsh Government spend, as well as the wider impact that policy implementation has on carbon emissions. An update to the Budget Improvement Plan will be provided alongside the 2022-23 draft budget, which will provide further details on the progress we are making on assessing the carbon impacts of our expenditure.

Infrastructure Investment Strategy. One of the most important considerations we can make is the link between the infrastructure we support and the impact it has on our environment.

Policy 9 – New Infrastructure Investment Strategy

Our new infrastructure investment strategy will be the successor to the current Wales Infrastructure Investment Plan, and will be published alongside our 2022-23 Draft Budget This will set the framework for Welsh Government investment in infrastructure and will be designed around the four well-being themes of economic, environmental, social and cultural well-being. At its heart will be the Welsh Government's response to the climate emergency, including the commitment to net zero and tackling the decline in biodiversity, and the strategy has been designed specifically to support the delivery of a net zero carbon economy.

This approach lets us recognise that, for example, alongside investments in electric vehicle infrastructure and in railway electrification, which have decarbonisation as a primary purpose, we can leverage the delivery of our wider programme of capital investment in areas such as hospitals and schools to contribute to delivery of net zero.

Many of the policies captured in this plan will also appear in the suite of documents which will describe this new infrastructure investment strategy.

In a fiscally constrained environment, we have also recognised the importance to consider the extent to which current spending can be repurposed to promote decarbonisation, rather than seeking to allocate additional resources. It is for this reason we are undertaking a zero based review of capital budgets as part of our 2022-23 budget preparations.

23 33740_Final Budget 2018-19 (gov.wales) (https://gov.wales/sites/default/files/publications/2020-12/2021-2022-budget-improvement-plan.pdf)

Carbon pricing. Carbon pricing is currently achieved in the United Kingdom through the UK Emissions Trading Scheme (UK ETS). The UK ETS was developed as a response to leaving the European Union (EU) and commenced on 1st January 2021. The UK ETS was developed and is operated by the UK ETS Authority, comprising the four governments of the UK.

Policy 10 – Carbon pricing – decarbonisation of power generation, industry and further scheme development

The UK ETS works on the 'cap and trade' principle, where a cap is set on the total amount of certain greenhouse gases that can be emitted by sectors covered by the scheme. This limits the total amount of carbon that can be emitted and, as the cap decreases over time, will make a significant contribution to all governments of the UK meeting their emissions targets.

Participants in the UK ETS are required to obtain allowances equivalent to their annual emissions under the scheme. These can be bought in regular auctions or by trading on the secondary market. Some participants at risk of carbon leakage receive some allowances for free (free allocations). The cap is reduced over time, so that total emissions in the sectors covered must fall.

The UK ETS currently applies to energy intensive industries, the power generation sector and aviation.

However, alongside our partner governments we have ambitions to expand and amend the scheme to capture a larger proportion of our economy and better reflect carbon leakage risks. Doing so will create greater assurance our net zero pathway can be met and ensure we do not increase consumption emissions, whilst reducing territorial emissions.

The UK Authority will shortly consult on proposals to:

1. Align the UK ETS cap with net zero and make the UK ETS the world's first net zero carbon cap and trade market;
2. expand the scope of the UK ETS to capture additional sectors of our economy, thereby expanding the use of carbon pricing as an investment signal and further assuring our net zero pathway;
3. review the free allocation policy to ensure it continues to mitigate against carbon leakage and competitiveness risks; and,
4. explore changes to the existing scope to overcome market distortions.

A key consideration of this consultation will be on the distributional impacts of the scheme, or in other words, where the costs will eventually fall. In managing a socially just transition to a cleaner future, we must avoid the burden of change falling on the shoulders of those least able to pay, as costs are passed down the supply chain from manufacturers to consumers of goods and services.

Economic Resilience and Reconstruction Mission and Economic Action Plan (EAP)
Our approach to business and the economy is set out in our Mission[24] and the EAP[25]. This outlines the range of actions we are taking to drive inclusive growth and future-proof the economy.

Decarbonisation features strongly in our proposals for supporting for businesses. This is centred on the Economic Contract, Calls to Action and the Economy Futures Fund (see the Industry and Business chapter in Part 3). To access direct financial support through the Economy Futures Fund, businesses must demonstrate that they contribute to our strategic priorities (the Economic Contract) and that they are delivering investment designed to future proof the Welsh economy (the Calls to Action).

In 2021 the Economic Contract was refreshed, strengthening our 'something for something' relationship with businesses and challenging those businesses we support to do more to contribute to our strategic priorities, including transitioning to a low carbon and climate resilient economy. We have deepened the requirements and have developed clear indicators and minimum standards, which must be met to achieve a contract.

In this carbon budget period we are driving further behaviour changes by introducing development pledges. We ask every business that we work with to make between three and five pledges to do things differently or to push further and faster on existing commitments.

We will discuss low carbon and environment resilience with 100% of organisations and our ambition is that at least 50% of economic contracts will include at least one pledge to reduce emissions or become more climate resilient by 2025.

Well-being Goal Spotlight – Prosperous Wales

We continue to build our constructive and engaging relationships with businesses through the Economic Contract to help us deliver a prosperous Wales. As we committed to in the Programme for Government, the Contract has been strengthened and we will continue to build on the strong foundations which have been established. Structured on four pillars, **Low Carbon and Climate Resilience** alongside **Economic Strength and Adaptability, Fair Work** and **Promotion of Wellbeing**, the pillars provide the framework for our conversations with businesses. This means we talk to 100% of businesses we support about how they are addressing the climate emergency. To secure an Economic Contract businesses must demonstrate their commitment to change as well as providing us with an opportunity to celebrate the best companies, and ensure our support is targeted at those businesses doing the most for Wales.

This process allows businesses to demonstrate their commitment to these principles, it allow us the opportunity to demonstrate our support to them and means together we can be ambitious for Wales.

24 Economic resilience and reconstruction mission | GOV.WALES (https://gov.wales/economic-resilience-and-reconstruction-mission)
25 Prosperity for All: economic action plan | GOV.WALES (https://gov.wales/prosperity-all-economic-action-plan)

The skills for a green recovery and transition to net zero

As we move towards a net zero economy, the skills we need in Wales are likely to change. With some of the 2050 workforce already in employment, a primary challenge will be around how we update and refocus people's skills, ensuring a Just Transition is central to our approach. The need to re-position skills within the net zero agenda must take place alongside other structural challenges impacting on the labour market including digitalisation, automation and the long-term response to Covid. These disruptive forces complicate public policy responses, but they also offer a window in which we can improve the skills of people in declining or vulnerable sectors of employment. The transition to net zero and the structural challenges offer us an opportunity to actively tackle inequalities.

To different extents, the transition to net zero will have implications for jobs at all skill levels and across all occupational groups. The current system will be challenged by and create opportunities from:

- Displaced jobs as we see the transition from one sector to another.
- New and emerging jobs that relate directly to the transition to net zero.
- Jobs that will need enhanced skills or competencies.
- Existing jobs that will be needed in greater numbers as the result of the transition to net zero.

Policy 11 – Skills Action Plan

We have an important part to play in ensuring that skills are a key enabler for net zero, promoting fair work alongside good and safe employment in social partnership with trade unions and employers. We will develop a Net Zero Wales Skills Action Plan, which we intend to publish in spring 2022.

We will need to take a Team Wales approach, working closely with stakeholders from across Wales in its development. Universities and colleges, along with skills providers, local authorities, and the third sector play a central role in providing the training, skills and innovation needed by employers and which improve the prospects of Welsh workers. We will work together to consider how we will:

- Build on Regional Skills Partnerships Labour Market Intelligence, including in relation to job quality.
- Define and achieve acceptance of industry requirements.
- Develop National Occupational Standards for the work to be done grouped into occupations.
- Review qualifications for future skills needs.
- Develop government incentives or legislation/regulation to stimulate the skills demand.

Regional Skills Partnerships (RSPs)

Net zero will be central to our PfG commitment to strengthen Regional Skills Partnerships (RSPs). We will continue to work together to understand the needs of employers in relation to net zero skills, and to understand how we can support workers to take advantage of these changes.

The skills system will need to be able to respond efficiently to shifting demand. We will ask RSPs to highlight skills gaps and shortages and work with the further education and higher education sectors to help inform supply, to meet the needs of employers. In addition, this intelligence will also help inform the deployment of apprenticeship funding to support our net zero goal.

We will take the opportunity to maximise our relationships with existing regional structures (delivering on Growth and City Deals, together with specific regional initiatives such as Energy Island in North Wales) and other stakeholders and groups to support this skills agenda.

Define and achieve acceptance of industry requirements

We need to consider the skills challenges across all sectors and not simply those considered "green" jobs. Whilst there are challenges in defining and quantifying the number of green jobs/skills needed in the economy, there is no doubt of the significance of the contribution they will make. The Action Plan will build on the work that is already being undertaken on "green" jobs in a wider sense. We have been working with key sectors to map the skills base and understand sector demand.

Develop National Occupational Standards

National Occupational Standards (NOS) set out the knowledge, skills and competencies required for an occupation. They underpin a range of apprenticeship qualifications and adult vocational qualifications across the UK and overseas. Through the Skills Action Plan we will build on the work already underway through the three-nation NOS commissioning board including:

- Identifying, developing and valuing transferable and portable skills to support movement into emerging and expanding occupational areas, mitigating the risk of employer-specific training solutions which inhibit mobility and have little value for the individual in the wider labour market.
- Making sure that responding to the low-carbon agenda is one of its key priorities.

Develop government incentives or legislation/regulation to stimulate the skills demand

We can stimulate economic activity that can make a significant contribution to achieving net zero transition, for example across the buildings, power or transport sectors. The Skills Action Plan will consider how the actions presented across the sectors in this plan can be used to map the demand and supply of skills needed.

Our Employability and Skills (and Welsh Government) programmes will need to build a better understanding and obtain evidence of the future skills requirements to help inform and influence our provision to support Net Zero Wales. This is also applicable to Working Wales[26] as they will need to gather the necessary local/regional/national information and intelligence to pass on to advisers and customers. The Skills Action Plan will build on the work currently underway in a number of these programmes to ensure that they are fit for purpose in a net zero Wales and that they will support the transition.

26 Working Wales is the Welsh Government's approach to delivering free, impartial, employability and careers advice tailored to an individual's needs and circumstances. The service, delivered by Careers Wales, provides professional careers information, advice and guidance, for individuals over 16, by undertaking a needs- based assessment, including barriers to employment, and referring the individual to appropriate support.

Science and innovation

The need for a coherent science and innovation system – to collect and analyse data, to investigate potential avenues for mitigation, to develop new techniques, products and services to deliver a net zero Wales – is embedded throughout this strategy. As set out in the foreword, this is the decade for action, where we must rapidly innovate, test, learn, adjust and roll out changes, which enable our transition to a cleaner future.

Science

We need to grow our capability to understand the scale and complexity of the data, interpreting robust evidence from multiple sources to develop sound and credible advice. This will give us the best possible evidence base to inform deliverable policy options that make a difference in tackling the climate emergency.

In our proactive approach to net zero, we will continue to support and value the high-quality research base available in Wales, for example through our support to Sêr Cymru. We will co-ordinate and collaborate, so that not just duplicating existing work but complementing it in the most efficient way possible. For example we will collaborate with the Environment Platform Wales, which brings together universities, research centres and others with the aim of translating world class research into high quality evidence for Welsh Government and Natural Resources Wales. We need to build on this and other forms of partnership, working including across the UK, so we maximise our opportunity and inward investment as well as harnessing the best in Wales. Together, we can use the excellence and diversity of research talent for the benefit of Wales and our international partners.

Innovation

Scientific research and ideas need to be applied in the real world to create innovation and impact. Innovation will be essential if we are to achieve significant emission reductions across all sectors and meet the net zero challenge. The need to take a systems approach adds to the complexity, as does the number and diversity of stakeholders who need to develop and adopt these new ideas.

This is not just about technology and process improvement. It is important that innovation happens in areas such as business model development, behaviour change and novel financial instruments. New ideas need to be developed and adopted at scale but this often takes time, so we need to innovate now to see the benefits in future carbon budgets. This is the decade of action.

As we transition from European Rural Development Fund (ERDF) funding for research and innovation in 2021-22, we will develop new support mechanisms to build on current programmes e.g. ERDF support to build research capability in energy systems in Flexis, SmartCymru grants for businesses to engage in research and development and driving innovation through procurement in the public sector using the Small Business Research Initiative (SBRI) mechanism. We will continue to aim to bring research closer to commercialisation and ultimately scale-up and deployment.

Policy 12 – Innovation for a net zero economy

We will put the net zero challenge at the heart of a new Welsh Government Innovation Strategy, which we expect to launch in 2022. This will sit alongside and complement the UK Government's innovation strategy launched in July 2021, which focuses on prosperity through innovation.

Digital

During the Covid pandemic we saw how digital technology can be harnessed to support better provision of online public services. Building on the momentum of the pandemic in March 2021, Ministers published a Digital Strategy for Wales[27] outlining our ambitions around better digital public services, connectivity, digital inclusion, economy, digital skills, and data.

Policy 13 – Digital Strategy

The Digital Strategy for Wales can support our journey to net zero by:

- Supporting remote working, reducing the need for travel, through ensuring that homes and businesses across Wales have access to fast and reliable digital infrastructure.
- Supporting public sector organisations in delivering efficient services designed around the citizen, maximising the opportunities for public services to be delivered digitally and in a way that minimises carbon usage through better understanding of the user journey for their services (for example therefore minimising the need to travel to access services).
- Promoting the use of modern and efficient digital cloud infrastructure, using shared services and platforms, which can help reduce the use and cost of legacy "on-premise" infrastructure.
- Promoting the effective use of data (including new sources of "smart data" such as sensors) to monitor and deliver interventions that support carbon reduction. We want to drive up the use of data driven innovation, automation and A.I., to unleash the power of data to improve our public services and economy. The decarbonisation agenda provides a clear area of priority for our ambitions in this area.

There are of course risks and costs which we will need to take into account. Large amounts of data need to be stored and processed somewhere, so we need to be mindful of the carbon cost of those data centres. Remote working reduces the need for travel, but it adds to the individual's energy usage. The use of "smart data" such as sensors or the "internet of things" must be done in an ethical way, which protects privacy at all times.

International action

Aligned with our International Strategy[28] we have developed a series of action plans to set out how we will establish Wales as a globally responsible nation, which is making a fair contribution to tackling climate change.

27 https://gov.wales/digital-strategy-wales
28 https://gov.wales/sites/default/files/publications/2020-10/international-strategy-for-wales-v1.pdf

Policy 14 – International action to support decarbonisation at home and abroad

Over the course of Carbon Budget 2 we will:

- Deliver our Priority Regional Relationships and Networks Action Plan[29], which highlights our commitment to play an active and leading role in international networks such as Regions 4SD and the Under 2 Coalition, and our Export Action Plan.
- Share our experience and learnings through our existing international networks and by leveraging our eleven international offices, and through our Memorandum of Understanding (MoU) with key partners, such as Brittany, Basque Country and Quebec.
- Demonstrate and promote how a well-being of future generations approach can help drive positive action on the world's greatest problems, including climate change, by working with the Future Generations Commissioner, the UN and other international bodies.
- We will deliver the Wales/Ireland action plan[30], with climate change and sustainability at its heart.
- We will continue to look at innovative ways to engage internationally, including learning lessons around the value of virtual engagement, not relying solely on travel and delivering international activity in a hybrid fashion.

Well-being Goal Spotlight – Globally responsible Wales

Wales continues to join forces with other states and regions to ensure no countries are left behind in efforts to combat the long-term effects of climate change. The Welsh Government contributes to the Climate Groups Future Fund, a key mechanism to empower developing and emerging economy regions to accelerate the transition towards a lower carbon world, which is kept well below 2°C of warming. It allows us to effectively collaborate, share ideas, and to drive faster and bolder climate action. Importantly the fund has helped to support more than 20 Governments to make their voice heard at important events such as the Global Climate Action Summit and UN COPs.

Trade policy could be either part of the problem or part of the solution to the climate change emergency. Trade can be used as a lever to improve global environmental standards, accelerate green technology, improve transparency on fossil fuel use and drive circular economy principles. Unfortunately, trade can also incentivise the manufacture of goods in countries with lower environmental standards, where costs can be cut.

Welsh businesses operate in both UK and international markets – their future success lies in positioning Wales as a location of choice for international and domestic investment and in seizing the opportunities presented by the move to net zero. However, climate change is a fairly new concept for trade deals and we call on

29 International Action Plans – ACTION PLAN FOR PRIORITY REGIONAL (gov.wales) (https://gov.wales/sites/default/files/publications/2020-11/priority-regional-relationships-and-networks.pdf)

30 Ireland-Wales shared statement and joint action plan 2021 to 2025 | GOV.WALES (https://gov.wales/ireland-wales-shared-statement-and-joint-action-plan-2021-to-2025)

the UK Government to pursue agreements on behalf of the whole of the UK, which deliver on their declared ambition to 'take the lead in tackling climate change' in multilateral trade.

Alongside the UK and Scottish Governments, we have already committed to withdrawing support for export into the fossil fuel sector overseas, refocussing our activities in the energy sector towards new international opportunities in a range of low-carbon and renewable energy sectors.

Our ambition over the next five years is to ensure that Wales' statutory net zero pathway is not undermined by any free trade agreements the UK Government signs. We will:

- Ensure Welsh Government trade policy and trade promotion play their part in accelerating the transition to a low carbon and more sustainable global economy.
- Support a UK border carbon tax to incentivise greener production methods providing it ensures fairness for workers in the UK and internationally. This would increase tariffs on goods, which are made in unsustainable ways.
- Re-iterate our support for the Paris Agreement and net zero targets. Call on the UK Government to ensure future trade deals:
  - Do not restrict our policy space and freedom to regulate in devolved areas related to climate change.
  - Include chapters on environmental sustainability and seek to harmonise and/ or improve environmental standards, using trade deals as a platform for sharing expertise and technology on green products.
  - Support Welsh low carbon goods and services exports.
  - Support a level playing field for the low carbon goods and services sector in Wales i.e. ensure imports do not undercut our producers due to lower regulatory standards.
- Encourage the UK Government to reduce tariffs (in a WTO compliant manner) on environmental goods and services to support the global expansion of renewable energy, recycling, sustainable agriculture, and other green activities.
- Encourage the UK Government to reduce non-tariff barriers (in a WTO compliant manner) on environmental goods and services such as opaque licensing practices, product standards and testing procedures.

Linked to our international strategy, we will also seek opportunities to promote exports into the clean energy/renewables sector through our Cluster Programme, assisting businesses to transition away from fossil fuel projects and undertake activity, campaigns and marketing that promote Wales' capabilities on the global stage in renewables including marine and wind energy.

A Team Wales approach to enable the change

Collaboration and involvement

Responding to the threat of climate change requires us to work differently and develop new solutions. Our pathway for net zero requires an approach in which government action is just one component of our response alongside concerted action across the public sector, across our economy and throughout our communities. Since the publication of Prosperity for All: Low Carbon Wales we have developed a Team Wales Approach.

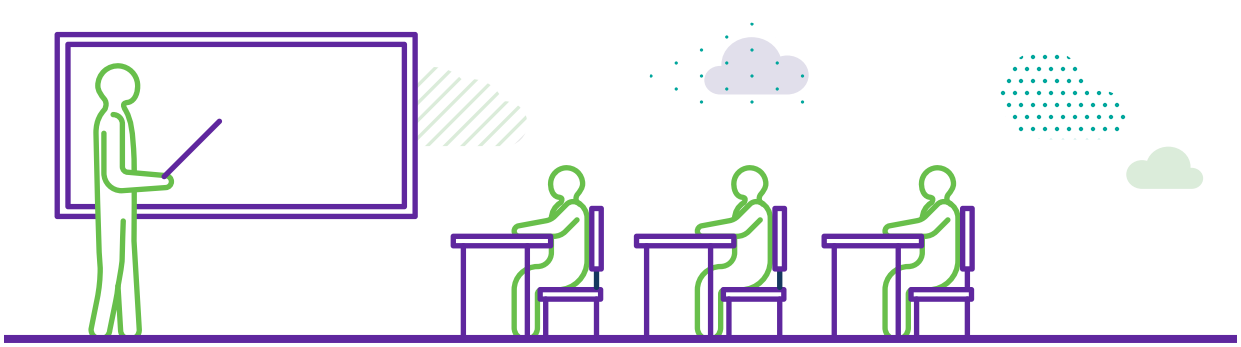
The overriding aim of our engagement work is to have an early and joined up discussion of the action being taken across Wales, the UK and internationally. This will ensure everyone has the opportunity to play their part.

Our Team Wales approach has grown in strength. In 2019, we collaborated with key stakeholders and activists in holding Wales Climate Week. We were determined that the Covid pandemic would accelerate, and not deter us from continuing to work with stakeholders in tackling the climate emergency and developing an all-Wales response. We therefore published our new engagement plan in July 2020 to provide stakeholders with opportunities to help shape the actions in this Plan.

Case Study – Wales Climate Week[31]

Between 2-6 November 2020, the Welsh Government worked with partners from across Wales and internationally in holding Wales Climate Week. Covering topics from community action to business, from marine energy to the arts it encapsulated the all-Wales approach needed to achieve net zero.

Held online to overcome the challenges of the pandemic, the week consisted of free digital events. In total 2,270 people signed up to the platform website, with over 80 speakers taking part across 20 events. A fringe programme was also held and 50 video case studies were provided by contributors. This was the biggest climate change conference Wales has ever held. Wales Climate Week marked one year to COP26 and the countdown to the publication of this Plan.

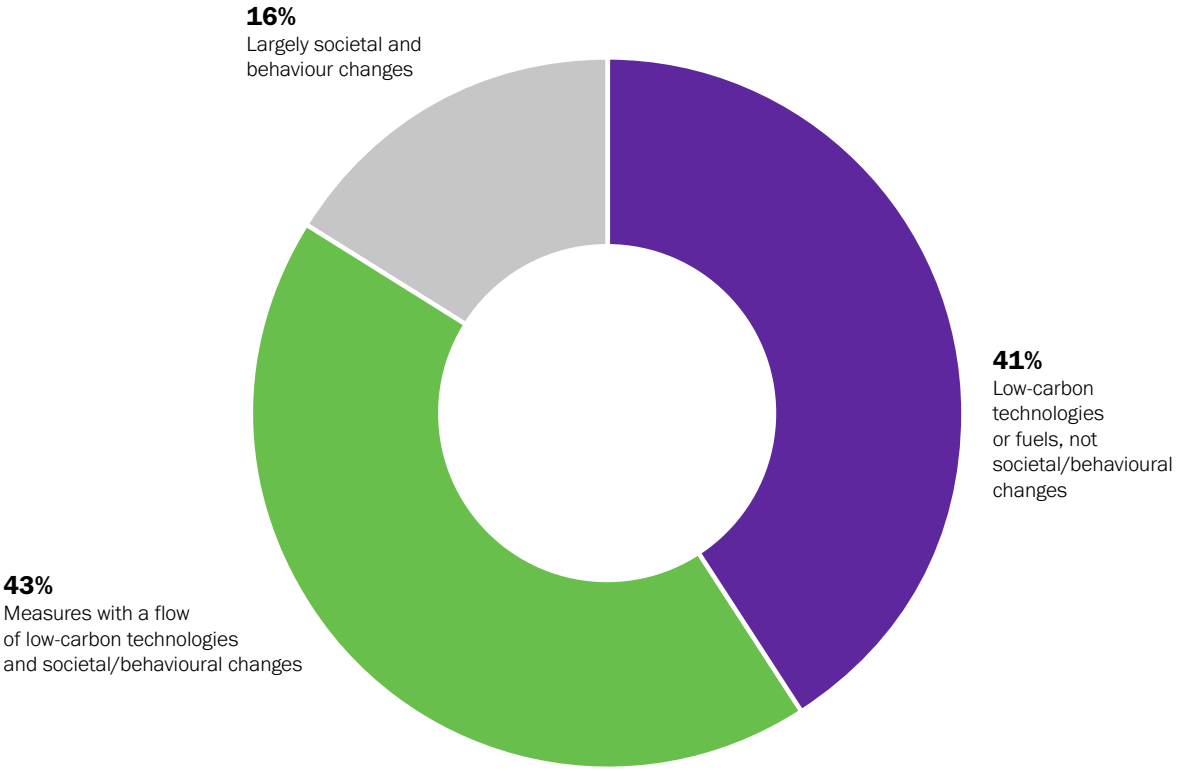


31 Wales Climate Week | The Waterfront (eventscase.com) (https://waterfront.eventscase.com/EN/walesclimateweek)

Building on what we have already achieved, we will continue to act in accordance with and apply the ways of working that are the basis of the Well-being of Future Generations approach. We must ensure stakeholders and citizens have the meaningful opportunity to contribute to delivering and strengthening the actions set out in this Plan. We will work with communities and civil society to develop a new engagement plan on the delivery of the policies and the development of the proposed polices in this Plan.

Policy 15 – Publish Stakeholder Engagement Plan for Net Zero Wales – Spring 2022

Figure 3: The role of behaviour change in delivering Net Zero[32]



32 www.theccc.org.uk/wp-content/uploads/2020/12/Advice-Report-The-path-to-a-Net-Zero-Wales.pdf page 145
Percentages are based on the CCC Balanced Pathway

Working with people

Reaching net zero emissions requires everyone to play their part. The progress we have seen to date has mainly been achieved in areas where little public engagement was necessary and went largely unnoticed by public perception. For example, the changes in the electricity grid have not required citizens to use energy differently.

As we look ahead to Carbon Budget 3, the changes needed will have far reaching impacts upon, and will be shaped by, the way we all live our everyday lives. The most effective means of ensuring fairness is to involve people in shaping the ways in which change is delivered (set out in Part 1).

Nearly 60% of the abatement in the CCC's scenarios to 2035 involved large numbers of people acting or choosing differently, whether that is adopting new low-carbon technologies (for instance driving an electric car, or installing a heat pump) or choosing to eat lower carbon foods, fly less and choosing products that last longer[33]. We need to support everyone to make these changes, which are likely to be more significant for those who currently have high carbon lifestyles.

The scale of the changes required means we need to move to facilitating a society-wide transformation. We know that we cannot achieve this without widespread endorsement and support from all sectors of society. Research shows that concern for climate change remains at an all-time high[34,35] and for example, eight in ten are concerned about climate change.

However, public concern does not automatically translate into the action and support needed to meet net zero; we know that many people want to help but are not sure how.

Proposal 1 – Develop a long-term strategy to promote a dietary shift to a healthier and suitable diet

We recognise the benefits of a healthy diet and the increasing interest and value placed by consumers on sustainability, including high animal welfare and environmental standards, in food production. Over this carbon budget period, we will explore ways to support Welsh consumers to eat healthier, more sustainably sourced, high quality local food.

Approximately 21-37% of global greenhouse gas emissions are attributable to food systems , but within greenhouse gas inventories food chain emissions fall across several different areas. Food systems are driving the decline of biodiversity and in developed countries they have an adverse effect on human health. Addressing these three interrelated issues will require a joined up and co-ordinated action across the food system.

Where and how that food is produced is equally important. Wales is a relatively low-greenhouse gas producer of ruminant meat compared to global average, and agriculture plays a significant role in our economic and cultural fabric. We must ensure any reduction in emissions from food production in Wales is not achieved simply by transferring them overseas and we will develop policies that directly contribute to delivering our climate change, biodiversity and economic ambitions.

33 www.theccc.org.uk/wp-content/uploads/2020/12/Advice-Report-The-path-to-a-Net-Zero-Wales.pdf Page 145

34 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/969428/net-zero-public-engagement-participation-research-note.pdf

35 Net zero public engagement and participation: a research note (publishing.service.gov.uk) (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/969428/net-zero-public-engagement-participation-research-note.pdf)

We will encourage local, shorter supply chains and business clustering where these can bring socio-economic and environmental benefit. Shorter supply chains and buying local can reduce the steps and 'food miles' travelled between producer and plate and provide market support to high quality and sustainable local food production. We will continue to emphasise provenance and quality in our promotional work for the food and drink sector, showcased by our geographic indicator products. Public bodies will take account of our sustainability and the Well-Being goals in their procurement decisions.

We use research, behavioural science and social science techniques to make sure our policies and interventions are designed around the citizen, providing us with a better understanding of the barriers to changing behaviour. Through understanding the experience of different population groups we can develop a better insight of whether and how these barriers differ to ensure any policies and interventions support our ambitions on equality.

Public engagement on societal change

The Covid pandemic provided an opportunity to gather evidence on the types of societal behaviour changes resulting from the public health measures, which are also positive and negative for the environment and climate change. We asked the Centre for Climate Change and Social transformations (CAST) to undertake a study[36] tracking households' low-carbon behaviours and attitudes before and during lockdown. We have also worked with BEIS on the Daily Life Survey[37], which looks to understand the impacts of the coronavirus pandemic on households' self-reported behaviours, attitudes and experiences in relation to net zero, green recovery measures and home energy use. Both of these surveys have also started to explore consumer behaviours, such as changes to shopping habits, diet and air travel.

On the basis that understanding and engaging the public in decision-making will provide a stronger basis for behaviour change, we will **consult on a Public Behaviour Change Engagement Strategy that sets out how we can involve society in the changes individuals and communities can make to help Wales meet net zero**.

36 https://cast.ac.uk/
37 https://www.gov.uk/government/collections/public-attitudes-tracking-survey

Policy 16 – Consult on Public Behavioural Change Engagement Strategy – Summer 2022

Children and young people

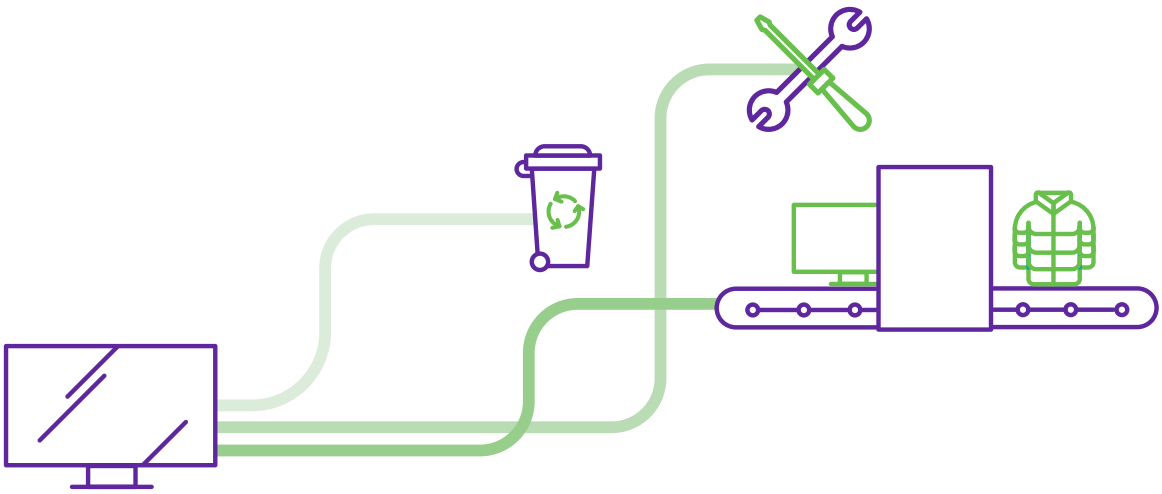
We are particularly anxious to engage with children and young people, who are increasingly aware of the challenges and risks presented by the climate and nature crisis. Around the world they have brought a consistent and clear message – we are all accountable and we can no longer wait to act. Our current, unsustainable approach is endangering the prosperity of current and future generations.

Through our environment education programmes, Size of Wales and Eco Schools, we are continuing our commitment to enhance opportunities for children and young people to have their voices heard but to also provide real opportunities to participate and influence what happens next. These programmes go further than the classroom, equipping our young learners with the knowledge, skills and motivation needed to address future challenges.

Following consultation, our new Curriculum for Wales has further embedded the importance of the climate and nature emergency and its impacts. Through mandatory statements of what matters, learning about different aspects of the environment will form part of every child's education throughout their learning journey including sustainability; understanding the impact of our decisions and care for the environment.

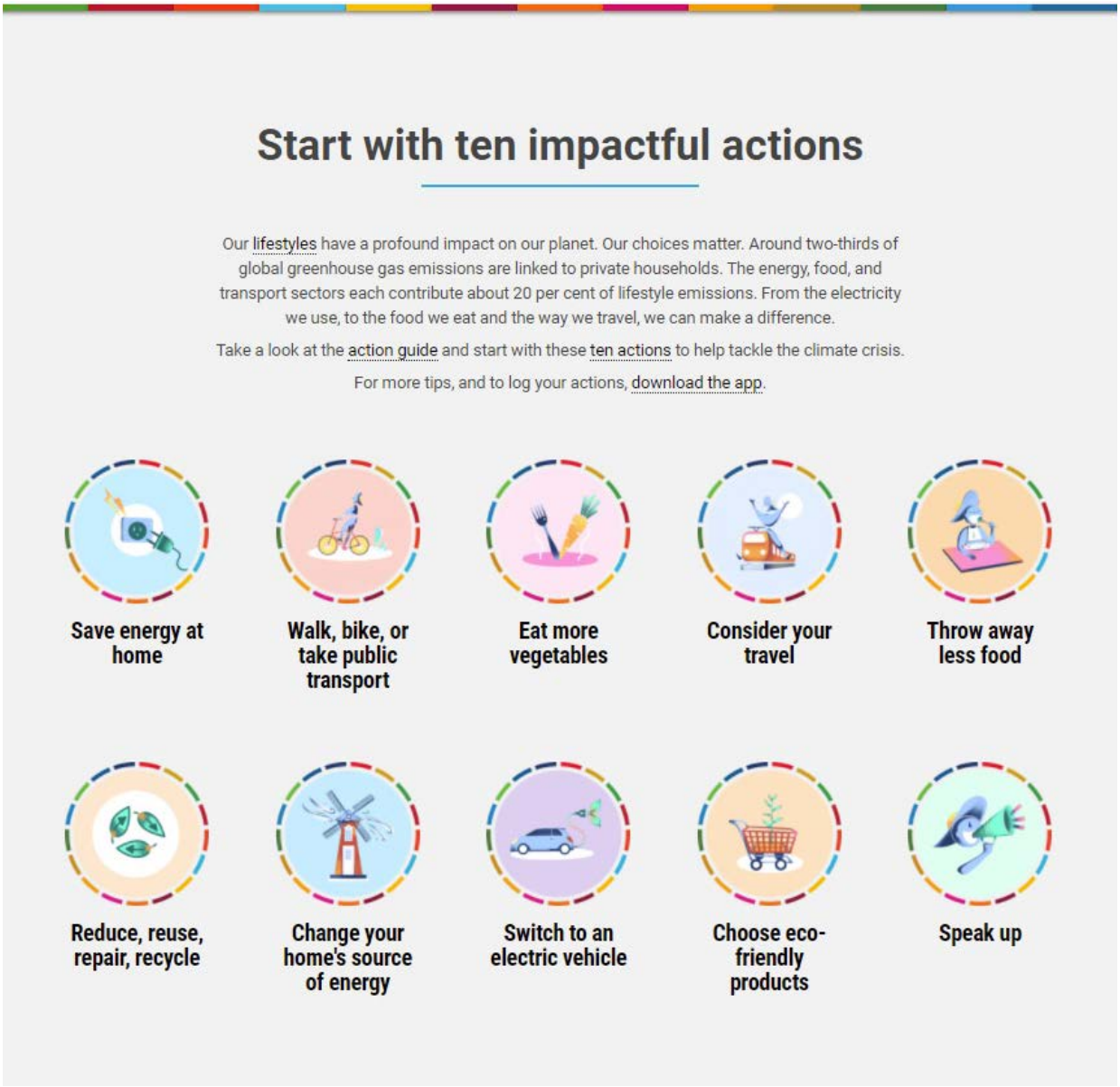
We will work closely with stakeholders, practitioners and experts through the National Network to consider how best to implement and support schools to embed learning about the climate and nature emergency across the 3 to 16 learning continuum.

As new jobs and careers are created for a cleaner future in Wales, we will continue to support our children and young people with the skills they will need. For example, collaborative approaches between industry and Careers Wales will showcase new occupations with young people as means of addressing youth unemployment.



Through public dialogue we will support everyone to play their part in reaching our climate change targets. We will inform and work with the public around the need for climate action and learn from the work underway in the UK and internationally, for instance The United Nations' (UN) Act Now campaign for individual action on climate change and sustainability.

Figure 4: The UN's Act Now campaign



This data is taken from the United Nations website (www.un.org/en/actnow/ten-actions) so only appears in English.

An effective public engagement strategy will drive our People-Centered Approach, which will encourage active participation of people in decision-making and the delivery of net zero. It will need multiple joined-up elements, including for example behaviour change and policy initiatives, communication strategies, stakeholder engagement and, participatory mechanisms.

Third Sector

Voluntary organisations and campaigners have been at the forefront of raising awareness about climate change, calling for alternative approaches and introducing positive solutions. There is growing recognition of the role that voluntary organisations across the sector will need to play in responding positively to the climate emergency and PfG.

We need to learn from our experience of the Covid-19 pandemic, ensuring we build on and strengthen the relationships that have been created. The Third Sector Partnership Council recovery group's report recognises the huge and often devastating impact the pandemic has had on our society, with different groups of people and different places being affected in different ways. This is explored further in the section on distributional impacts in Part 2.

These are complex problems and finding solutions that support people's wellbeing will demand contributions across different sectors and organisations. However the third sector are ideally placed to help with this due to their trusted status.

We will need to embed structures that support good, productive relationships to create our ambition of a fair, green and just recovery.

We also recognise that individuals and groups in society need time and space to learn from each other and to share ideas. Seeing your peers adopt low- or zero-carbon technologies and hearing about their benefits can be a big driver of mass behaviour change. We will therefore develop an information hub, to provide access to information on approaches for adopting a low carbon life

Well-being Goal Spotlight – Vibrant Culture and Welsh Language

A vibrant culture is becoming increasingly important in helping us work with society in addressing the climate and ecological crisis. During Wales Climate Week we brought artists and experts together to discuss the role of storytellers in shaping the narrative and communal imagination towards action and engagement with the climate crisis. We see the arts, culture and Welsh language as pivotal in reaching all parts of Wales' society. Therefore we will continue to work with our partners over the period of the Carbon Budget 2, starting with COP Cymru 2021.

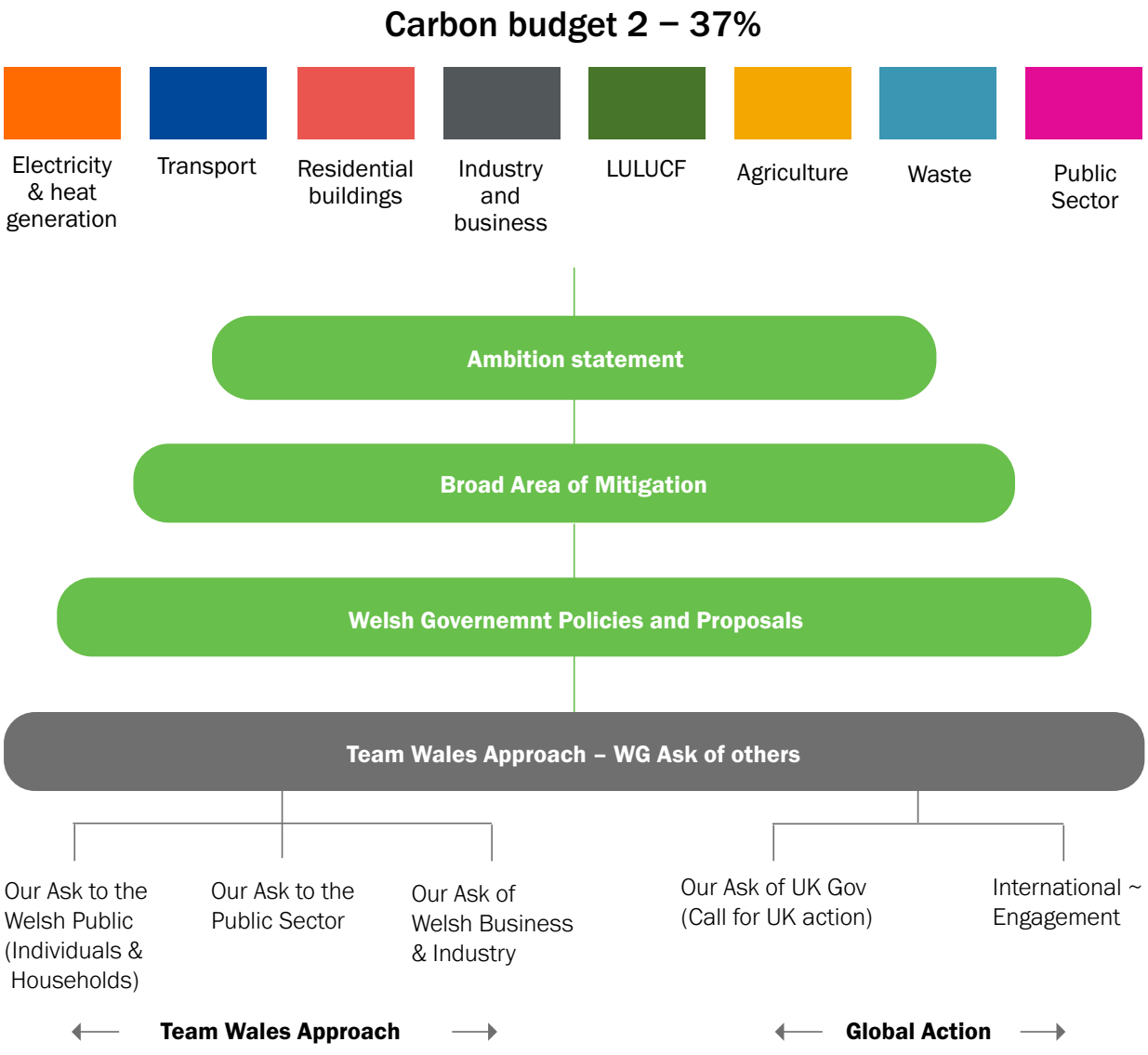
Part 3 – Emission sector chapters and methodological approach

Introduction

The emission sector chapters in this Plan set out how policies and proposals contribute to meeting Carbon Budget 2. This Plan contains eight emission sector chapters: Electricity and Heat Generation, Transport, Residential Buildings, Industry and Business, Land use, land use change and forestry (LULUCF), Agriculture, Waste and Public Sector. It also includes a section on the role of UK Government on delivering emissions in Wales and vice versa. Further information around the breakdown of the sectors for this Plan can be found in Annex 4.

Chapters have been colour coded throughout this plan to display the collective action across Wales.

How we meet our targets



Each chapter follows the same structure:

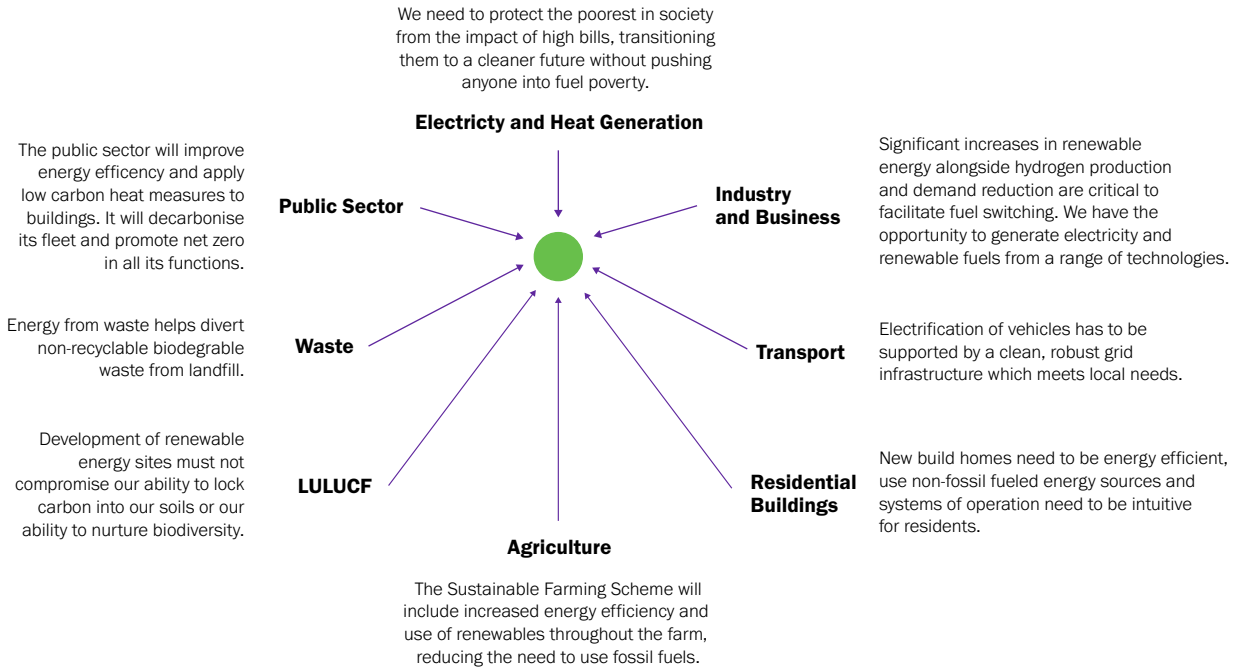
1. **Introduction** – Details the scope of the emission sector and sets out their vision for CB2 and beyond.
2. **Emissions** – Describes the sectors' emissions sources and progress made to date.
3. **Ambition statements** – Describe the desired level of change for key decarbonisation measures within each sector, underpinned by 'Broad Areas of Mitigation'.
4. **Polices and proposals** – Details the actions being taken or explored by the sector that underpin the Ambition statement and and contribute to CB2 or beyond.
5. **Team Wales approach** – This sets out our ask of others involving people, the public sector, Welsh businesses and industry, UK Government and international partners.

Supporting and underpinning the 'Collaborative Approach', we have published *Working Together to Reach Net Zero*, which sets out the Pledges we have received from organisations and individuals across Wales on their intent to act. It also provides additional case studies describing action already taking place across Wales as well as a specific section for young people.

These chapters are organised by sector, aligned with the greenhouse gas inventory. Presenting our policies, proposals and calls to action in this way does not capture the richness and complexity of the net zero system, which we discussed in Part 2, as part of the section on integration.

The figure below uses the electricity and heat chapter as an exemplar to demonstrate the interconnectivity across the plan, highlighting the multiple impacts which can flow from a single action. We will work with organisations and key stakeholders across Wales to develop our understanding of this system and publish more detail by spring 2022.

Figure 5: Example of integrated thinking across the sectors



Across the United Kingdom

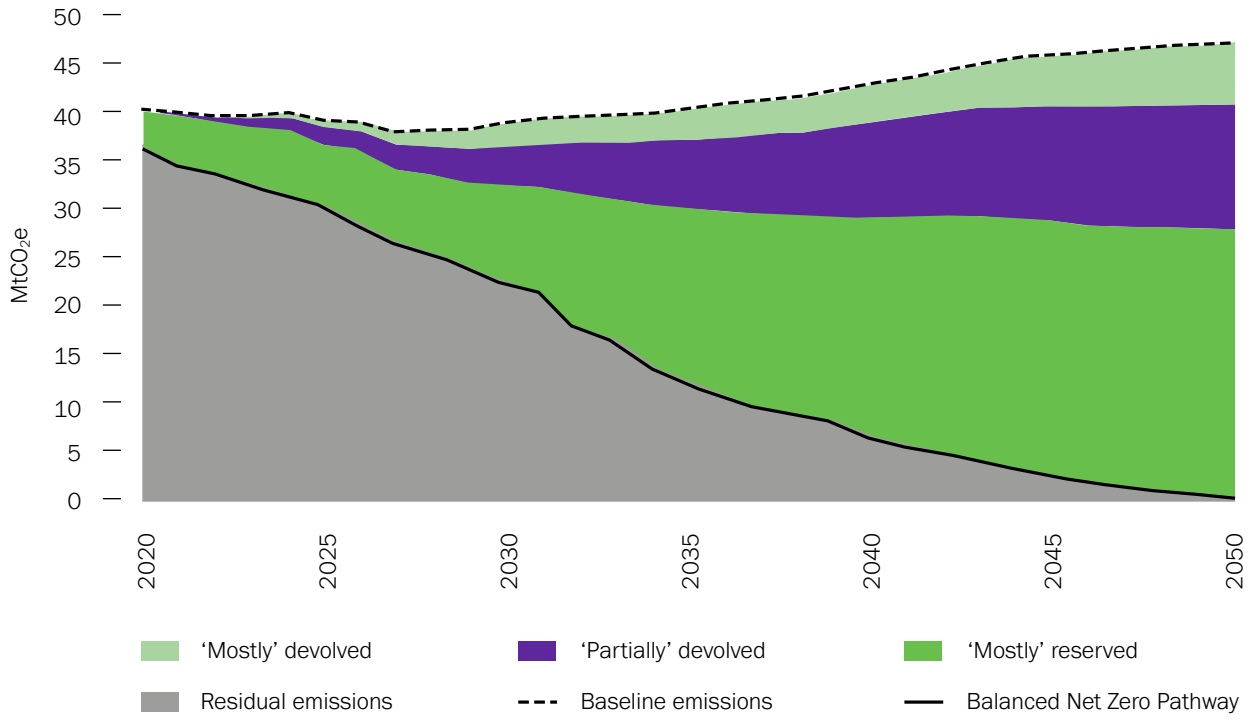
The UK Government also has a legislative target for net zero in 2050. Collectively, Wales, Scotland and Northern Ireland accounted for 22% of UK total emissions in 2019 but the powers to tackle those are not all devolved.

That means that while UK Government is responsible for some of the actions needed to tackle the climate emergency in Wales, the UK Government will rely upon action by Welsh Government to deliver on its own legislated targets. Both Governments were informed by the same CCC advice, and so the pathways set by each government are aligned.

Most recently, the UK Parliament legislated for the UK's Carbon Budget 6 (covering 2033-37). The CCC estimated that around 9% of the action in their Balanced Net Zero Pathway for the UK during the Carbon Budget 6 period will be delivered in Wales, decreasing to 8% by 2050[38]. Wales' contribution is particularly important to the UK target due to our large agricultural and manufacturing sectors.

Conversely, the CCC estimate 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 5 shows the responsibility for abatement in the Balanced Pathway, shared by the Welsh and UK Governments.

Figure 6: CCC graph showing responsibility for abatement in the Balanced Pathway for Wales is shared by the UK and Welsh Governments



Source: CCC Analysis

38 Advice-Report-The-path-to-a-Net-Zero-Wales.pdf (theccc.org.uk) (https://www.theccc.org.uk/wp-content/uploads/2020/12/Advice-Report-The-path-to-a-Net-Zero-Wales.pdf)

The CCC highlights the significant degree of interdependent policy from both the UK and Welsh Governments, which will be needed to achieve net zero. The CCC classifies policy areas in three ways (Table 1):

- 'Mostly' devolved. Areas where powers are largely devolved, and the Welsh Government can make progress, supported by the UK Government;
- 'Partially' devolved. Areas where some key powers are reserved, but the Welsh Government can still make significant progress using devolved policy levers; and
- 'Mostly' reserved. Areas where decarbonisation is most contingent on UK Government policy, but supporting Welsh Government policy is needed.

Table 1: Balance of devolved and reserved powers in Wales for difference sectors[39]

'Mostly devolved'	'Partially devolved'	'Mostly reserved'
› Agriculture › Land use, land-use change and forestry › Waste management › F-gases	› Buildings › Surface transport	› Electricity supply › Fuel supply › Manufacturing and construction › Aviation › Shipping › BECCS for power generation

In each of the emission sector chapters in Part 3, we have outlined the role we need the UK Government to play. As we work to develop our plan for Carbon Budget 3 and beyond, we will continue to work with our UK colleagues to ensure the UK Government is stepping up to the challenge.

39 www.theccc.org.uk/wp-content/uploads/2020/12/Advice-Report-The-path-to-a-Net-Zero-Wales.pdf (theccc.org.uk) p.36

UK Government's Net Zero Strategy

The UK Government published their own Net Zero Strategy on 19 October 2021. This was Welsh Government's first sight of the strategy. Whilst the Welsh Government has been engaged in some areas of policy contained within the Strategy, there are others where we have been largely blind to UK Government intent.

In addition, the UK Government Spending Review is important context to this Plan and until this Spending Review is completed, Welsh Government is unsighted on its budget settlement beyond March 2022. This makes it difficult to appropriately scale policy delivery and assess how our approaches will dovetail with UK Government policy, impacting our ability to be clear on ambition and impact.

We continue to call on UK Government to be more transparent and collaborative in the development of policy and to work with Welsh Government to bring greater clarity to the decarbonisation pathway of Wales and the UK as a whole.

Greenhouse gas removals

The primary focus of Part 3 is the rapid reduction of greenhouse gas emissions. However, the scale of the problem we are facing means that reducing emissions is not enough. We must also remove greenhouse gases that are already in the atmosphere.

The LULUCF chapter is predominantly concerned with removals – by planting trees or restoring peatland, for example. The Agriculture chapter also references action to improve soil carbon sequestration. There are other, more technological methods of removing greenhouse gases from the atmosphere which may provide opportunities for further and more rapid emissions reduction. These engineered removals are discussed further in the industry and business chapter.

The UK Government has a key role in the development of engineered removals, not least because of the reliance on carbon capture and storage.

Electricity and heat generation

1. Introduction

Scope

The electricity and heat generation sector in Wales covers the production of electricity in Wales from fossil fuel, low carbon and renewable generation. It also includes the generation and supply of heat, such as through heat networks.

Vision

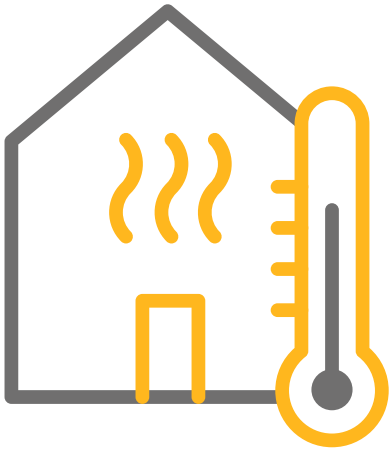
Our energy system is fundamental to almost every area of life in Wales and the supply and use of energy to provide heat, power and transportation is currently the source of the vast majority of our greenhouse gas emissions.

Despite huge progress since the start of the century, our energy system remains dominated by fossil fuels. **Our vision is for a decarbonised energy system which provides wider economic and social benefits for Wales than the system we see today.** We aim to virtually eliminate greenhouse gas emissions from power stations by 2035 and in this carbon budget we will focus on significantly reducing emissions from fossil fuels in Wales.

Much of the change will be driven by greater electrification of heat and transportation and the flexible use of generating technologies, energy demand, storage and low carbon fuels, **enabling the transformation of our industrial base**. Technological changes will need to be married to behavioural and regulatory change. We need to remove market distortions which today mean low carbon, electrical heating is currently more expensive than fossil-fuelled alternatives, we need to enable rapid deployment of new technologies and business models and we need to resolve complexities in how power and gas networks work together.

Whilst we expect demand for electricity to rise, we must do all we can to limit this increase. We cannot continue to simply add infrastructure when as a society we are often so wasteful with existing infrastructure and resources. Demand reduction and smoothing that demand with a **more localised**, flexible and smart low carbon renewables based system will be vital to meeting our future emissions reduction targets and **reduce the cost to our environment and society**. Demand reduction also helps us to deal with the 'problem' of marginal supply, the majority of which is currently delivered by fossil fuel generation.

Carbon Budget 2 will also be the period to plan and innovate for the future energy system for Wales. Delivering the smart energy system we need using a **regionally planned approach**, rather than a top down, market driven approach, is more likely to enable delivery at the speed demanded by the climate emergency, at optimal cost to the system, and in a way that delivers a more **socially just system** with no people or places left behind.



Delivering a system of this type will create **employment opportunities and exportable expertise**.

A smarter and demand reduced system means increased value for consumers from:

- Maintaining the high level of security and quality of energy supply we enjoy today;
- more energy efficient and responsive building, transport solutions and business processes;
- intermittency of renewables managed through:
  - consumer incentives to balance supply and demand;
  - smarter, increasingly digitised and interconnected (multi-vector) power, gas and storage networks to balance local and national energy supply and demand, with fuels such as hydrogen and biogas having the potential to provide storage, electricity or heat, depending on what is required;
- **robust consumer protection** enabling trusted data sharing.

Whilst previous years have seen a rapid increase in the proportion of Wales' existing demand met from renewable energy – at the end of 2019, 51% of electricity consumption came from renewable sources[40], 2021 – 2025 is the period to plan and innovate for the future energy system for Wales.

Future Wales and the Welsh National Marine Plan (WNMP) provide us with the **place-based decision making frameworks** to help us deliver the smart energy system we need for the future. Our work on Local Area Energy Planning will help identify changes needed to local energy systems, to decarbonise heat and local transport and realise opportunities for local renewable energy production. We are also committed to using public land in bringing forward new energy generation using new business models to bring **greater benefits to local communities**.

We have committed to expand renewable energy generation by public bodies and community enterprises in Wales by over 100 MW between 2021 and 2026. This will put us on the path to meet our longer term target of 1 GW of renewable energy generation capacity to be locally owned by 2030. As part of our forthcoming consultation on meeting Wales' electricity demand from renewable generation we will also review our target for local ownership.

Innovation and new technologies will also be crucial and we have committed in our PfG to support innovation in new renewable energy technology. Some of the more innovative decarbonisation solutions in the energy sector have yet to be proven at scale. We will use the 2020s as a decade of demonstration and early commercial roll-out of these technologies prior to full implementation during the 2030s and beyond. Carbon Capture Use and Storage and hydrogen, whilst not currently operational at scale in the UK, may have the ability to support a low cost pathway to net zero, enabling fuel switching for our energy intensive industries and creating options for storage and decarbonisation of hard to treat sectors. There is significant uncertainty related to cost, speed of deployment and areas of the economy where they could be deployed first. Despite this uncertainty, the CCC's advice is clear they will have a role to

40 energy-generation-in-wales-2019.pdf (gov.wales) (https://gov.wales/sites/default/files/publications/2021-01/energy-generation-in-wales-2019.pdf)

play and we must identify ways of reducing cost and deploying at pace whilst avoiding further harms. We will, therefore, encourage the industry to explore a range of potential solutions to decarbonise their operations, recognising some will prove unfeasible.

We need to support the people who rely on existing technologies for work as we transition to the technologies of the future. We believe that displacing fossil fuels with low carbon sources will **help Wales create the industries and jobs of the future. New skills and capabilities** will be required across industry and government to the meet the challenge of decarbonising the energy system. Many of these new jobs are expected to be **highly skilled and well paid and will provide opportunities to redeploy employees from traditional industrial sector**. There will also be an expansion of lower skilled employment in the renovation and construction sector.

These local jobs will enable businesses to drive innovation and new ways of working across Wales. The challenge to government and employers alike is to upskill and expand the existing workforce in growth sectors supporting a net zero economy in Wales and Welsh waters, and we recognise that optimising existing programmes, adapting training provision and increased delivery in low carbon will be critical.

Finally, we must ensure the cost of the low carbon transition is funded in a proportionate and fair way, considering impacts on households on low incomes who are struggling to pay their energy bills and on businesses operating on fine margins within competitive global markets.

2. Emissions

Where the emissions come from

The electricity and heat production sector covers a large share of Welsh emissions and is comprised of emissions from the production of electricity in power stations heat utilised as a by-product and heat from gas derived from sewage and waste.

At 7.3 $MtCO_2e$, electricity and heat generation accounted for 19% of Welsh emissions in 2019 making it the second largest emitting sector. In 2019, 99.8% of sector emissions were from power stations with the remainder attributed to power stations using gas from sewage treatment works, municipal solid waste, and landfill sites. Practically all electricity and heat production emissions (99.8%) are emissions of carbon dioxide, with the remainder coming from nitrous oxide and methane.

Figure 7 : Graph – Electricity and heat production sector emissions in 2019 ($MtCO_2E$)[41]

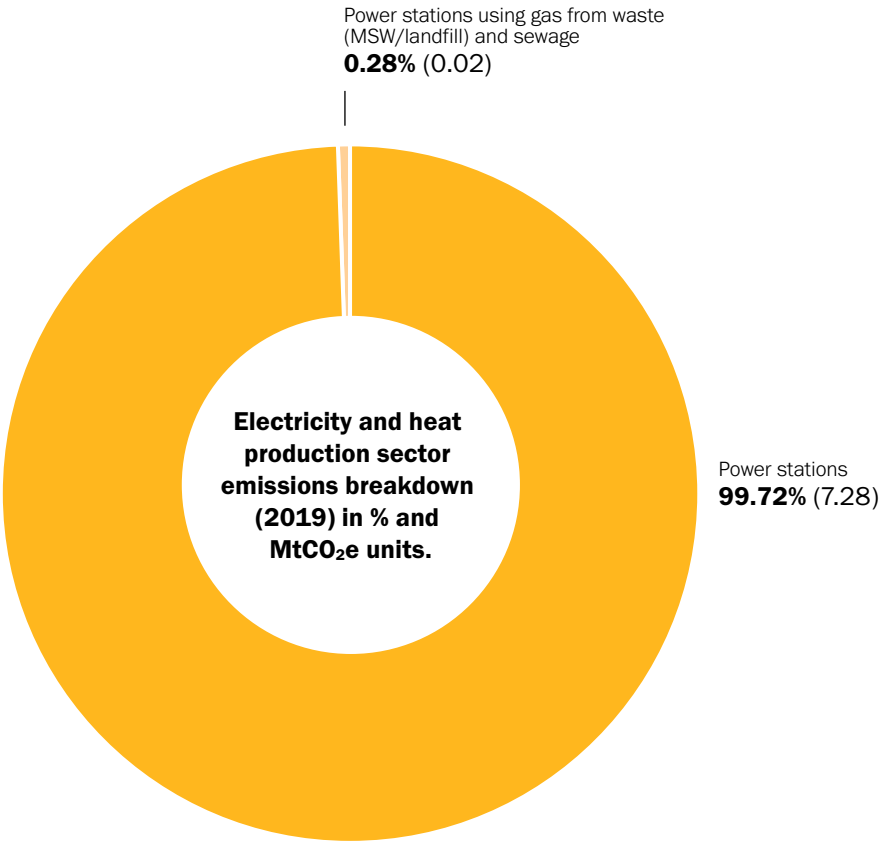


Table 2: How the biggest emissions sources in the electricity and heat production sector energy supply contribute to the welsh total

Source	% of total Welsh emissions
Power Stations	18.68%
Gas from Waste (MSW/ Landfill) and Sewage	0.05%

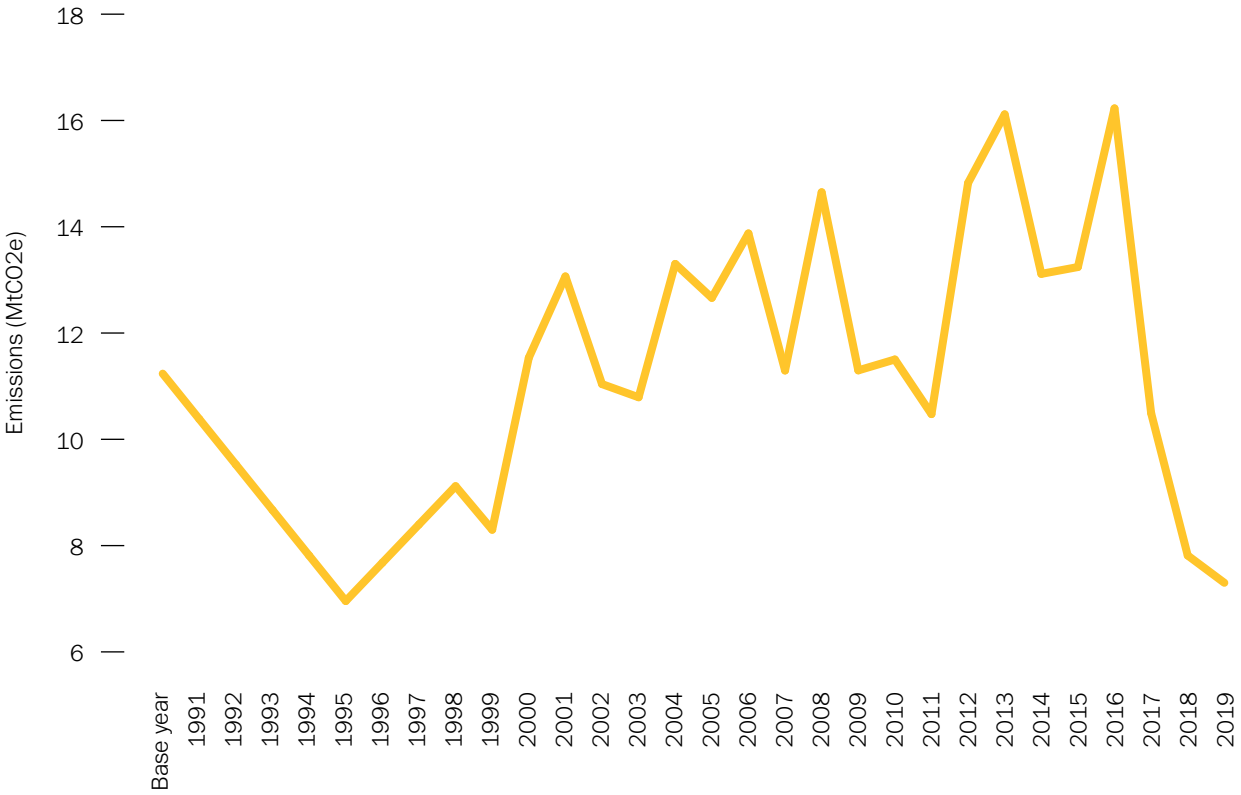
Summary of progress to date

Total emissions from the electricity and heat production sector in Wales have decreased by 35% between the base year (1990) and 2019 mainly due to a switch in the fuel mix from coal to gas, and increased low carbon renewable generation, as well as improved efficiency in energy generation. Moreover, the Aberthaw coal-fired power station has now closed and will not generate at any time in this carbon budget period.

In 2019, the Welsh electricity and heat production sector emissions decreased by -7% compared to 2018.

41 The emissions data is sourced from the Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019 and aligned to the Welsh Government sectoral definition as described in the Annex 4.

Figure 8: A graph to show 1990–2019 historic Welsh emissions for the electricity and heat production sector



Progress has also been made in the deployment of renewable electricity sources in Wales. The most recent data for 2019, taken from our report on Energy Generation in Wales[42], shows we have a total of 3.37GW of installed capacity, of which an estimated 825MW is locally owned.

Despite this progress, emissions from the combustion of fossil fuels for electricity generation in Wales are proportionately greater than our share of the total UK emissions. In 2019, Wales contributed 7.8% of total UK emissions and 12.5% of UK electricity and heat generation emissions.

Energy policy is largely not devolved and Wales is part of Great Britain's interconnected power system. Since 1990, the UK Government has made a number of infrastructure planning decisions, which have resulted in significant additional fossil fuel generation being located in Wales. Additionally, renewable electricity deployment has slowed considerably in recent years since the UK Government reduced the level of financial support projects can access. Our asks of the UK Government are set out later in this chapter.

42 energy-generation-in-wales-2019.pdf (gov.wales) https://gov.wales/sites/default/files/publications/2020-11/energy-generation-in-wales-2019.pdf

3. Ambition statement

The most effective ways to reduce emissions from the energy sector are to reduce demand and use our energy as efficiently as possible. Ambition statements reflecting changes across the economy are included in other chapters. The ambition statements below reflect the need to reduce emissions from the sector while meeting future demand for electricity and heat.

For the electricity and heat emissions sector meeting Carbon Budget 2 and entering onto a pathway for delivering net zero emissions across Wales by 2050 will require action in the following two areas:

- **Decarbonising electricity production from fossil fuels** – gas with Carbon Capture Utilisation and Storage (CCUS) and fuel switching to green hydrogen.
- **Increasing electricity from low carbon and variable renewables.** This encapsulates the following policy aims for moving to a more integrated net zero energy system:
  - Integrated network planning, including increasing power flexibility through using storage, increasing demand side flexibility and use of interconnectors.
  - Supporting innovation of new renewable energy technology for commercial deployment in the 2030s.
  - Maximising the local and community benefits from renewable energy infrastructure in Wales including through public and community owned development.
  - Laying the groundwork for renewable and low carbon heat.

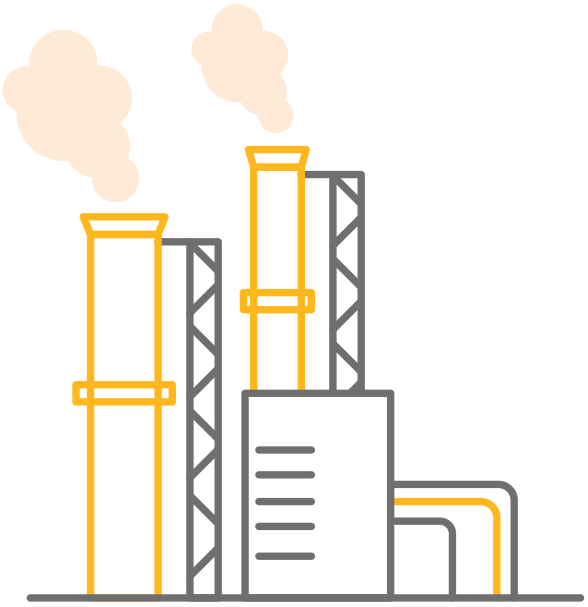
These two broad areas for mitigation align with the levers in our Wales 2050 calculator, which we have used to set the Wales 2050 pathway. These inform our ambition statement for the electricity and heat generation sector.

Electricity and heat generation ambition statement

By 2025, 1GW additional renewable energy capacity will be installed.

From 2021 there will be no new build unabated fossil fuel generation in Wales. All current unabated gas generation removed from the system by 2035.

In this high renewables system, any additional supply will be met from decarbonised power plant from 2035 at the latest.



4. Policies and proposals

The Ask of the UK Government

The CCC's advice recognises that many of the powers in respect of reducing emissions in the power sector are not within the control of Welsh Government. Development of new power generation has historically been driven by market conditions and investment priorities identified by developers. The UK Government is responsible for many aspects of energy policy, such as electricity market reform and associated financial mechanisms, the regulation of energy conservation (energy efficiency) and nationally significant infrastructure decisions, as well as energy resilience.

We need the UK Government to reflect the demands of the climate emergency. A number of UK polices stem from historic legislation not in line with binding targets on emission reduction. Specifically we are calling for the UK Government to remove the statutory duty of the Coal Authority to maintain and develop an economically viable coal industry. We have called on the UK Government to revise the *Coal Industry Act* in order to reflect the need for the Coal Authority to consider climate policy in its decisions, and provide the certainty that will allow the Authority and the industry to focus on areas that will benefit people and businesses, such as the extraction of renewable heat from existing mines.

Equally the Oil and Gas Authority consulted on proposals to revise the *Maximising Economic Recovery Strategy for the UK* in 2020. The overwhelming response (54 of 59 responses) to the consultation were in favour of the integration of the net zero target in the OGA Strategy. The Welsh Government calls on the OGA to develop a strategy consistent with the net zero pathway.

The principal barrier to deployment of renewables in Wales and the rest of the UK continues to be the lack of a consistent and predictable route to market. Our ask of the UK Government is for a long-term approach which supports a broad range of renewable technologies, creating a sustainable market for the wide range of low carbon heat technologies we will need to deliver our renewable and decarbonisation targets.

The other significant barrier is the need for strategic grid investment. We are working with the network operators to clarify the scale of the investment required but these costs should not all fall on bill payers. Given the pace of change needed and the time taken to consent and build grid infrastructure, investment ahead of need is absolutely vital.

There are instances where renewables projects consented by Welsh Ministers have not been able to go ahead due to issues with UK Government Ministers giving consent for grid infrastructure. We believe Welsh Ministers should have responsibility for all consent decisions for the electricity grid transmission network onshore.

The Ask of the UK Government (cont'd)

Wales should benefit from energy projects on land and in Welsh waters. The Crown Estate is devolved to Scotland and, consequently, income such as from leasing the seabed in Scottish waters, is returned to Scottish Ministers. The Crown Estate is set to benefit financially from Wales hosting offshore and marine renewables. There should be parity with Scotland regarding the status of the Crown Estate.

We are looking to the UK Government to deliver system rules and incentives which drive development of low carbon power sources to serve local demand. We need places in Wales to lead the low carbon transition by developing low carbon energy systems within the frameworks set by UK and Wales. Our work on regional and local energy plans will set the path for this transition.

The reopening of Contracts for Difference auctions to onshore wind and solar may open up some more opportunities to take forward renewable energy developments in Wales. Our work on marine energy will rely on the UK Government ensuring its Contracts for Difference mechanism has ring fenced funding for early stage marine projects, necessary to incentivise the industry to continue investment.

As described in Part 2 of this plan (Policy 10 – Carbon Pricing), in January 2021 the Welsh Government alongside the other Governments of the UK, acting as the UK Emissions Trading Scheme (UK ETS) Authority, launched the UK ETS. The UK ETS applies to the fossil-fuelled power generation sector, other than small-emitters, due to the burden of administration.

Fossil-fuelled power generators participate in the UK Emissions Trading Scheme. Revenues from the UK ETS are collected by HM Treasury. Fossil-fuelled generators can, and do, pass through the carbon costs of the UK ETS to consumers. We therefore call on the UK Government utilise the revenues generated by the UK ETS to stimulate emission reduction in power generation in ways which drive investment in Wales.

To ensure a Just Transition, we need the UK Government and Ofgem to provide a framework which allows network owners to invest proactively in networks to ensure less affluent areas have access to similar opportunities. This could include, for example, areas off the gas grid being prioritised to allow the delivery of low carbon heat and transport technologies. We also need to ensure demand connections are prioritised to create employment in areas where well paid jobs are less readily available.

Welsh Government has also called on the UK Government to find a more progressive way of funding the changes necessary to decarbonise the energy system. The current increases and the pressures they will place on the least able to pay in our society, highlight the urgent need to consider this broader question alongside the additional costs of meeting the UK's net zero ambition.

Overview

The Welsh Government will use the full range of levers available to us, including national, regional and local planning powers, support, regulation, innovation and collaboration. These include powers to legislate for the consenting of generating stations which have an installed capacity of 350 MW or less, as well as all onshore wind and energy storage developments (with the exception of pumped hydroelectric storage).

The following polices set out how we will meet Carbon Budget 2 and how we look out towards future carbon budgets and our net zero target. For electricity, our actions are set out under the two broad areas: reducing the use of fossil fuels and increasing electricity from low carbon and variable renewables. This encapsulates the policy aims for planning for a more integrated energy system, supporting innovation and new technologies, and retaining the benefits of the transition in Wales. For heat, we will be laying the groundwork for deep decarbonisation.

Decarbonising electricity production from fossil fuels

Reducing our greenhouse gas emissions requires us to reduce the use of fossil fuels. Our policy approach[43] does not support the extraction of petroleum in Wales and we will bring the extraction and consumption of fossil fuels in Wales to a managed end. During Carbon Budget 1 we have also taken forward policies on planning and licensing which will have an enduring impact through Carbon Budget 2 and beyond.

These policies will strengthen Welsh Government's position in the determination of large, non-devolved generating stations, which are currently determined by the UK Government.

Whilst the use of fossil fuels must reduce to meet carbon budgets, we need to maintain a secure supply of electricity for people and businesses in Wales as our capacity for renewable energy generation increases. Therefore, we will ensure this supply is met through decarbonised sources as soon as possible and from 2035 at the latest.

Policy 17 – Reducing emissions from the combustion of fuels for electricity generation

We aim to reduce carbon emissions from the power sector in Wales whilst maintaining security of supply in a high renewables system.

Later this year we will publish our strategic policy position on combustion of fuels for electricity generation. It will set out a strong presumption against new fossil fuelled power plant, nor replacing our current fleet of plant with alternatives which may themselves be the source of greenhouse gas emissions. This presumption will have the effect of discouraging decision makers from consenting new fossil-fuelled plant. In 2019, Wales hosted 17% of the UK's gas-fired power generation capacity and we see no role for further fossil fuelled power plant in Wales. Our combustion of fuels policy will also explain how we will keep the situation under review, with input from National Grid, and update our position to reflect changes in generation, demand and grid management.

43 Written Statement: Petroleum Extraction Policy statement (10 December 2018) | GOV.WALES
https://gov.wales/written-statement-petroleum-extraction-policy-statement

To support continued security of supply we will work with Wales' existing fossil-fuel generators to set the conditions and regulatory framework to encourage decarbonisation of existing plant.

Policy 18 – Planning frameworks to restrict fossil fuel extraction

Wherever possible we must prevent further extraction of fossil fuels. We have placed all forms of fossil fuels at the bottom of the energy hierarchy within our strategic planning document, Planning Policy Wales (PPW)[44].

In December 2018, Welsh Government committed to not issuing any new petroleum licensing in Wales, or support applications for hydraulic fracturing petroleum licence consents. The continued extraction of all fossil fuels, including coal and petroleum, is not compatible with our challenging targets for decarbonisation. Sustainably managing our natural resources will not be served by exploring or developing new sources of petroleum extraction. The Welsh Government's policy objective is therefore to avoid the continued extraction and consumption of fossil fuels.

In March 2021, we published a Coal Policy Statement[45], which states the use of coal for energy use in Wales will not be permitted, given there are a range of other low carbon energy technologies. It is Welsh Government policy to not consent new mines, provide additional time for mining in existing mines, or to permit an expansion of mining in existing mines, except in exceptional circumstances, for example, to safely wind down mining operations. This applies to both the planning regime, and Coal Authority licence authorisation approvals.

Whilst the licensing of offshore hydrocarbon exploitation is not devolved, the Welsh National Marine Plan includes policy requiring offshore marine oil and gas developments with land based elements to be compatible with the Welsh Government's decarbonisation approach, with the intention, as far as possible, to discourage offshore extraction of fossil fuels.

During Carbon Budget 2, this planning framework will provide a clear policy steer to local and national decision makers.

Proposal 2 – Making new thermal power generation ready for net zero

In July 2021, we issued a joint call for evidence with the UK Government on introducing new Decarbonisation Readiness requirements for power plant. The intention is to build on the 2009 Carbon Capture Readiness (CCR) requirements. We are seeking views on removing the 300MW threshold, expanding the scope to different technologies such as energy from waste facilities and combined heat and power (CHP) and introducing the option to comply through hydrogen conversion. We are also proposing moving the requirement into the environmental permitting regime, which is managed in Wales by NRW and local authorities.

We anticipate the feedback from this call for evidence will form the basis of further consultation on specific proposals for Decarbonisation Readiness and the legislative changes necessary to implement them. We intend to issue this consultation in early 2022 and for the necessary legislation to come into force in 2023.

44 https://gov.wales/planning-policy-wales
45 Coal policy statement [HTML] | GOV.WALES https://gov.wales/coal-policy-statement-html

Policy 19 – Reducing emission growth from new energy from waste plants in Wales

Incineration is a transitional technology on the path to a zero waste society, and as an energy recovery solution, should only be used for the non-recyclable material fraction, as long as no technically, economically or environmentally better alternatives exist.

Following the publication of *Beyond Recycling* in March 2021, we have brought forward an immediate moratorium on any future large scale energy from waste developments, as laid out in the Written Statement from March 2021[46], together with the accompanying updated Strategic Assessment on the need for new energy from waste capacity across the three economic regions in Wales. As laid out in our Written Statement, small scale energy from waste plants (of less than 10MW) must also supply heat, and where feasible, be carbon capture and storage enabled or ready.

The updated strategic assessment shows, apart from a modest potential need for smaller scale energy from waste capacity for non-recyclable waste and to properly dispose of dangerous wastes such as clinical waste, the success of our recycling and the decrease in waste generated in Wales means no further large scale energy from waste plants are required.

Increasing low carbon and renewable generation – planning for a more integrated net zero energy system

Alongside reducing fossil-fuelled generation in Wales, we need to increase generation from renewables in ways which are the most cost effective and beneficial for Wales. We need to understand where the future demand for energy will be, and how it will vary across the day and night, for what purpose (power, heat and transport) and across the seasons. If we are to realise the most cost effective, fair and beneficial change for Wales, we need a very different approach to organising the energy system. Moving to a more planned approach, rather than a market driven approach, is more likely to enable delivery at the speed demanded by the climate emergency, at optimal cost to the system, and in a way that delivers a more socially just system with no people or places left behind.

Our work on whole-system energy planning will help identify changes needed to local energy systems, to decarbonise heat and local transport, to consider the future requirements of industry, and to realise opportunities for local renewable energy production. This section includes policies on integrated energy system, supporting innovation and new technologies, retaining the benefits of the transition and laying the groundwork for renewable and low carbon heat.

Policy 20 – De-risking and integrating investment in Wales through energy planning

The only way to deliver an affordable net zero energy system is by pursuing a joined-up whole-systems approach – and by ensuring full public engagement across the whole spectrum of actions needed.

46 Written Statement: Taking action to make the circular economy a reality (24 March 2021) | GOV.WALES
https://gov.wales/written-statement-taking-action-make-circular-economy-reality

We have initiated, funded, resourced and supported four Regional Energy Strategies, which start to identify the scale of change needed to reach a low carbon energy system and establish regional priorities for a low carbon energy system. This work models future demand for power, heat and transport[47] and contains an economic assessment of the impact of delivering the proposed ambitions.

Regional Economic Frameworks (REFs) will build on the strategic opportunities identified in the Regional Energy Strategies. REFs are a key component of our approach to regional economic development and are being developed in partnership with key regional stakeholders including local authorities and others. REFs are discussed further in Part 2.

We have also made a major new commitment to Local Area Energy Planning (LAEP).

LAEP builds on the work of the Regional Energy Strategies, taking a more detailed approach to identify the actions to decarbonise a local energy system. The LAEP process aims to inform, shape and enable key aspects of the transition to a low carbon energy system, identifying what needs to happen, where and by when. The resulting plans will provide crucial evidence to support:

- energy efficiency retrofit
- heat
- transport
- economic development; and inform grid network providers' plans.

We have initiated and funded two LAEP pilots in Conwy and Newport Local Authority areas. We are working with local authorities and regional decision makers to shape the roll out of this more detailed planning across Wales during 2021–22. We are working to ensure all areas of Wales have a detailed local energy plan by the end of the 2023–24 financial year.

Integrated Network Planning

Policy 21 – Planning the delivery of the electricity and gas grid we need for Wales

We have established a project with all the energy network operators in Wales, and Ofgem, to develop a long term plan for the energy networks in Wales. We will look out to 2050 to understand what networks we need to support a net zero energy system and best serve the communities and places they support. The work will help to inform *Future Wales*, Wales' National Plan.

Welsh Government will take the strategic lead on the project. The network owners will provide resource to the process and use its outputs to inform their network plans. Ofgem will provide independent and impartial advice to support the development of options.

The focus will be to achieve a joint view across all participants of the likely future energy needs in Wales to 2050, building on existing modelling. Bringing together thinking across the gas and electricity networks and across the transmission and distribution networks in this way, we aim to be the first country to have a joined-up approach to developing gas and electricity networks, enabling opportunities for additional prosperity in Wales. We will work with others who need to inform those

47 It was not possible to model future demand from industry in the regional strategies. Local plans will aim to include it subject to data availability.

plans: the local authorities, infrastructure operators and the people who will be supplied and impacted by new networks, as well the many stakeholder groups who will have a view.

The National Infrastructure Commission for Wales has called for further evidence on the economic and practical implications of changes to energy transmission for individual consumers, industry and society. We will work with the Commission to agree their role in this work.

We expect to have early outputs from the work in 2022, with more detailed plans informing network operators' plans as soon as their business planning allows.

Wales within the GB Energy System

Our work in Wales will link to any future novel UK Government whole-systems approach to net zero. We will work with the UK Government and the energy regulator, Ofgem to deliver this.

Ofgem proposes £25 billion is required to transform Great Britain's energy system and net zero targets are core to the five-year investment programmes it agrees with network owners. Our work with network owners will also help us identify opportunities for energy network owners to develop projects in Wales for support through innovation funding.

Public acceptance of the change

Electrifying heat and transport to deliver a low carbon energy system, even with demand reduction, will result in additional electricity infrastructure. Public acceptance will be necessary, and will need a more active role for people as citizens and as decision makers in daily life. Real and enduring engagement with energy plans can contribute to the discussion, but sustained effort and solutions seen as beneficial to the whole of Wales will be required to deliver a true democratic mandate for change. This will form part of our approach to citizen engagement set out in Part 2.

Policy 22 – Increasing renewable energy developments on land through our planning regime

As introduced in Part 2 of this Plan, *Future Wales* provides a positive policy framework for new renewable energy developments and associated infrastructure, and determines renewable and low carbon energy developments of national significance. Planning Policy Wales has been updated to reflect the framework in *Future Wales*.

Future Wales' policies therefore provide a positive policy framework to support the consenting and development of large-scale renewable energy projects. Proposals are beginning to come forward in the pre-assessed areas and, subject to consenting by Welsh Minsters, are likely to be built and producing energy within the Carbon Budget 2 period.

We will improve and unify the consenting of energy generation projects in Wales to provide a quicker and more proportionate consenting regime for energy infrastructure. We intend to introduce legislation that explores providing an integrated system for consenting devolved infrastructure projects, including low carbon and renewable energy projects, on land and offshore.

Since April 2019 Welsh Ministers powers to consent have been expanded from the upper limit of 50MW onshore to 350MW both on and offshore (excluding onshore wind, the consenting for which is already fully devolved). We are taking a phased approach to implementing these expanded powers, with interim arrangements in force from the commencement date whilst we develop a bespoke and unified consenting

process over the longer-term. Such reforms will require a Senedd Bill, which we are considering during this Carbon Budget 2 period. Our aim is to provide better certainty of outcomes for renewable energy developers in Wales, while also enabling decisions to be made within a statutory timeframe, and the potential to include other ancillary authorisations as part of a single consent. Our process will complement the BEIS Offshore Transmission Network Review.

Policy 23 – Consenting storage projects to support a flexible and responsive energy system

Changes have been made to the consenting of energy storage in Wales to provide a quicker and more proportionate consenting regime. We have delegated all planning applications for the consenting of storage (with the exception of pumped hydroelectric schemes) to Welsh Local Planning Authorities. In addition, the UK Government has made changes in relation to previously non-devolved projects, which have resulted in the full devolution of storage consenting (with the exception of pumped hydroelectric schemes) to Welsh Local Planning Authorities. These changes all took effect in April 2019 and will impact on consenting during Carbon Budget 2 and into the future.

Policy 24 – Marine evidence, planning and licencing: supporting offshore and marine renewable energy deployment

Natural Resources Wales (NRW) has a key role to play in advising on future opportunities for marine renewable energy and we are working with NRW to continue the Offshore Renewable Energy Programme (OREP). We will also continue to work in collaboration through the Consenting Strategic Advisory Group and the Evidence and Science sub-group to address the key barriers to planning and consenting for marine renewable energy.

Our policy will be to streamline consenting wherever possible, joining up regulatory processes and seeking win-win outcomes. We are progressing strategic marine planning initiatives for marine renewable energy including:

- Publishing Sector Locational Guidance (SLG), which brings together ecological and socio-economic evidence for wave and tidal stream energy sectors by the end of 2021.
- Identifying potential Strategic Resource Areas for marine renewable energy by 2023 in line with marine planning policy and taking account of environmental considerations.

We will, by November 2022, report on the effectiveness of the Welsh National Marine Plan, including progress being made towards securing plan objectives and the effects of the policies in the plan with respect to our support for marine renewable energy.

We are collaborating with the Crown Estate and others through the Offshore Wind Evidence and Change Programme to understand spatial opportunities for offshore wind including floating wind developments. Alongside this work, we are providing evidence to the ongoing offshore transmission network review to ensure Welsh interests are reflected in future planning and regulatory arrangements.

Supporting innovation and new technologies

Policy 25 – Innovation in new renewable energy technology to drive faster and deeper decarbonisation and support the green economy

Our PfG includes a commitment to further support innovation in new renewable energy technology, which will support the transformation of the energy system. We have already supported Welsh businesses and academia to work together to build capability and develop solutions to drive forward net zero solutions through initiatives such as FLEXIS https://www.flexis.wales/, a consortium involving Cardiff University, Swansea University, the University of South Wales, Neath Port Talbot Borough Council and Tata Steel UK.

The effective and innovative use of data will also play a part in supporting our ambitions. The increasing availability of "smart" data and use of data driven innovation techniques can ensure we better understand energy use and balance supply and demand on the local and national scale and we will pursue this with academic and business partners. We can also provide open geospatial data to support energy planning, bringing together data on the natural environment, energy provision and wider societal data through the continued development of our Data Map Wales platform.

We will link our support to our wider Innovation Strategy (see Part 2) and will focus on high impact areas, setting out our plan by the end of 2022.

We will also highlight opportunities for UK funding for innovation. In Wales, the Whole system Business Research Innovation for Decarbonisation (WBRID) scheme challenges businesses to help communities and the public sector adapt to the challenge of net zero on a whole system basis. By supporting and understanding the needs of businesses in Wales, for example by engaging with the South Wales Industrial Cluster, we will influence UK Government funding streams to be fit for Wales.

Case Study – The Milford Haven: Energy Kingdom

The Milford Haven: Energy Kingdom project brings together a wide range of stakeholders to complete a front end engineering design plus demonstration project, which aims to test the feasibility of decarbonising the Milford Haven Waterway. The proposal includes the use of hydrogen vehicles, smart hybrid heating system, solar PV and wind. Milford Haven is also strategically located to maximise the economic benefits associated with the estimated 70 GW of Floating Offshore Wind (FLOW) generation within the Celtic Sea.

The Welsh Government pump primed the project £110,000, which enabled a bid to Innovate UK for substantial further funding.

Hydrogen

Hydrogen may provide one of the few ways to decarbonise heavy industry through fuel switching, and to reduce emissions in hard-to-abate modes of transportation, notably in heavy goods vehicles, aviation and shipping. Hydrogen may also displace natural gas in heating systems or be used as a storage medium for renewable electricity. Whilst there is a great deal of uncertainty of where in the economy and to what scale hydrogen will play a part, given the relative inability of the energy system to currently store electricity at scale, hydrogen as a flexible storage solution and fuel will be pursued.

Hydrogen can be sourced in several ways:

- 'Grey' hydrogen – sourced from steam reformation of natural gas.
- 'Blue' hydrogen – sourced in the same way as 'grey', but the carbon dioxide emitted from the process is captured rather than released.
- 'Green' hydrogen – sourced from the electrolysis of water and produces no CO_2, but requires large amounts of electricity.

In November 2020 the UK Government's Ten Point Plan included a target to install 5GW of low carbon hydrogen production capacity in the UK by 2030 and up to £500m of funding to support new production facilities and trials of hydrogen for heat.

More details in the *UK Hydrogen Strategy*[48], published in August 2021 included hydrogen business models and a revenue mechanism for bringing through private sector investment. It also sets out the UK Government's support mechanisms for hydrogen and Carbon Capture and Storage (CCUS) industries in parallel, in conjunction with support for the demand side such as heating trials.

To facilitate the development of hydrogen activities and opportunities in Wales, we will shortly set out a pathway for hydrogen development in Wales during this carbon budget period. The next stage is to develop a long-term plan to make hydrogen zero-carbon, after which hydrogen could also play a role in decarbonising the power system.

We believe strong Welsh Government commitment to a net zero pathway, backed by financial support, regulation and clear hydrogen strategies and targets, could trigger unprecedented and sustained momentum in Welsh hydrogen in the medium to longer-term. We need to understand the role hydrogen should play in Wales in the longer term – in transport, in industry and in energy – but in the meantime will take action to keep our options open.

We will:

- **Establish at least one renewable hydrogen production site 10+ MW by 2023-24:** providing stimulation and support to the demand side.
- **Scope large-scale hydrogen production sites:** Given the time required from developing a concept to implementation of hydrogen production at scale, there is a need to begin planning low carbon/ renewable hydrogen production and delivery facilities in parallel with the deployment of the initial smaller scale facilities.
- **Support local projects and place-based approaches:** such as the Holyhead Hydrogen Hub.
- **Engaging with other hydrogen initiatives:** such as opportunities for hydrogen boilers / hybrid heat pumps.

48 UK hydrogen strategy – GOV.UK (www.gov.uk) www.gov.uk/government/publications/uk-hydrogen-strategy

Capturing benefit for Wales

Proposal 3 – Updated targets for renewable energy developments to support our net zero pathway

Wales is making good progress towards meeting our current renewable energy targets. Our target is for the equivalent of 70% of electricity consumption in Wales to come from renewable sources by 2030. By the end of 2019 we had reached 51%.

Our renewable electricity targets were set in 2017 and re-evaluated in 2020 and we now need to re-evaluate our renewable targets again in the context of net zero. Our targets need to reflect the evidence and the scale of our ambition for change. We will review our targets in 2022 to make sure we will meet our duties and ensure renewable generation delivers wider benefit to Wales. The work will result in a consultation by the end of 2022.

A Ministerial led deep dive will explore how we can further maximise the local and community benefits of renewable energy generation in Wales with the outcome published by the end of 2021.

Policy 26 – Locally owned energy developments to secure an economic return for Wales

We are well on our way to our target for 1 GW of renewable energy generation capacity to be locally owned by 2030. By 2019, 825 MW of renewable energy generation capacity was locally owned. We also have a target to expand renewable energy generation by public bodies and community groups in Wales by over 100MW between 2021 and 2026. Together with our commitment to review the target for renewable generation in Wales we will review our 1 GW target to ensure this still meets the scale of our ambition.

We published our policy on ownership of energy generation in February 2020.

We currently support locally owned energy projects through the Welsh Government Energy Service (WGES) and through grant funding Community Energy Wales. We are supporting developers and communities through WGES to agree routes to shared ownership.

We also provided support to Ripple Energy to pilot a new business model. This cooperative model will supply its members, who own the wind farm, with electricity at wholesale prices. We have supported Ripple to deliver the pilot project and will work with the cooperative to consider how its findings may inform developments in Wales, over the next year and rest of the carbon budget period.

Building on this, we will develop new approaches to support new generation where proposals meet our needs. Starting immediately, we will:

- Review the Welsh Government Energy Service, to consider the evolving needs of places, as we shape service provision beyond the existing four year service.
- Explore new models connecting people and developments, so communities have a stronger relationship with them and can see benefits.
- Support communities to explore partnerships with commercial developers.
- Assess options for other innovative ways of funding locally owned low carbon generation, building on the strong track record of community share offers in Wales.

- Build on the existing pipeline of public and community renewable projects, evaluating the potential for renewables on public land.
- Identify opportunities on the Welsh Government Woodland Estate, balancing the potential to generate energy with the need to preserve biodiversity and increase tree planting in Wales.

Establish a Welsh Government or public energy developer to accelerate the delivery of renewables.

Well-being Goal Spotlight – Cohesive Communities

We want a Wales of Cohesive Communities that are attractive safe and well connected. Communities are well placed to understand their local areas and to bring people together with common purpose. Promoting and developing locally owned renewable energy can reduce energy bills, contribute to energy security and reduce carbon emissions. It can also contribute towards a range of other benefits that could contribute to community cohesion including increasing the awareness of energy and energy efficiency issues, addressing fuel poverty, and contributing to the local economy. We are supporting locally owned energy projects through WGES and through grant funding Community Energy Wales. One example is the Community Wind Turbine at Ffwrd Farm, Ceredigion. Grannell Community Energy successfully commissioned the 0.5 MW wind turbine on Ffrwd Farm, Llanwnnen, in October 2019. With support from WGES and costs met by a combination of a loan from the Development Bank of Wales and investment from 129 individuals, there is also an associated fund for the local community. By June 2020, the turbine had generated over 1,000,000 kWh of clean energy.

Policy 27 – Maximising Welsh benefit from commercially operated infrastructure projects in Wales

Welsh Government's aim is to ensure maximum possible benefit is retained in Wales from new energy generators. We will look for opportunities to work with the private sector to deliver local priorities in support of net zero, and support Welsh businesses to take up supply chain opportunities and build the necessary skills in Wales to generate local social and economic benefits.

We have undertaken port and grid infrastructure mapping exercises to identify the scale of the investment required to unlock the potential for Wales. We have already stress-tested the findings and are working alongside our ports and a wide range of project developers to further develop our approach.

Both Carbon Trust[49] and the Offshore Renewable Energy Catapult's (OREC) floating offshore wind (FLOW) supply chain studies identified significant existing expertise within Welsh businesses that could be used by the sector.

With the offshore wind and FLOW sectors, we will work with the owners of major infrastructure to develop local supply chains. Specific opportunities we are pursuing include:

- Maximising supply chain and local job opportunities from the approximately 4GW of upcoming additional offshore wind developments off the North Wales coast – including Awel y Môr and projects successful in the recent seabed leasing round.
- Work with the offshore wind industry through the Offshore Wind Sector Deal to open up new supply chain and manufacturing opportunities for Welsh businesses.

49 Carbon Trust Future Potential for Offshore Wind in Wales, 2018

- Funding Marine Energy Wales to work with potential suppliers for offshore and floating offshore wind.
- Work with the FLOW developers within the Celtic Sea between Wales and the east coast of Ireland to identify their needs and collaborate with the Irish Government to secure benefits to our businesses and communities from any FLOW developments.

We will raise awareness of the opportunities that will come from managing this more dynamic energy system. We are piloting a new approach to local energy markets with Bridgend County Borough Council, and will share the learning from this process with regions during the development of delivery plans for the Regional Energy Strategies during 2021-22.

Other marine technologies present a less immediate opportunity for commercial deployment, but one where Wales is at the forefront of development and testing and no country has yet secured a lead in manufacturing. Welsh Government has allocated £90m of EU funds for marine energy, with £74.1m of this committed to approved projects and £42.6m being spent by July 2021. We will work with Marine Energy Wales and its members on the opportunities for future industry from this sector.

We have committed to a Marine Energy Programme which will:

- Develop a Tidal Lagoon Challenge, providing robust evidence on the viability of the technology and the potential for supporting a project in Welsh waters that can demonstrate environmental sustainability in line with WNMP objectives and policies.
- Work with the industry to develop a strategic plan to maximise the realisation of the potential benefits to Wales from marine energy.
- Develop thinking on maximising opportunities for ports in Wales across a range of energy and other opportunities.

While the Wylfa Newydd project promoted by Hitachi on Anglesey is no longer going forward, the site at Wylfa is still regarded as being one of the best in the UK and indeed Europe for large-scale nuclear development. There is expectation the UK Government will consider a new project at Wylfa, subject to any new developer proposals representing value for money.

Nuclear Energy remains of interest to Welsh Government but we will remain hard-headed about the potential risks from facilities themselves and the waste they generate. We are exploring the potential economic benefit from the development of innovative Small Modular Reactors (SMRs). Whilst not at this stage considered as part of the low carbon energy mix for Wales due to the early nature of the technology, the potential for well paid jobs in Trawsfynydd is significant. Welsh Government has committed to establish a Trawsfynydd Site Development Programme in support of the Snowdonia Enterprise Zone strategy to create job opportunities and economic growth at the former nuclear power station site. The programme aims to deliver a number of key projects through Cwmni Egino, a site development company that has been established and is fully-owned by Welsh Government. We expect to see further progress on the formal business plan in the coming months.

Laying the groundwork for renewable and low carbon heat

Decarbonising heat is essential to meeting our 2030 target. There are, however, considerable uncertainties about the most appropriate solutions across Wales. Earlier in this chapter we have discussed energy planning, infrastructure development, working with stakeholders and innovation, which will all be important in decarbonising heat.

Our policies focused at the household level are included in the Residential Buildings chapter. This section is about our approach to the challenges and opportunities around the supply of low carbon heat in the future, and increasing the use of waste heat and low carbon heat sources, for instance through heat networks.

Policy 28 – Scope out the challenges and opportunities around low-carbon heat

In 2019, there was 686MW of renewable heat capacity in Wales. The production of renewable heat was approximately 2.3 TWh in 2019, which is equivalent to 4% of estimated heat demand in Wales.

The UK Government published a review of the evidence related to heat decarbonisation in 2019[50]. This has since been supplemented by the CCC's advice to the Welsh and UK Governments in December 2020. The UK Government has also updated the National Comprehensive Assessment of the potential for combined heat and power and district heating and cooling in the UK.

We have included requirements to explore heat networks in the most appropriate areas within *Future Wales*. We have also worked with regions to develop ambition in relation to low carbon heat through the emerging regional energy strategies and heat will be a key consideration for local area energy planning.

We will:

- Consolidate these evidence bases, identify any gaps, and commission work where necessary to fill these evidence gaps.
- Publish a heat strategy for Wales in 2023.

This will help ensure Welsh Government funding and effort is focused on the most appropriate solutions for Wales to help organisations access sources of external support for decarbonising heat in buildings.

Policy 29 – Increase the use of waste heat and low carbon heat sources

We need to identify sources of waste heat, which could be used to heat buildings. We have supported the development of low carbon heat network projects in Cardiff and Bridgend, which have then secured UK Government funding. One district heating project using waste heat has been awarded funding by the UK Government's Heat Network Investment Project in Carbon Budget 1 (Cardiff Viridor) of £7m and this has been supplemented by commitment to a zero interest loan from Welsh Government of £8.6m. This activity will continue into Carbon Budget 2.

We will update the current national heat map for Wales to identify heat consumption and generation at sites across Wales. This will build on the work commissioned by the UK Government to update the National Comprehensive Assessment of heating and cooling published in September. In 2022, we will also incorporate evidence from our work on Local Area Energy Planning.

50 www.gov.uk/government/publications/heat-decarbonisation-overview-of-current-evidence-base

5. Team Wales approach

We need everyone to play their part in decarbonising the electricity and heat generation sector. This includes the UK Government in areas where key powers remain reserved, the public sector, business and individuals.

The Team Wales approach to decarbonising the electricity and heat generation sector will be taken forward with communities, businesses, individuals, the public sector and developers to increase prosperity by encouraging more locally owned energy generation in Wales. This will encourage as much Wales supply chain involvement and Wales job creation as possible.

In taking forward the Team Wales approach, more detail below, we will work with stakeholders to deliver low carbon energy generation, which provides a clear economic benefit to Wales. There will be a focus on projects which offer ownership to local communities, and those which deliver local content and local jobs. This will work in tandem with Wales' resource efficiency and circular economy policies and programmes and complement climate change adaptation policies.

The approach is captured in summary at the end of this chapter. The *Working Together to Reach Net Zero* document accompanying *Net Zero Wales* sets out where our partners have committed action through their Pledges together with additional case studies to demonstrate the action already taking place across Wales.

BT Group is proud to buy 100 per cent of its electricity in Wales from renewable energy – but we want to go further and help others to do so too. We pledge to collaborate across sectors and our supply chain in Wales to become a net zero carbon emissions business by 2030 for our own operations and 2040 for our supply chain and customer emissions. In particular, we are ready to work with Welsh Government and others to address the decarbonisation of transport.

BT Group Pledge

The Ask of Others

Individuals/households

As individuals we have a choices in the amount of energy we consume, how we heat our homes and the way we ask for our electricity to be generated.

The Welsh Government wants to help inform people about the role they can take in contributing to net zero and in doing so improving the health and wellbeing of themselves and their communities'.

For the decarbonisation of electricity and heat generation we will support people:

- **In their homes**, to improve decisions in energy efficiency, generation and storing their own energy and through smart management measures. These can be combined with purchasing more low carbon electricity and low carbon heating fuels and adopting low-cost flexible time of use tariffs.
- **In their communities**, to allow their home energy data to be used for local low carbon energy planning purposes and support their local authorities to develop strong local and regional energy planning.
- **In their workplaces**, encouraging their employers to pursue the same low carbon ambitions in offices as in their homes. In factories employers are encouraged to pursue resource efficiency, to switching to low carbon fuels and invest in other decarbonisation solutions. These investments all increase the future competitiveness of their products and services.

We will be developing our approach to involve society through the consultation on Public Engagement taking place in 2022 (described in Part 2).

Public sector organisations

We are looking to public sector organisations to contribute to meeting net zero in a number of ways. Public sector bodies can act as exemplars and can drive significant impact through their service provision and purchasing power, influencing supply chains to decarbonise. Public sector bodies must invest in energy efficiency and create new income streams, or avoid future costs, from generation of renewable energy.

Through WGES we are supporting public sector bodies and communities to take forward their own projects, or securing ownership stakes in commercial projects. WGES has invested over £109m of zero-interest loans across the public sector in Wales between 2015 and 2021. WGES has also supported the delivery of a further £40m of energy and energy efficiency projects, where finance was secured from alternative routes. The Service is now further developing the strategic thinking to complement the work across Wales on energy planning with the aim of developing projects which deliver a more locally focused energy system.

Local authorities also have a major influence through their role as place makers. As planning authorities, they will need to develop the capacity to plan for a low carbon future, where travel is minimised and active travel enabled; where homes and businesses can access local low carbon energy generation, and where homes and public buildings become much more energy efficient. We ask local authorities to work with us to develop local and regional energy plans, which will provide strong evidence to inform these place based plans for a net zero society.

Welsh businesses and industry

The team of stakeholders we are engaging with includes investors; businesses; expert consultants; universities; local authorities; energy services providers; utility infrastructure operations (including electricity, gas, water and telecoms); environmental bodies and UK Government utility regulators and trade bodies.

The key areas in which this Team Wales approach is being deployed are:

- **the generation of sufficient and accessible low carbon electricity and low carbon fuels** for Wales' use and, if it meets our well-being criteria, the significant export of low carbon electricity;
- **ensuring the necessary investment to enable our Wales grid** (particularly electricity and gas) networks infrastructure to be fit for purpose;
- the provision of sufficient services, expertise and skills training **to undertake a long term programme of buildings (of all types, but particularly our 1.3 million homes) decarbonisation**;
- **transport-related infrastructures**, which enable rapid decarbonisation of all transport modes;
- **energy-innovation systems**, involving companies and universities in Wales and expertise from further afield, which assist with both the development of the necessary, affordable and secure low carbon technologies, and their application, alongside enabling the decarbonisation of currently heavily fossil fuel dependent operations (industries and gas-fired power stations).

We will need strong regional support and growth deal coordination covering both generation and smart demand. It is also vital we decarbonise industrial clusters through circular economy principles, energy efficiency Carbon Capture Utilisation and Storage (CCUS) and hydrogen.

International engagement

Welsh Government has been working with a range of partners across Europe and further afield to share knowledge and experience on decarbonising energy. For example Welsh Government has been working with partners across Europe on the TRACER project, which aims to foster cooperation between coal-intensive regions around Europe to re-design research and innovation strategies to facilitate their transition towards a sustainable energy system.

The project has brought together a wide range of stakeholders across the target region to discuss and agree on a shared vision and priorities for the coal transitions. Through participating in TRACER Wales has been able to share best practice examples of successful and ambitious transition processes in coal intensive regions elsewhere in Europe. The project has also helped assess the social, environmental and technological challenges around the low carbon transition in Wales.

Electricity and Heat Generation

Ambition Statement

Two broad areas of mitigation

Decarbonising electricity production from fossil fuels

- **Policy 17 –** Reducing emissions from the combustion of fuels for electricity generation
- **Policy 18 -** Planning frameworks to restrict fossil fuel extraction
- **Policy 19 –** Reducing emission growth from new energy from waste plants in Wales

- **Proposal 2 –** Making new thermal Power Generation ready or Net Zero

Increasing electricity from low carbon and renewables

- **Policy 20 –** De-risking and integrating investment in Wales through energy planning
- **Policy 21 –** Planning the delivery of the electricity and gas grid we need for Wales
- **Policy 22 –** Increasing renewable energy evelopments on land through our planning regime
- **Policy 23 –** Consenting storage projects to support a flexible and responsive energy system
- **Policy 24 –** Marine evidence, planning and licencing: supporting offshore and marine renewable energy deployment
- **Policy 25 –** Innovation in new renewable energy technology to drive faster and deeper decarbonisation and support the green economy
- **Policy 26 –** Locally owned energy developments to secure an economic return for Wales
- **Policy 27 –** Maximising Welsh benefit from commercially operated infrastructure projects in Wales
- **Policy 28 –** Scope out the challenges and opportunities around low carbon heat
- **Policy 29 –** Increase the use of waste heat and low carbon heat sources

- **Proposal 3 –** Updated targets for renewable energy developments to support our net zero pathway

Team Wales approach – The Ask of others

1. Our Ask of the Welsh Public *(Individuals & Households)*	We ask the public to improve decisions in energy efficiency, generation and storing their own energy whilst also making conscious choices on the amount of energy consumed and how they heat their homes, switching to more low carbon electricity and heating fuels.
2. Our Ask of the Public Sector	We ask that Public sector bodies act as exemplars to help drive significant impact through their service provision and purchasing power, influencing supply chains to decarbonise. Public sector bodies must invest in energy efficiency and create new income streams, or avoid future costs, from generation of renewable energy. We also ask that Local authorities develop the capacity to plan for a low carbon future, where travel is minimised and active travel enabled. We ask local authorities to work with us to develop local and egional energy plans, which will provide strong evidence to inform these place based plans for a net zero society.
3. Our Ask of Welsh Business & Industry	We ask that key stakeholders continue to provide strong support to key areas which will enable growth in both generation and smart demand; encouraging decarbonisation through circular economy principles, energy efficiency Carbon Capture Utilisation and Storage (CCUS) and hydrogen.
4. Our Ask of UK Gov *(Call for UK action)*	We call on UK Government to: • Reflect the demands of the climate emergency. A number of UK polices stem from historic legislation not in line with binding targets on emission reduction. Specifically we are calling for the UK Government to remove the statutory duty of the Coal Authority to maintain and develop an economically viable coal industry; • Develop a long-term approach which supports a broad range of renewable technologies, creating a sustainable market for the wide range of low carbon heat technologies we will need to deliver our renewable and decarbonisation targets; • Deliver system rules and incentives which drive development of low carbon power sources to serve local demand. We need places in Wales to lead the low carbon transition by developing low carbon energy systems within the frameworks set by UK and Wales • Ring fence funding for early stage marine projects, necessary to incentivise the industry to continue investment; • Utilise the revenues generated by the UK ETS to stimulate emission reduction in power generation in ways which drive investment in Wales • Work with Ofgem to provide a framework which allows network owners to invest proactively in networks to ensure less affluent areas have access to similar opportunities. We also need to ensure demand connections are prioritised to create employment in areas where well paid jobs are less readily available; • Find a more progressive way of funding the changes necessary to decarbonise the energy system; and • For the Oil and Gas Authority (OGA) to develop a strategy consistent with the net zero pathway
5. International Engagement	We ask that partners across Europe and further field continue to work with us, sharing knowledge and experience on decarbonising energy. .

Transport

1. Introduction

Scope

Emissions from the transport sector include those from cars, trucks, buses, taxis and railways within Wales along with our share of emissions from international aviation and international shipping.

Vision

Transport has a significant role to play in helping Wales reach net zero and **generating wider benefits across health, air quality, accessibility and the economy**. Through the policies and actions in this chapter and in 'Llwybr Newydd', our Wales Transport Strategy https://gov.wales/llwybr-newydd-wales-transport-strategy-2021, **we will put people and climate change at the front and centre of our transport system**.

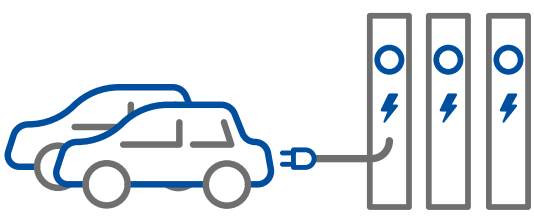
Llwybr Newydd sets our vision for an "accessible, sustainable and efficient transport system" built on three priorities.

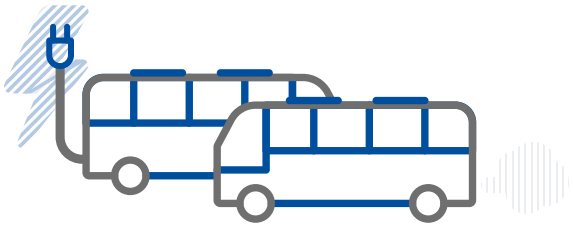
Firstly, we will plan ahead for better physical and digital connectivity, more local services, more home and remote working and more active travel, to reduce the need for people to use their cars on a daily basis.

Secondly, we need an integrated transport system that **works for everyone**, where people and goods can move easily from door-to-door by accessible, sustainable and efficient transport services and infrastructure. This means **significant investment in sustainable modes**, such as bus, rail and active travel, to create services that people want to use, can use and do use.

Thirdly, we will encourage people to make the change to more sustainable transport by making it more attractive and more affordable and by adopting innovations that make it easier to use **for everyone**.

For the journeys which cannot be made by active travel, we will also need to see a rapid shift towards zero emission technologies in vehicles. This will happen first in cars, vans, trains and buses, later in HGVs, and finally in aeroplanes and ships. In the near future, these will be cheaper to own and run than existing petrol and diesel vehicles.





The associated benefits of **swift, bold and ambitious action** to tackle transport emissions are significant.

Health:

Greater levels of walking and cycling have been shown to have a significant beneficial impact on health. **Fewer cars on the roads and in our towns and cities will reduce congestion, reduce the need for road building and allow us to repurpose land** used to accommodate cars for potentially transformative urban realm improvements. Zero emission vehicles will result in reduced concentrations of nitrogen dioxide, which harm our health, and reducing incidences of cardiovascular disease, respiratory disease, some cancers and Type II diabetes.

Wellbeing:

A stronger public transport network could lead to **stronger social and community ties, and sense of place, leading to positive effects on mental health and wellbeing**.

Economy:

Economic benefits from **enabling more people to access work**; gains in social equity; cleaner air and more successful town centres.

By investing in attractive and viable alternatives to car travel we will support a just transition to net zero, which will in turn create a more equal society, where access to work and services is not dictated by car ownership.

Overall, as a result of the uptake of zero emission vehicles **the Welsh economy is expected to benefit** from annual net cost savings against the baseline of **between £730 million and £1 billion by 2050**[51].

There are also potential economic opportunities for Wales, such as the manufacturing of zero emission vehicles and large-scale battery manufacturing, battery recycling, deployment and maintenance of electric vehicle charging infrastructure, innovative new business models, manufacturing of e-bikes and keeping production of fuel in Wales, whether electricity or hydrogen.

2. Emissions

Where the emissions come from

The transport sector includes transport emissions within Wales along with Wales' share of emissions from international aviation and international shipping. At 6.6 $MtCO_2e$, transport accounted for 17% of Welsh emissions in 2019. Transport is our third largest greenhouse gas emitting sector following the electricity and heat production sector (second largest) and the industry and business sector (largest). Practically all transport emissions (99%) are emissions of carbon dioxide.

51 Climate Change Committee 2019 advice

Figure 9: Graph – Transport sector emissions in 2019 ($MtCO_2e$)[52]

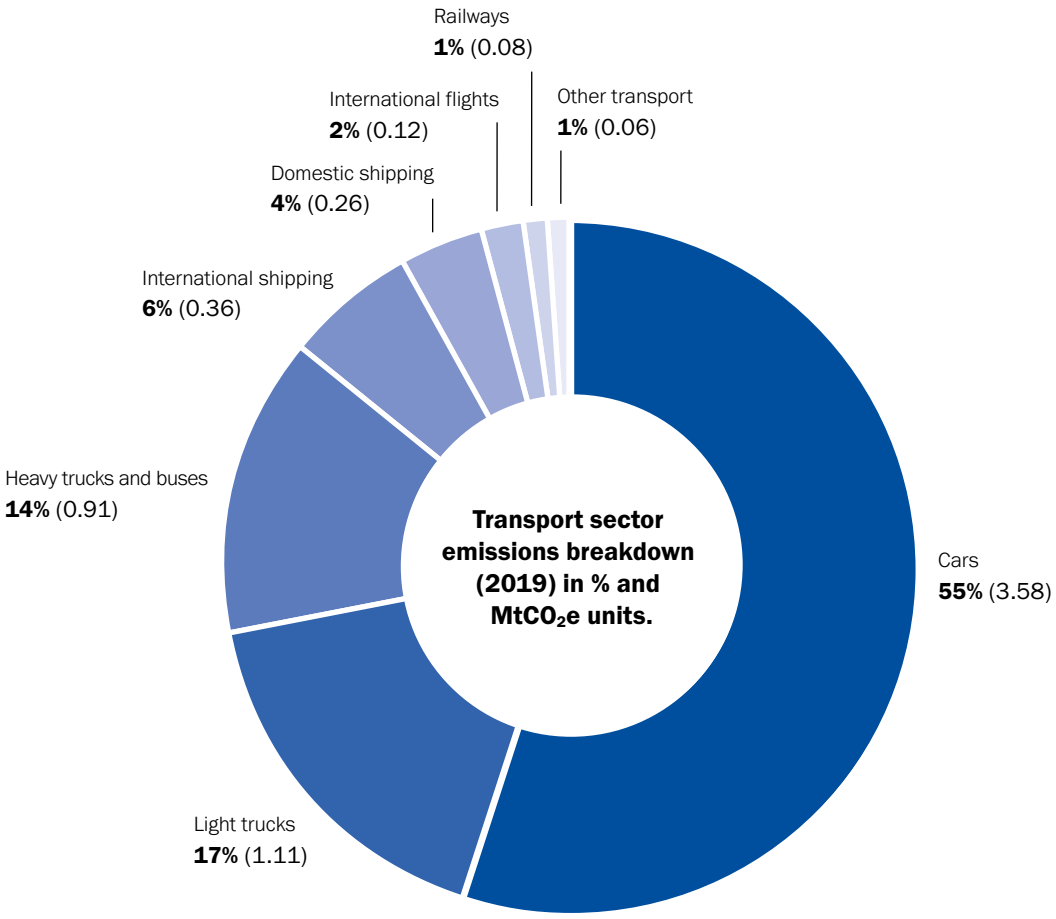


Table 3: How the biggest emissions sources in the transport sector contribute to the Welsh total

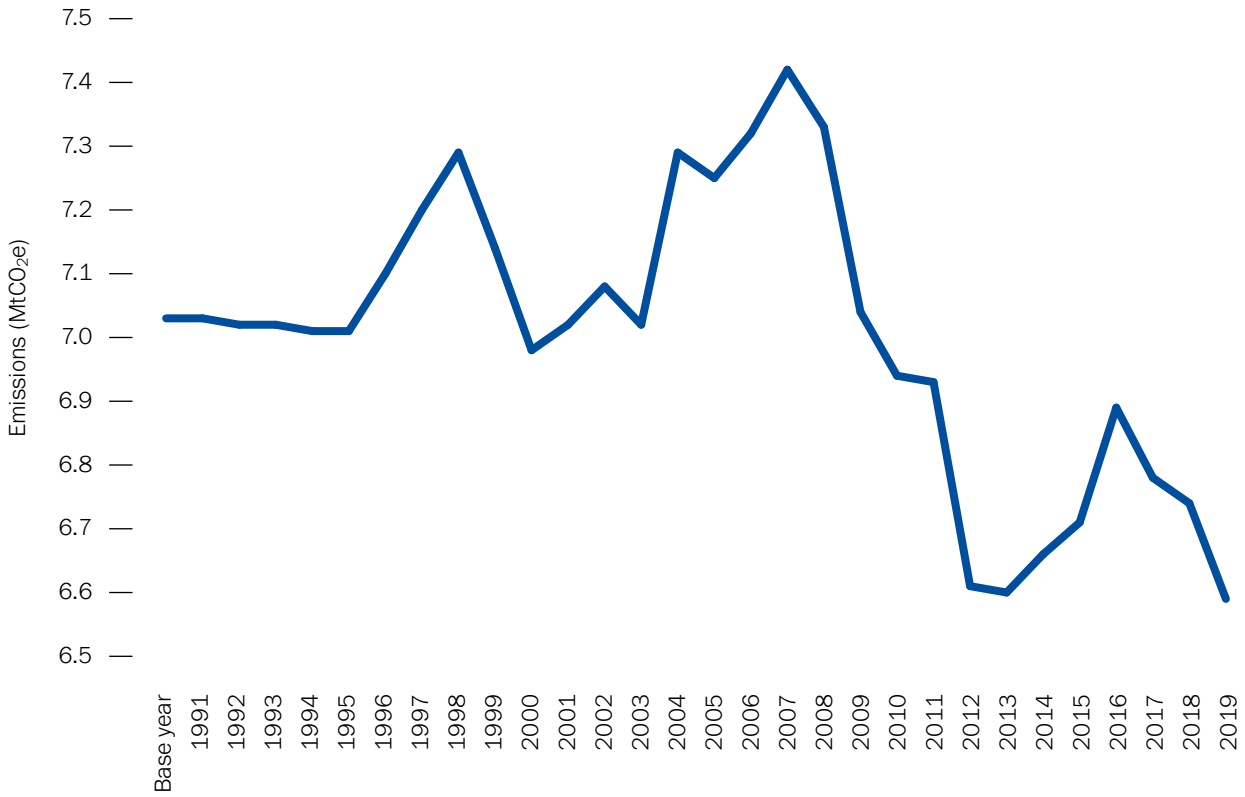
Source	% of total Welsh emissions
Cars	9%
Light trucks	3%
Heavy trucks and buses	2%

Summary of progress to date

Although vehicles are becoming increasingly efficient, we are also travelling more, so overall sector emissions have changed little since the 1990 baseline, declining by just 6% to 2019. In fact, cars and light duty vehicles made up 71% of the Welsh transport sector emissions in 2019. Overall, the transport sector emissions have decreased by 2% compared to 2018. Within this overall decline for the transport sector, international aviation increased by 12% between 2018 and 2019, while international shipping decreased by 3% between 2018 and 2019.

52 The emissions data is sourced from the Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019 and aligned to the Welsh Government sectoral definition as described in Annex 4. The "Other Transport" legend label consists of: Military transport, Motorcycles, Fishing, Engine lubricant use, Flights within the UK, LPG vehicles, Road transport of Urea, and Aircraft support vehicles.

Figure 10: A graph to show 1990-2019 historic Welsh emissions for the transport sector



A progress report setting out more detail of the actions taken so far will be published in 2022.

What are we aiming for?

Carbon impact of policies

We have sought to model the carbon impact of individual policies and how this would impact carbon budgets, particularly Carbon Budget 2 and Carbon Budget 3. This is underpinned by detailed thematic papers, which will be publicly accessible through Transport for Quality of Life, and the target carbon savings are included under the individual policies below.

This approach demonstrates the direction we want to take in all policy areas and in all emissions chapters for Carbon Budget 3 as we mature our evidence base and understanding of climate mitigation.

Many of the policy levers influencing the decarbonisation of transport are held by the UK Government. Further work and close cooperation is necessary to quantify the total carbon savings for transport in Wales using this methodology.

3. Ambition statement

Meeting Carbon Budget 2 and setting Wales on a pathway to deliver net zero emissions by 2050 will require action in three broad areas for passenger and freight transport:

- **Demand reduction and modal shift –** how behavioural and societal shifts could reduce or change demand for travel.
- The **technological options available and the uptake of transport with low or zero emissions**.
- **Improvements to fuel efficiency** in conventional vehicles.

These three broad areas for mitigation align with the levers in our Wales 2050 calculator, which we have used to set the Wales 2050 pathway for passenger and freight transport. These inform our ambition statement for the transport emissions sector.

Transport sector ambition statement

We aim to reduce emissions from passenger transport by 22% in 2025 (from 2019) and 98% in 2050 through demand reduction, modal shift and the uptake of low carbon technologies.

Our aim is to reduce the number of car miles travelled per person by 10% by 2030 and to increase the proportion of trips by sustainable travel mode (public transport and active travel) to 35% by 2025 and 39% by 2030.

By 2025 10% of passenger car travel will be by zero emission car and 48% of new car sales will be zero emission, we will have a comprehensive network of electric vehicle charging points, and will also have transitioned a large proportion of our bus, taxi and private hire vehicles fleet to zero emission vehicles.

4. Policies and proposals

The Ask of the UK Government

The UK Government owns many of the levers needed to propel us towards our ambition. We need ongoing commitment from the UK Government to energetically progress areas in which they have control or influence:

- The primary policy levers supporting the uptake of electric vehicles in Wales are retained by the UK Government. We must have clarity from the UK Government on the plan and milestones for implementing the ban on new petrol and diesel cars, which we support. There is a risk that take-up of battery electric cars and vans will be slower in Wales than elsewhere and this must be understood and mitigated.
- Following their consultation, the UK Government must bring forward proposals for ending the sale of all non-zero emission HGVs from 2040, with lighter HGVs from 2035, bringing clarity on how we can support the sector to trial new technologies and utilise the financial incentives from the UK Government.
- On rail services, the UK Government must fully engage with us and other partners to:
  - Agree to our proposals for a full devolution of rail services and infrastructure and a fair funding settlement to ensure that Wales is able to decarbonise its rail network at a sufficient rate to deliver carbon budgets;
  - develop rail services and provide new stations between Cardiff and Severn Tunnel Junction;
  - improve rail infrastructure across Wales alongside Network Rail; and,
  - develop a new multi-modal Logistics and Freight Plan for Wales.
- In line with rail industry recommendations, the UK must commit to work in partnership and provide funding for an extensive Overhead Line Equipment (OLE) programme to enable rail electrification.
- Aviation policy is not devolved. Following the consultation 'Jet Zero'[53] in 2021 the UK Government must bring forward proposals to drive fuel efficiency, the development of new zero emission aircraft and accelerating the supply and uptake of sustainable aviation fuels (SAF).

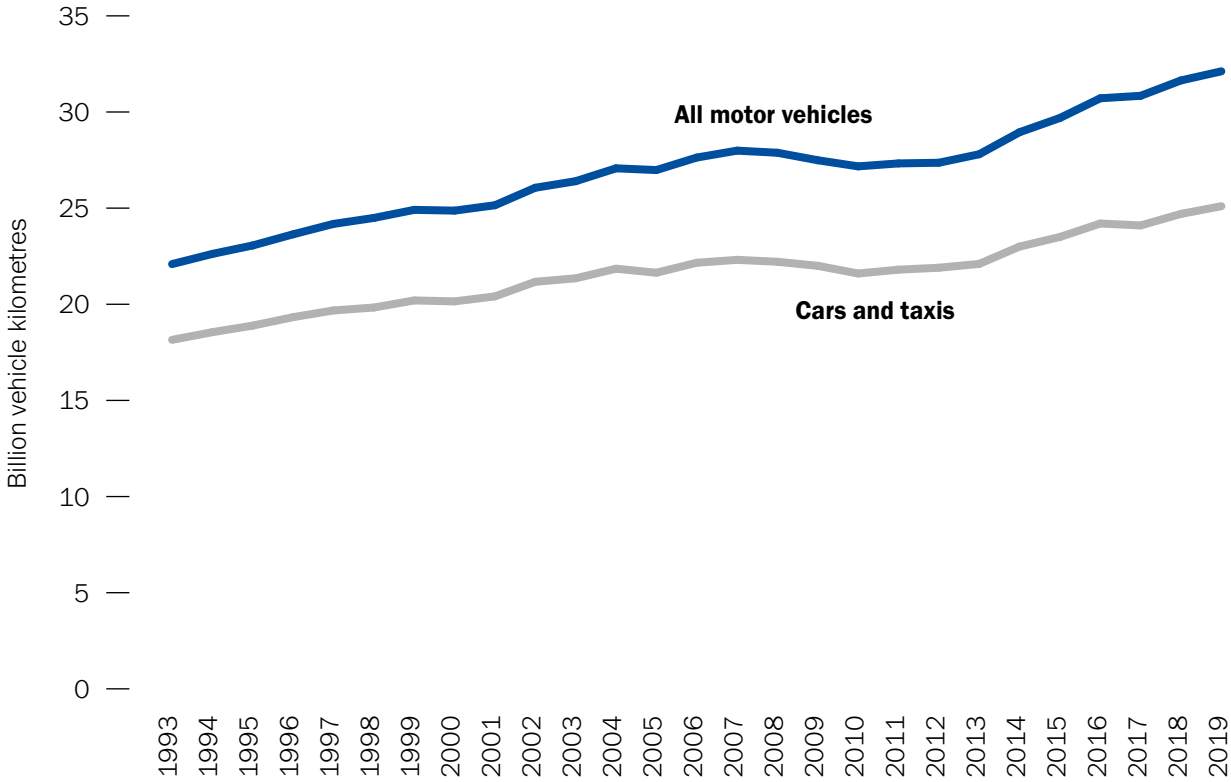
53 Jet zero: our strategy for net zero aviation – GOV.UK (www.gov.uk) www.gov.uk/government/consultations/achieving-net-zero-aviation-by-2050

Managing travel demand and modal shift

The development and roll out of technology to drive down emissions from vehicles is well underway, but will take time. Early actions to manage travel demand and encourage modal shift will play an important role and will bring wider benefits, for example to health, reducing congestion, and improving air quality.

We have to tackle the ever-increasing volume of traffic, which has grown by 45% between 1993 and 2019 and was the highest on record in 2019 at 32.1 billion vehicle kilometers (bvk) or 10,186 vehicles kilometers (6,329 miles) per person[54].

Figure 11: Volume of traffic 1993 to 2019



54 https://gov.wales/road-traffic-2019

The CCC's baseline projection predicts that this growth in vehicle km will continue without government policies to address the issue. The CCC's Balanced Pathway represents a marginal reduction compared to present (-2% in 2030 compared to 2021) but a more significant reduction in car driving distance relative to the predicted position that would occur without intervention (-6% in 2030).

The following policies and proposals set out the actions we will take to reduce car traffic and support the shift to sustainable travel modes in line with the balanced net zero pathway. We aim to reduce average car driver miles per capita to 10% below 2019 levels by 2030.

Llwybr Newydd, our new Wales Transport Strategy, sets out that we **will plan ahead for better physical and digital connectivity, more local services, more home and remote working and more active travel, to reduce the need for people to use their cars on a daily basis.**

Proposal 4 – A pause and review of existing road proposals and a new methodology for assessing the appropriateness of future road schemes

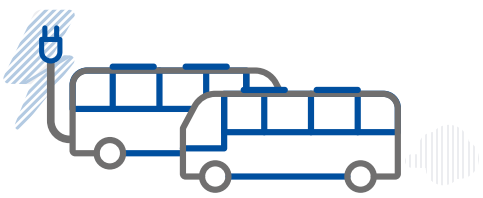
In June 2021 we announced a pause on us supporting most new road building projects in Wales, pending a review by an independent panel, consisting of engineering, planning and sustainability experts. The review is essentially intended to 'raise the bar' for when road-building is justified, primarily in light of the pressing need to reduce transport CO_2 emissions.

The review will consider whether roads projects already in our pipeline have sufficiently looked at non-transport solutions, and then non-road solutions. This is in accordance with the new mode hierarchy set out in Llwybr Newydd, which prioritises active travel and public transport ahead of private motor vehicles.

The review aims to report quickly, by summer 2022, and will inform decision making on both our current pipeline of road projects and our methodology for consideration of future schemes.

Some demand management measures will be required to support these levels of modal shift and carbon savings. Our strategy is to invest in low-carbon, accessible, efficient and sustainable transport services and infrastructure to ensure that practical, attractive and affordable sustainable modes of travel are available and in place first, which is why are committed to invest significant additional funding in public transport and active travel between now and 2040.

In Llwybr Newydd we committed to develop a framework for a fair and equitable road user charge. Once that framework is in place, consideration will be given to specific measures. In the meantime, we will consider other demand management measures alongside road user charging and will commit to developing a national Demand Management Plan.



Policy 30 – Enable people to work at or near to home

Bringing services to people in order to reduce the need to travel is the first priority in Llwybr Newydd. This includes planning ahead for better physical and digital connectivity, more local services, more home and remote working to reduce the need for people to use their cars on a daily basis.

We have stated our long-term ambition to enable around 30% of Welsh workers to work remotely, at or near to home, on a regular basis beyond Covid. This will be achieved by helping to give more people the choice to work in a way that helps their productivity as well as their work-life balance.

As fewer car miles are driven in peak periods, it is likely that there will be additional benefits in terms of reduced noise, air pollution and congestion.

We have already undertaken a public engagement 'Have your Say' exercise to gauge demand for local work hubs, which elicited over 1,000 responses and 2,000 interactions. Alongside this we launched a series of pilot hubs across Wales and published the first tranche of guidance on Business Wales under 'Remote Working'.

We know, however, there is more to do. We will keep working across government to undertake further research, to embed the policy and bring co-working providers together to share and learn, promoting best practice. For example, in this carbon budget period we will lead a group of best practice public and private sector organisations to explore, pilot and propagate the best ways to achieve hybrid meetings that mix office-based physical meetings with remotely situated employees.

We will also publish our Remote Working Strategy and the Integrated Impact Assessment, alongside analysis and a range of supporting documents.

We will enhance support and guidance for businesses and organisations and explore digital solutions to join up Public and Third Sector initiatives. We will bring this to life by investing up to £500,000 by 2025 in six flexible working sites in the Valleys. Alongside this, we will work with the UK Government to improve access to fast and reliable broadband, in order to help grow towns and communities and facilitate more remote working and therefore reduce the need to travel.

We estimate that carbon savings are possible through delivery of the above ambition, equivalent to between 0.13 and 0.41$MtCO_2e$ cumulative savings between now and 2040 (the range representing different assumptions on the numbers of days worked at home per week).

Policy 31 – Increase trip mode share of active travel from a current estimated proportion of 27%[55] to 33% by 2030 and at least 35% by 2040

Following the successful introduction of the ground breaking Active Travel (Wales) Act 2013 and our sustainable travel mode share targets, we are continuing to invest more than ever in active travel routes and facilities to help local authorities create a comprehensive network of routes. For example, we invested £75m in financial year 2021-22 in active travel routes and facilities to help local authorities create a comprehensive network of routes. We also worked with the Active Travel Board to develop further targets to increase active travel for journeys to work and school.

55 Estimate based on English National Travel Survey, disaggregated by rural-urban category and weighted to match the proportion of people living in each rural-urban category in Wales.

Building on this, we have an ambition to invest significantly in active travel between now and 2040. This funding will deliver very significant increases in the quantity and quality of cycling and walking routes and infrastructure by investment in area-wide networks of better, safer cycling tracks – physically separated from traffic, including hub-and-spoke networks linking villages to towns in rural areas. For example, this could include support for workplace travel schemes that incentivise cycling and walking, funding to secure all-weather cycle parking at railway stations, investment in public bike hire and e-bike hire schemes and campaigns to encourage more people to walk and to cycle. This will be reinforced by training for adults and children and investment in infrastructure such as pedestrianisation of town centres and large-scale traffic calming to create 'Low Traffic Neighbourhoods'.

In this carbon budget period we will focus on working in partnership with local authorities to support development of ambitious active travel schemes, so that as funding becomes available, many more schemes are shovel-ready. Other actions in this carbon budget will include:

- Ensuring that all new developments, including new school and health facilities make provision for walking and cycling.
- Change the default speed limit from 30mph to 20mph in built-up areas to reduce traffic related injuries and fatalities and make walking and cycling safer and more attractive, building people's confidence to travel by more active means.
- Encourage organisations to adopt the Healthy Travel Charter, develop workplace travel plans including Cycle to Work Schemes and provide facilities such as cycle parking, charging, lockers and showers.
- Work with external partners on behaviour-change programmes to encourage uptake of healthy and active travel.
- Support uptake of e-bikes, to ensure that active travel is a realistic option for more people, especially in rural areas where distances are longer and potential carbon benefits greater.
- Explore the potential for longer-distance commuter cycle routes between towns, starting in SE Wales with a Danish-style commuter cycleway between Cardiff and Newport.
- Set, monitor and review targets for active travel as part of Llwybr Newydd's monitoring framework and report annually.

Our analysis estimates that this investment will deliver cumulative emissions savings of 0.3-0.7 $MtCO_2e$ between now and 2040. Towards the end of the time period modelled, in Wales Carbon Budget Period 5 (2036-40), the carbon saved would be equivalent to 2.0-4.8% of all emissions from cars in Wales. Our analysis also suggests that the maximum potential savings if all suitable car trips shifted to walking, cycling and e-bikes, is considerably larger than this.

Investment at this level will deliver considerable wider benefits which, when monetised, generally exceed investment costs by multiples. These include reduced incidences of cardiovascular disease, respiratory disease, some cancers and Type II diabetes; stronger social and community ties leading to positive effects

on mental health and wellbeing; greater health equity (i.e. a fairer distribution of the health benefits of physical activity to disadvantaged groups); more successful local town centres; and less congestion in cities.

Policy 32 – Increase trip mode share of public transport from a current estimated proportion of 5%[56] to 7% by 2030 and 13% by 2040

The current fragmented public transport system does not result in the best services for passengers. Enabling people to switch from private cars to lower carbon modes of travel will be important to meet our near term carbon budgets.

This will be enabled by developing an integrated, multi-modal public transport system, which results in a seamless and effortless experience for passengers. We are prepared to take significant action in both bus and rail as the core network of services, as well as embracing technology and emerging modes of shared transport to make public transport a more attractive, practical and affordable alternative to car travel. Broader economic analysis shows increased public transport access also helps people to access better jobs.

The integration of modes, information and cost of public transport is critical to increased use. Future integration will need to be designed around user need and enable passengers to make informed decisions about their journeys.

The foundation for this ambition is already in place. Major construction work has already started on the South Wales Metro, through the £800m Core Valley Lines Transformation Programme. This programme is expected to be completed in 2023-24 with a peak spend of £280m in 2022-23 and will see new tram-trains provide turn-up-and-go services. We have also made significant improvements to the Welsh Government funded TrawsCymru strategic bus network across Wales, which has led to sustained passenger growth and has significantly improved access to areas of Wales not directly served by the rail network.

Looking ahead to this carbon budget, and taking each transport mode in turn:

Rail:

Within our competence, we will continue to invest in the Metro. Our three Metro programmes (South Wales, Swansea Bay & West Wales, and North Wales) are the areas where competitive and sustainable alternatives to car journeys can most easily be offered. They cover 20 of the 22 local authorities in Wales and over 93% of the population. However, the UK Government have a part to play too. We will work with them to develop rail services and provide new stations between Cardiff and Severn Tunnel Junction, as part of the wider solution to reduce congestion on the M4 in South East Wales, building on the recommendations of the South East Wales Transport Commission (SEWTC) chaired by Lord Burns. We will also work with them and Network Rail to improve rail infrastructure across Wales, including delivering network improvements and extensions, developing new stations and re-opening stations in Wales. More broadly, we will also press for a stronger voice in rail investment decisions that affect Wales, and ultimately for the full devolution of rail service and infrastructure in Wales and a fair funding settlement to enable rail and bus services to be fully integrated.

56 Estimate based on English National Travel Survey, disaggregated by rural-urban category and weighted to match the proportion of people living in each rural-urban category in Wales

Bus:
We are committing to deliver new bus legislation to address the restrictions of de-regulation and create a legislative basis that ensures that bus networks can be planned in their entirety in the best public interest. This means we can better support high quality, affordable, regular, reliable and punctual bus services in partnership with local authorities, the commercial and third sectors. We will address congestion hotspots through bus priority measures, investment in bus stations and stops to speed up journeys and improve passenger experiences and improved bus-to-bus interchange hubs in urban, town and rural areas where core and secondary bus routes come together. Over the longer term, conversion of core bus routes to Bus Rapid Transit (BRT), Light Rail Transit (LRT) or alternative emerging modes of public transport to increase capacity of public transport services as patronage grows will be considered.

Looking across both, we want to use this carbon budget period to develop multi-modal ticketing, the experience of passengers through integrated ticketing to speed up journeys. We will also work to extend the reach and resilience of public transport, by establishing complementary shared and micro-mobility options to improve travel options for passengers. More broadly, we will embrace technology solutions (e.g. Mobility-as-a-Service) to enable a shift away from personally-owned transportation to services that enable people to plan, book, pay for, and use different types of transport.

One of the transport challenges in Wales is around ensuring that rural areas have access to sustainable transport opportunities. Llwybr Newydd includes a commitment to our rural offer and a 'rural pathway', which sets out how we will take the needs of rural communities into account in planning transport.

We estimate that our investment will deliver cumulative emissions savings of 0.49MtCO_2e between now and 2040 by shifting people out of cars and onto the metro. This would represent between 0.6% and 2.7% of emissions from cars in the different Wales carbon budget periods. Together with reformed legislation and actions outlined under our bus mini plan in the Wales Transport Strategy, a programme of three phases of additional investment in buses and trams, requiring significant additional investment between now and 2040, will deliver emissions savings of at least 0.32MtCO_2e between now and 2040. This would represent between 0.2% and 2.3% of emissions from cars in the different Wales carbon budget periods. Carbon savings could be considerably higher than this if a proportion of the investment is used for additional services rather than infrastructure schemes.

Public transport investment at these levels will also deliver wider economic benefits, enabling more people to access work and training, particularly for those less well-off and socially excluded. Greater public transport use will generate significant health benefits from physical exercise, cleaner air, and more pleasant and successful town centres.

Policy 33 – Reduce emissions from freight and logistics

The freight and logistics sector is proving to be one of the hardest sectors to decarbonise. Road based freight is the second highest contributor to carbon emissions in Wales behind cars.

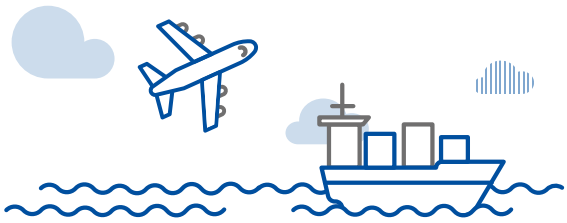
The UK's freight system is almost wholly privately owned and operated. Substantial mode shift is often not commercially viable under existing arrangements, and action from government is required to stimulate demand for more sustainable movement of freight. This requires a detailed understanding of supply chains across the industry, each of which is complex and completely unique. A range of interventions, many of which complement one another, will be required to help the industry move to a low/zero carbon operation.

To respond to this challenge, in this carbon budget period we will develop a new multi-modal Logistics and Freight Plan for Wales, with decarbonisation as an important element, working with the UK Government, the sector and other partners. This includes actions such as an assessment of the specific impacts of next-day deliveries on emissions and road congestion, setting aside land for multi-modal hubs to transfer long haul freight to smaller vans or e-cargo bikes for last mile deliveries, and developing the business case for a demonstration city to set up consolidation schemes. We will also encourage more freight to be moved by rail and plan for the future of the Welsh supply chain through logistics hubs, innovations and shared transport solutions in line with our priorities in the Wales Marine Plan and our planning priorities in Future Wales.

Policy 34 – Land use planning

The land use planning system will ensure development is located in the right place so people can live, access services and facilities and work in places which are accessible by sustainable modes of travel and are not dependant on private motor vehicles. The Welsh Government published edition 11 of Planning Policy Wales (PPW) and Future Wales – the National Plan 2040[57] in February 2021, which guides the content of Strategic Development Plans and Local Development Plans. This is discussed in Part 2. PPW and Future Wales help us to create places that reduce the need to travel, make efficient use of land and ensure that land use choice is guided by a clear understanding of their environmental, social, cultural and economic impacts. They also promote a strong focus on public transport and active travel.

We will work closely and collaboratively with local planning authorities to ensure that Strategic Development Plans (SDPs) and updates to Local Development Plans fully reflect and take forward the vision, objectives and policies set within PPW and Future Wales. We will also consider how existing policy could be further strengthened through future updates of national planning policy. This includes exploring ways in which policies can be better managed, monitored and enforced.



57 Welsh Government (2021) https://gov.wales/sites/default/files/publications/2021-02/future-wales-the-national-plan-2040.pdf

Technology and the uptake of delivering transport with low or zero emissions

Decarbonising transport at a sufficient rate to deliver our carbon budgets will require action to support and accelerate the transition to vehicles that produce zero tailpipe emissions. The rate at which this transition takes place will have a big influence on total emissions savings in transport and across the Welsh economy as a whole.

For cars and vans, this will predominantly represent a transition to battery-electric vehicles. For the transportation of freight, options include battery-electric vehicles, hydrogen fuel-cells and electric road systems. The continued electrification of the rail network, potentially supplemented with hydrogen, battery-electric and hybrid trains, will also be needed.

In the longer term we expect zero emission technologies in aviation and shipping to have a role, but this is unlikely to have a significant impact on emissions between now and 2030.

Policy 35 – Accelerate the uptake of zero emission cars and vans

The transition to zero emission cars and vans will be one of the most important actions needed across all sectors to achieve Wales' net zero targets and keep emissions within interim carbon budgets.

The primary policy levers supporting the uptake of electric vehicles in Wales are retained by the UK Government. We support the plans to end the sale of new petrol and diesel cars and vans from 2030, and for all new cars and vans to be zero emission at the tailpipe by 2035 and will work with the UK Government to support stretching targets for the uptake of electric vehicles. We also want to work with large van fleet operators to monitor and support the progress in transitioning the fleet to zero emission.

It is not yet clear what the targets for the uptake of electric vehicles will be in advance of the 2030 ban on sales. Variations in the rate of transition to zero emission vehicles will have a big impact on total emissions savings.

In Wales, currently 7% of all new car and van sales are electric battery vehicles. The CCC's Balanced Net Zero Pathway requires battery electric cars and vans to account for 48% and 56% respectively of all new car and van sales in the UK by 2025. It is imperative that the UK Government implement a regime that ensures that this pathway is followed across all nations of the UK. There is a risk that take-up of battery electric cars and vans will be slower in Wales than elsewhere, and carbon savings from electrification will therefore be smaller.

In this carbon budget period we will lead the transition to zero emission vehicles through delivering existing policy for the decarbonisation of the public sector fleet, zero emissions taxis and private hire vehicles and zero emission buses. We will also focus on activities such as supporting the adoption of electric car clubs to promote uptake of shared electric mobility and address rural transport issues. We will also review the costs and benefits of introducing loan schemes to incentivise the purchase of new and second hand electric vehicles and the potential for a scrappage scheme targeted at removing the most polluting vehicles.

An appraisal of the CCC's Balanced Net Zero Pathway shows that if vehicle electrification proceeds at the rate required by that pathway, tailpipe emissions from cars and small vans will be reduced by 0.5 $MtCO_2e$ per year in 2025, rising to 4.3 $MtCO_2e$ per year in 2040. The total carbon savings between 2020 and 2040 would be between 35 $MtCO_2e$ and 39 $MtCO_2e$.

The transition to electric vehicles will also significantly reduce harmful emissions from transport. Transport is now the largest source of Nitrogen Oxides in Wales, predominantly due to emissions from road transport, accounting for approximately one third of emissions[58].

Work to move to a zero emission public sector fleet is captured in the public sector chapter.

Case Study – Ford Low Carbon Vehicle Transformation Fund

Together with Ford we have launched a £1.8m fund to encourage businesses to move beyond manufacturing internal combustion engines to producing low carbon vehicle technologies. The fund will address strategic industrial technical challenges associated with low carbon vehicles with a clear focus on commercialisation and exploitation of new products, processes or services and growth in capacity and capability.

https://businesswales.gov.wales/expertisewales/ford-low-carbon-vehicle-transformation-fund

Policy 36 – Plan for and invest in EV charging infrastructure

The provision of electric vehicle charging is an essential precursor to rapidly increasing the number of electric cars and vans on the road.

Our EV charging strategy (https://gov.wales/electric-vehicle-charging-strategy-wales) was published in March 2021. This contains our vision for EV charging in Wales that *'By 2025, all users of electric cars and vans in Wales are confident that they can access electric vehicle charging infrastructure when and where they need it'*. The strategy estimates that the number of rapid chargers (43+kW) and the number of fast chargers (22kW) will need to increase rapidly in the next 10 years to meet demand from cars and vans. It details what UK Government-led initiatives apply in Wales, and where Wales can go further and tailor charging infrastructure to meet our needs.

Our EV Charging Action Plan details the specific actions we will take to help to ensure this vision becomes reality.

Looking ahead, by 2025 we will deliver a network of electric vehicle charging points on the strategic trunk road network every 20 miles across Wales to facilitate easier long distance travel. We will ensure that there is at least one publicly accessible charge point for between every 7 and 11 electric cars and vans in Wales and support local authorities to deliver public and on-street charging via the Welsh Government ULEV Charging Fund. By setting national standards, we will ensure a better quality user experience of charging.

Beyond this we will amend building regulations to mandate electric vehicle charging is provided at all new and

58 https://gov.wales/white-paper-clean-air-wales-bill

refurbished buildings. Taken together, our approach to EV charging will ensure that the charging infrastructure in Wales is on a par with the best in comparable areas of the UK. Improvements in this area will not be driven by government alone and we will need to work closely with partners across the public, private and third sectors in developing the infrastructure needed to give people confidence in using electric vehicles. For example, we will also work with network operators and stakeholders to plan and ensure a resilient grid infrastructure to support electric vehicles charging.

Policy 37 – Zero emission bus fleet

In addition to the actions to reform bus governance, we are committed to deliver on our targets to decarbonise the bus fleet.

In addition to the actions to reform bus governance, we are committed to deliver targets of;

- The whole Traws Cymru bus fleet to be zero tailpipe emission by 2026.
- The most polluting 50% of service buses to be replaced by a zero tailpipe emission bus fleet by 2028.
- The remaining 50% of the service bus fleet to be zero emission by 2035.
- To investigate opportunities to reduce the emissions of the less polluting service and school transport buses before their replacement before 2035.
- To review the policy for home to school transport before the autumn of 2022 and bring forward costed plans to replace the balance of the school fleet by 2035.

We will also reform the Bus Services Support Grant (BSSG) to encourage the decarbonisation of the bus fleet and continue to allocate funds, which enable our ambition. In addition, legislative provisions which support the decarbonisation of the bus fleet will be considered.

We estimate that delivery of the 2028 zero emission bus target will result in cumulative carbon savings of 1.32 $MtCO_2e$ between now and 2040. This assumes increased bus miles associated with improved service and additional bus mode share, which will be achieved through actions outlined in the above section on demand reduction and mode shift.

Policy 38 – All taxis and private hire vehicles to be zero emission by 2028

We have committed to deliver a zero tailpipe emission taxi and private hire fleet by 2028. Reducing emissions from taxi and private hire vehicles will contribute to improving air quality in our towns and cities as well as contributing to our carbon budgets.

Welsh Government funding has enabled a ‘try before you buy’ scheme of 50 wheelchair accessible electric taxis, which operate at zero cost to drivers, in the Cardiff City Region, Pembrokeshire and Denbighshire Council.

Building on this and on our support for dedicated rapid charging facilities for electric taxis in the Cardiff City Region, in this carbon budget we will explore the scope to legislate to set new national standards for licensing which will include reference to standards for emissions. We will also develop a complementary lease scheme which will allow drivers with limited access to finance to make the transition. We will also provide financial incentives such as capital grants, loans and support packages such as waiving licence fees and introduce enhanced incentives to increase the uptake of zero-emission wheelchair-accessible vehicles. Finally, we want to install additional rapid charging sites at busy locations, reserved for taxi and private hire vehicle use only.

We estimate that delivery of the 2028 zero emission taxi target will result in cumulative carbon savings of approximately 0.2 $MtCO_2e$ between now and 2031.

Policy 39 – Decarbonise the rail network

A comprehensive programme to introduce new train fleets across the Wales and Borders routes is underway. This will include electric/battery Stadler fleets for the core valley lines services and new diesel fleet which is expected to be in the region of 20% more efficient than the existing fleet.

Utilising Overhead Line Equipment (OLE) presents the most efficient option for rail decarbonisation, enabling the direct transfer of electrical energy to the train rather than by way of storage and/or conversion using alternative technologies, such as battery and hydrogen. Typical estimated efficiencies at current technology levels are 80% for electric traction, 65% for batteries and 25% for hydrogen[59].

In line with rail industry recommendations, a rolling programme of OLE electrification in Wales is recommended to form the backbone of the rail network, supported using alternative technologies where not feasible.

Only a portion of the network is devolved and under Welsh Government control, with the associated uncertainty of future commitments having a significant bearing on how and when Wales' rail decarbonisation may occur.

Under existing arrangements, the commitment to an extensive OLE programme requires partnership with the UK Government and funding to deliver. However, within these constraints we will continue to work with Network Rail and the UK Government to improve rail infrastructure across Wales, including rolling out rail electrification, delivering network improvements and extensions, developing new stations and re-opening stations. Specifically we will progress transformation infrastructure works to provide discontinuous electrification across the Aberdare, Coryton, Merthyr Tydfil, Rhymney and Treherbert railway lines, known as the Core Valley Lines. Upon completion, scheduled for introduction of the timetable in December 2023, approximately 170 kilometres of track will be electrified, with 2,500 overhead line structures installed.

This work with the UK Government will extend to include development of rail as part of the wider solution to congestion on the M4.

In this carbon budget we will commence a rolling stock replacement programme, which will conclude prior to 2030. This will, introduce a range of rolling stock suitable for use on a future decarbonised network, particularly the Core Valley Lines where electrification is already planned, as well as including diesel traction to operate on routes that are not electrified and where alternative fuels do not yet exist.

Finally, we will develop the Global Centre of Rail Excellence. This train, rail infrastructure and technology testing facility, will provide unique capability in the UK and Europe, to support innovation in the UK and the international rail industry, including the testing of cutting-edge, green technologies.

Policy 40 – Zero emission HGVs

The UK Government has published a consultation on ending the sale of all non-zero emission HGVs from 2040, with lighter HGVs from 2035. This is

59 Railway Industry Association "Why Rail Electrification" report, 2021

a significant step, which sets a clear direction for the industry to develop technologies in the 2020s.

It is still not clear which technology will be most suitable for decarbonising long distance HGVs. Trials of three technologies will soon be underway in the UK assessing the feasibility of hydrogen fuel cell, battery electric and overhead catenary systems.

Within our competence, we will support the sector to trial new technologies, using the financial incentives available from the UK Government. We will seek to align trials of new technology with emerging opportunities for the production of clean energy, such as the Holyhead Hydrogen Hub.

Improvements to fuel efficiency in conventional vehicles

Improvements to the efficiency of conventional vehicles will play an important part in the decarbonisation of transport, particularly in sectors where zero emission technologies are still being developed. The introduction of lower carbon fuels can often deliver immediate carbon savings with little or no change required to vehicles or fuel distribution. Petrol with up to 10% bioethanol (E10) will be used as standard petrol from September 2021. Potential negative impacts from land use change and deforestation, genuine carbon savings and residual air quality impacts need to be carefully assessed.

The UK Government supports the use of lower carbon fuels through the Renewable Transport Fuel Obligation (RTFO) and has indicated that the annual obligation on fuel suppliers to supply a certain share of renewable fuels will be increased from 9.6 per cent in 2021 to 14.6 per cent in 2032. It has stressed that the use of low carbon fuels must be targeted at modes with limited zero carbon alternatives.

Individuals can play their part in improving the efficiency of their vehicle by practicing eco-driving (smooth driving, and ensuring correct tyre pressure). We will monitor the effect of the M4 50mph limit on air quality, traffic flow and estimated carbon emissions.

Policy 41 – Reduce emissions from aviation

Emissions from both domestic and a proportion of international aviation are included within Wales' carbon budgets and are calculated through a combination of aircraft movement analysis and fuel bunker sales[60].

The UK Department for Transport projects that demand will increase by 73% between 2018 and 2050[61]. The use of larger and more efficient planes, and a limited uptake of low carbon sustainable aviation fuels will, according to DfT analysis, result in aviation greenhouse gas emissions remaining broadly flat if current trends in technology and demand continue.

60 https://uk-air.defra.gov.uk/assets/documents/reports/cat09/2004231028_ukghgi-90-18_Main_v02-00.pdf
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/ 932122/decarbonising-transport-setting-the-challenge.pdf
https://uk-air.defra.gov.uk/assets/documents/reports/cat09/2004231028_ukghgi-90-18_Main_v02-00.pdf

61 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/ 932122/decarbonising-transport-setting-the-challenge.pdf

Aviation policy is not devolved. The nature of air travel in the UK means that many travellers from Wales use, or have the option to use, airports in England, which has implications for the potential effectiveness of Welsh policies. The UK Government launched a consultation on 'Jet Zero' in 2021 covering a number of potential actions across the areas of fuel efficiency; the development of new zero emission aircraft; accelerating the supply and uptake of sustainable aviation fuels (SAF); modernisation of UK airspace and airports; and the development of verifiable markets to offset residual emissions.

The UK Emissions Trading Scheme is described in Part 2. The Scheme Authority, including the Welsh Government, has committed to reviewing the current scheme to ensure that the cap trajectory is consistent with its ambition for net zero emissions and has pledged to engage with international organisations such as the International Civil Aviation Organisation to improve the environmental ambition of the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). We will engage fully with this work, using our governance role to influence its development in line with our ambitions.

Cardiff Airport remains a wholly-owned subsidiary of the Welsh Government. We will support Cardiff Airport to fulfil its pledge to decarbonise its ground operations and to promote the uptake of sustainable aviation fuels and ultimately zero emission flight technology in Wales.

Policy 42 – Reduce emissions from shipping

Wales' maritime emissions consist of both domestic shipping emissions and a share of international shipping emissions based on the amount of fuel taken from bunkers to support international shipping. Domestic shipping vessels standards are a reserved UK Policy lead but port infrastructure and planning has a strong devolved element.

Emissions from the sector make up 2% of total Welsh emissions, and coastal shipping also accounted for 4.7 kt of NOx in 2018, 9% of all Wales' NOx emissions.

The UK Government's Transport Decarbonisation Plan set out the potential for a phase out date for the sale of new non-zero emission domestic vessels, and support for the wider deployment of shore power.

We will also support projects that deliver sustainable ports infrastructure and ensure work with the Welsh Ports Group and other partners on a Welsh Ports and Maritime Strategy for Wales is aligned to our net zero targets. Looking beyond the scope of this chapter, we will work with ports in Wales to identify opportunities to support the wider decarbonisation of the Welsh economy such as offshore renewable energy generation.

5. Team Wales approach

Both Wales and UK policies and proposals are needed to decarbonise the transport sector. The delivery of the Ambition Statement will require others such as business, public sector, international cooperation and individuals to play their part too. The details of this are captured below, with a summary overview of this Team Wales approach at the end of the chapter. In addition the *Working Together to Reach Net Zero* document accompanying *Net Zero Wales* sets out where our partners have already committed to taking action together with additional case studies to demonstrate the action already taking place across Wales.

The Ask of others

Individuals/households

We will support individuals to make low carbon choices for their transport and mobility needs. Welsh Government will enable and incentivise individuals to reduce transport emissions, but other people need to play their part too.

Individuals and communities are already demonstrating how they are taking action in reducing emissions (see the case study below and the *Working Together to Reach Net Zero* document).

We recognise that not all of these will be relevant or feasible for everyone in Wales, but here are some things people can do to help reduce emissions and improve personal health:

- Replace journeys otherwise taken by car with Active Travel (including e-bikes e-cargo bikes) or Public Transport.
- Replace a fossil fuelled vehicle with an EV or other low-carbon alternative.
- When no alternative to driving, practice eco-driving techniques.
- Reduce the amount of flying.

People who walk or cycle have a lower risk of premature mortality, and walking and cycling reduce the risk of a number of diseases, including cardiovascular disease, respiratory disease, some cancers and Type II diabetes[62]. They also have positive effects on mental health and general wellbeing and can provide very significant cost savings and increase disposable income.

Public sector organisations

Public sector organisations have a key role to play both in reducing emissions under their direct control as well as their role in influencing and enabling wider emissions reductions across society.

All public sector organisations should be working towards Wales' target to have all new cars and light good vehicles in the public sector fleet as ultra-low emission vehicles by 2025 and where practicably possible, all heavy goods are ultra-low emission by 2030.

Local authorities will also be essential to enable delivery of almost all elements of this transport chapter, and will do much of the work to manage allocation of investment (for example in active travel or EV charging) at a local level. Welsh Government will closely with local authorities over the coming months to ensure clarity in roles.

62 Public Health England (2018) Cycling and walking for individual and population health benefits: a rapid evidence review for health and care system decision-makers (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/757756/Cycling_and_walking_for_individual_and_population_health_benefits.pdf)

As Future Generations Commissioner for Wales I will continue to highlight climate change as the key challenge for future generations. In the work that I do, and the way my organisation is run, we are taking action on climate change in a number of ways as set out below. In 2021 we will continue to challenge ourselves on doing better to reduce our organisation's footprint even further:

- *We have signed up to Cardiff's Healthy Travel Charter which includes commitments to support walking, cycling, public transport and ultra-low emission vehicle use.*
- *We encourage staff and visitors to travel by public transport and active travel – over three quarters of my team routinely travel to work by public transport or active travel. We also use walking meetings and promote the benefits through social media.*
- *We monitor travel, waste, electricity, water and gas in line with the UK Government's advice on measuring greenhouse gas emissions, and report on office energy consumption and business mileage annually, and printing quarterly. In 2019-20, car mileage decreased by 52%.*
- *Continue with our 'Anytime Anywhere working' policy which has been in place since 2016. This reduces team need to travel unnecessarily and supports work life balance – it put us in a good position when adapting to home working as a result of the COVID-19 crisis.*

Pledge from Future Generations Commissioner for Wales [63]

Welsh businesses and industry

All Welsh businesses and industry are encouraged to explore how low or zero carbon transport can be incorporated within their business models and we encourage setting of specific targets. A number of the initiatives and polices outlined in the sections above, including e-cargo bike pilots and our 'try before you buy' taxi scheme, are designed to support this.

We encourage all small businesses in Wales to join the UK Government's Together For Our Planet campaign and to access to resources available through the new UK Business Climate Hub.

In addition, the Welsh Government welcomes correspondence from Welsh businesses and industry on specific barriers and challenges faced in decarbonise transport, and where appropriate we will work to help address these.

International engagement

Reducing emissions from international aviation and shipping in particular will require international cooperation through the International Maritime Organisation (IMO) and the International Civil Aviation Authority (ICAO). Wales will look to support the UK Government in these engagements wherever appropriate.

63 For complete pledge see *All Wales Plan*

Transport

Ambition Statement

Three broad areas of mitigation

Demand reduction and modal shift

- **Policy 30 –** Enable people to work at or near to home
- **Policy 31 –** Increase trip mode share of active travel from a current estimated proportion of 27% to 33% by 2030 and at least 35% by 2040
- **Policy 32 –**Increase trip mode share of public transport from a current estimated proportion of 5%1 to 7% by 2030 and 13% by 2040
- **Policy 33 –** Reduce emissions from freight and logistics
- **Policy 34 –** Land use planning

- **Proposal 4 –** A pause and review of existing road proposals and a new methodology for assessing the appropriateness of future road schemes

Uptake of zero emission vehicles

- **Policy 35 –** Accelerate the uptake of zero emission cars and vans
- **Policy 36 –** Plan for and invest in EV Charging infrastructure
- **Policy 37 –** Zero emission bus fleet
- **Policy 38 –** All taxis and private hire vehicles to be zero emission by 2028
- **Policy 39 –** Decarbonise the rail network
- **Policy 40 –** Zero emission HGVs

Fuel Efficiency

- **Policy 41 –** Reduce emissions from aviation
- **Policy 42 –** Reduce emissions from shipping

Team Wales approach – The Ask of others

1. Our Ask of the Welsh Public *(Individuals & Households)*	We ask the public to make conscious choices for their transport and mobility needs, replacing journeys with low carbon, active travel, or public transport where possible and also reduce the amount of flying.
2. Our Ask of the Public Sector	We ask that all public sector organisations work towards Wales' target to have all new cars and light good vehicles in the public sector fleet as ultra-low emission vehicles by 2025 and where practicably possible, all heavy goods are ultra-low emission by 2030.
3. Our Ask of Welsh Business & Industry	We encourage all Welsh businesses and industry to explore how low or zero carbon transport can be incorporated within their business models and we encourage setting of specific targets. We encourage all small businesses in Wales to join the UK Government's Together For Our Planet campaign and to access resources available through the new UK Business Climate Hub.
4. Our Ask of UK Gov *(Call for UK action)*	**We call on UK Government to:** • Provide clarity on the plan and milestones for implementing the ban on new petrol and diesel cars; • Bring forward proposals for ending the sale of all non-zero emission HGVs from 2040, with lighter HGVs from 2035, bringing clarity on how we can support the sector to trial new technologies and utilise the financial incentives from the UK Government; • Commit to work in partnership and provide funding for an extensive Overhead Line Equipment (OLE) programme to enable rail electrification, in line with rail industry recommendations; • Bring forward proposals to drive fuel efficiency, the development of new zero emission aircraft and accelerating the supply and uptake of sustainable aviation fuels (SAF); and • Fully engage with us and other partners to: – Agree to our proposals for a full devolution of rail services and infrastructure and a fair funding settlement to ensure that Wales is able to decarbonise its rail network at a sufficient rate to deliver carbon budgets; – Develop rail services and provide new stations between Cardiff and Severn Tunnel Junction; – Improve rail infrastructure across Wales alongside Network Rail; and, – Develop a new multi-modal Logistics and Freight Plan for Wales.
5. International Engagement	We ask that international cooperation through the International Maritime Organisation (IMO) and the International Civil Aviation Authority (ICAO) is enhanced to ensure global reduction of emissions from international aviation and shipping.

Residential buildings

1. Introduction

Scope

The residential buildings sector covers emissions from energy usage in homes, as well as work to reduce embodied carbon in constructing and retrofitting residential properties[64]. This chapter covers the residential sector (all of Wales' housing including owner occupied, privately and socially rented homes).

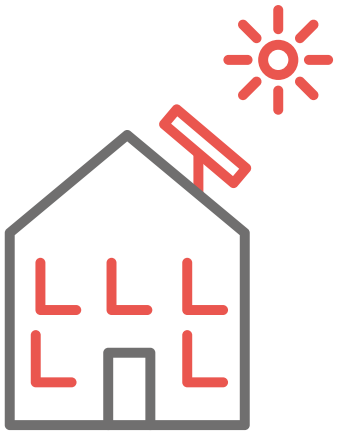
Vision

This chapter sets out the policies and wider actions that will help us ensure that new homes are built low carbon and to the highest standards and help us reduce carbon in the existing housing stock.
To reduce emissions, housing needs to set challenging build and retrofit standards, and **help people live in ways that are good for them now and for future generations**. Our work in this sector will be governed by a set of strategic principles.

- Taking a **test and innovate approach** to whole home decarbonisation;
- Recognising we will learn and iterate as part of our no regrets approach;
- Using the social housing sector to lead the way and set the highest standards;
- **Foundational economy principles** at the heart of everything we do.
- Starting with new build homes in the social housing sector, progress has been rapid in terms of building houses with high energy ratings, delivering affordable warmth using low carbon construction methods and innovations.

Kick-starting this decade of action, we have just set enhanced standards for new build social homes to avoid locking in significant amounts of carbon, but we now need to ensure that all new homes are either low or zero carbon to run, or at a minimum future proofed for ease of later retrofit. Decarbonising our 1.4m existing homes is even more complex, we have some of the oldest housing stock in Europe and cannot repeat the mistakes of the past.

The Innovative Housing Programme (IHP) has invested £155m into building 2,000 innovative, affordable and market homes across Wales. The programme is now being mainstreamed into core housing capital programmes. We will learn from the IHP programme to inform new build policy and practice. In this carbon budget period we will set challenging requirements for all new homes.



64 Note: emissions generated at power stations, even if in response to demand from residential building owners, are captured as part of the 'electricity and heat' chapter.

Affordable homes built using Welsh Government grant funding will be expected to exceed standards set in Building Regulations, leading the way and driving market change.

We acknowledge that retrofitting existing homes is a complex and iterative process, and homes are likely to need to go through several stages of retrofit work to reduce their carbon incrementally, embracing innovation and experimentation over time.

Learning from our Optimised Retrofit Programme (ORP) will inform retrofit. ORP will act as proof of concept for approaches to both fabric and technology retrofit and establish a firm evidence base on which to develop our longer term retrofit strategy. Our principled approach is to target households with the worst thermal and energy efficiency ratings.

Investment of £1.8bn in the Welsh Housing Quality Standard (WHQS) has already significantly improved the quality of social homes across Wales, including raising their energy efficiency rating to a minimum of EPC D. 93% of our 225,000 existing social homes now meet the standard.

Our focus between 2021 and 2025 will be on optimising the thermal and energy efficiency of other existing Welsh homes. In deploying our optimised retrofit model, we will maximise air tightness, eliminate thermal bridging, optimise insulation, solar gain and natural ventilation so reducing heat loss and making homes 'fabric ready'. Individual homes are being assessed with building passports setting out their journey to zero carbon and **retrofitted in a bespoke way** to lower carbon emissions. We will incrementally extend our optimised retrofit approach beyond social homes, to the private rented sector and eventually owner-occupied homes.

We will take a staged approach using the social housing sector and investment in it to lead the way for both new build and retrofit programmes. We will not push households into fuel poverty but rather **lift households out of fuel poverty** focusing on **changing fabric and behaviours** to save people money as well as saving the planet.

Our policy commitments will be supported by **financial investment** in social housing capital grants to build 20,000 new, low carbon social homes over this term of Government, to drive up standards in existing social housing stock and to test and learn approaches to retrofit. Our approach to funding retrofit will be based on partnership and shared responsibility. We will prioritise use of public funds on the most vulnerable and those least able to contribute, **developing ways to support those less able to pay**.

Our investments will act as a significant fiscal stimulus, supporting a green shift amongst the Welsh small and medium business supply chain, helping grow capacity and develop a new skills base. This will support our aspiration to buy more sustainable locally sourced construction materials to improve competitiveness, support the foundational economy, reduce the sectoral carbon footprint and shorten supply lines.

Working together with colleges and business, significant new green jobs and training opportunities will be created within the retrofit supply chain. Our programmes will focus on upskilling people already engaged in current housing retrofit activity, as well attracting new entrants into the green skills arena. Acquiring these skills will accelerate decarbonisation of homes, by providing a competent green skills workforce for Wales. This workforce will have the skills and experience to retrofit not just social homes in Wales, but also those which are

privately owned. We will work collaboratively with partners and stakeholders to ensure the **Skills Action Plan** (Policy 11) adequately reflects our long term needs for both new build and retrofit construction skills and that we maximise opportunities for high quality apprenticeships.

Finally, we will address the need for societal changes seeking to **normalise investment in the decarbonisation** of homes and helping to **change how we live in homes** to maximise the impact of fabric changes.

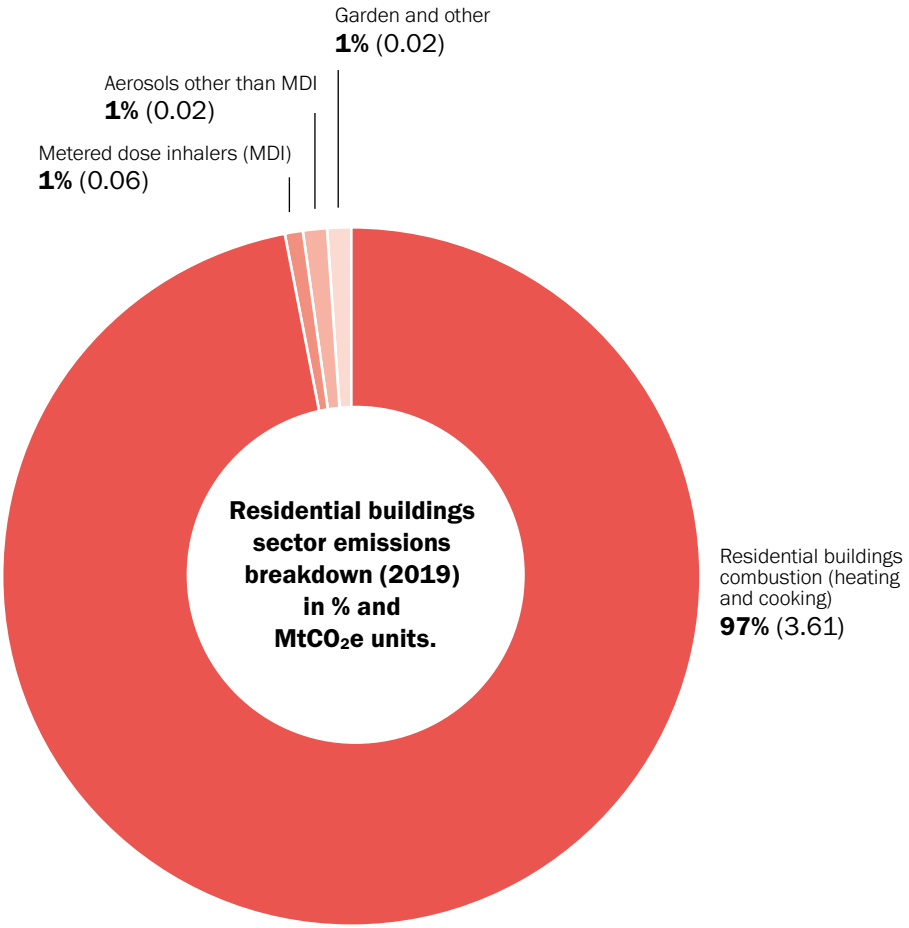
Through the policies set out below we will not only lower carbon from domestic buildings but we will generate **happier, healthier home environments supporting people to thrive and reducing demand on public services**.

2. Emissions

Where the emissions come from

The residential buildings sector covers emissions from direct fuel combustion in homes such as heating, cooking and garden machinery, as well as household products (non-aerosol), aerosols and inhalers. At 3.7 $MtCO_2e$, the Residential Buildings sector accounted for 10% of Welsh emissions in 2019. The dominant source of emissions is from combustion (for heating and cooking) in residential buildings, which make up 97% of the sector emissions and 9.3% of total Welsh emissions. Practically all residential buildings sector emissions (95%) are emissions of carbon dioxide.

Figure 12: Graph – Residential buildings sector emissions in 2019 ($MtCO_2e$)[65]



65 The emissions data is sourced from the Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019 and aligned to the Welsh Government sectoral definition as described in Annex 4. The "Other" part of the legend label "Garden and Other" consists of: household products (non-aerosol), Recreational use of N_2O, and accidental fires.

Table 4: How the biggest emissions sources in the Residential buildings sector contribute to the Welsh total

Source	% of total Welsh emissions
Residential Buildings	9%
Aerosols	0.52%

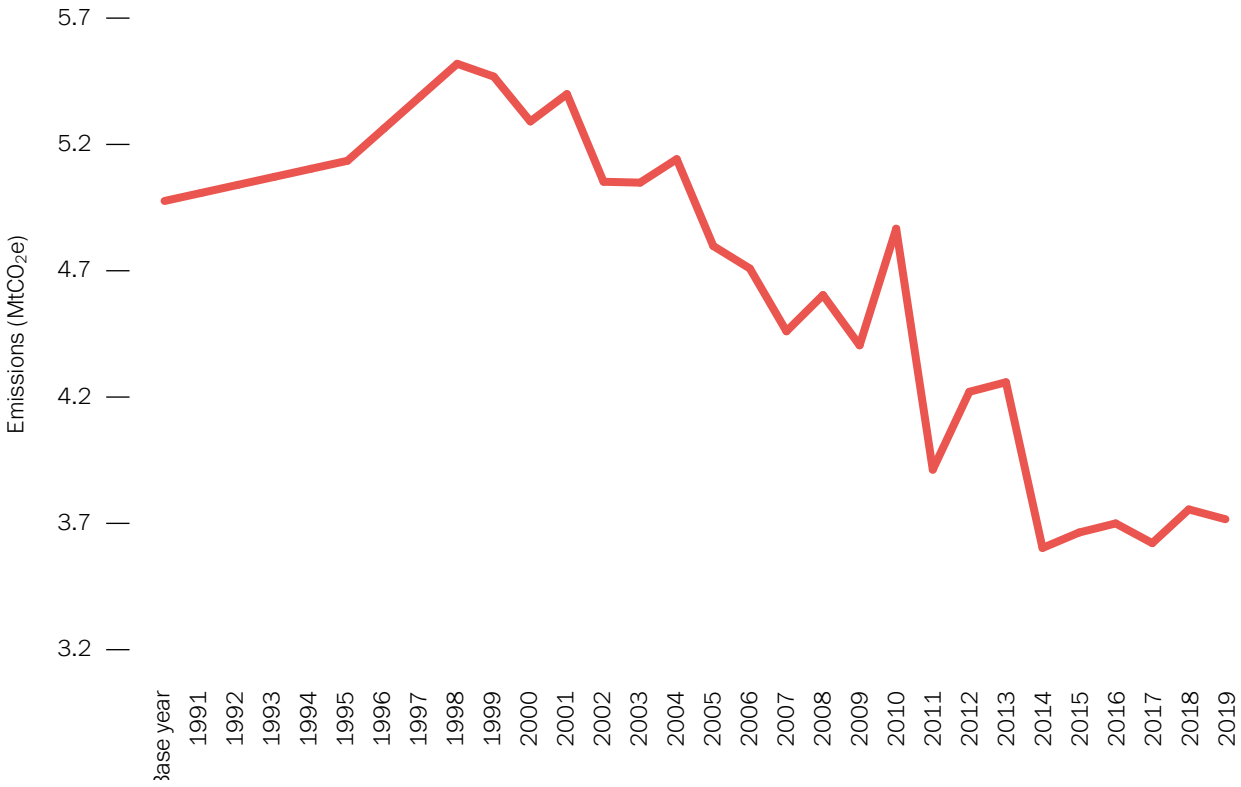
*The Aerosols category includes Aerosols from MDI and Aerosols other than MDI.

Summary of progress to date

Total emissions from the residential buildings sector in Wales have decreased by 25% between the base year (1990) and 2019, driven largely by a change to the fuel mix from coal to natural gas and energy efficiency measures. In 2019, emissions from the Welsh buildings sector decreased by 1% compared to 2018 mainly driven by a reduction of emissions from the residential buildings (heating and cooking). Despite this, emissions from residential buildings only just slightly decreased between 2018 and 2019, specifically by 1%. Within the residential sector, some components have seen more significant emissions reductions.

Our residential buildings sector is strongly influenced by temperatures in Wales and there can be significant year-to-year variability.

Figure 13: A graph to show 1990–2019 historic Welsh emissions for the residential sector



3. Ambition statements

Meeting Carbon Budget 2 and entering onto a pathway for delivering net zero emissions across Wales by 2050 will require mitigation action in three broad areas:

- Energy Efficiency – Setting demanding standards for new build, and existing properties, with the social housing sector leading the way.
- Low Carbon Heat – Phase out fossil fuel heat sources.
- Behavioural shift and demand reduction – Examine how behavioural and societal shifts could lead to reduced demand and the energy efficiency of appliances.

These three broad areas for mitigation align with the levers in our Wales 2050 calculator which we have used to set the Wales 2050 pathway. These inform our ambition statement for the building sector.

Building sector ambition statement

By 2025 we expect around 148,000 houses across Wales receive retrofit measures to reduce heat loss.

By 2025 we aim to move from fossil fuels through increasing the proportion of heat that is electrified by 3%.

By 2025 all new affordable homes in Wales will be built to net zero carbon, and our ambition is that our net zero standards are adopted by developers of all new homes regardless of tenure by this date.

4. Policies and proposals

The policy action in this area focuses on three broad areas of energy efficiency: setting demanding standards for new build, and existing properties; low carbon heat; and behavioural shift and demand reduction.

Improved energy efficiency – improving standards and retrofit

Energy efficiency measures will be crucial to meeting Carbon Budget 2 and our net zero target. Wales has 1.4 million homes of every size and type, including a significant proportion of older buildings. Wales has a slightly higher proportion of solid-wall homes than the UK reference, which means more of our housing stock is more expensive to insulate. Over this budget we will use our levers to drive energy efficiency, however we also call upon the UK Government to provide a supportive regulatory and fiscal environment. The UK Government Heat and Buildings Strategy, over which there has been little engagement with Welsh Government, will be extremely important context for this Plan. The UK Government must also work with us to resolve market distortions between the cost of electricity and gas. We need to protect consumers from poor quality work with a UK-wide legislative framework. The implementation of the Minimum Energy Efficiency Standards (MEES) for the Private Rented Sector needs to be done in a fair and just way and we need to ensure the new Energy Company Obligation (ECO) Scheme 2022 – 2026 supports families in Wales. The scheme is a £4bn GB wide scheme over four years to improve the domestic energy efficiency of lower income households. The focus of the measures is low carbon domestic heating and must be able to work in tandem with Welsh Government programmes rather than creating perverse choices. In Wales, we will increase the energy efficiency of our homes through the following policies.

Retrofit of existing properties

Improvements to the energy efficiency of existing properties will need be delivered through both intensive and incremental retrofit activity, depending on the home.

Many of the technologies we will see widely deployed in the 2030s will take some time to gain market traction. Encouragement for householders and landlords to implement them will depend on technology costs reducing, supportive regulation, new market offerings, the current condition of a home and the financial circumstances of the occupants. Many financial and non-financial barriers need to be overcome including:

1. The point of sale options for consumers;
2. The high cost of heat pump installation;
3. The high cost of electricity compared to gas, which in part is due to market distortions resulting from an unequal application of carbon price and other green levies applied to electricity.
4. Low consumer awareness; and,
5. A trusted supply chain.

Welsh Government financial support for housing retrofit has historically been targeted at those least well off in the hardest to heat homes (EPC D-G). This prioritisation is expected to continue through the 2020s as we seek to leave no-one behind in our transition to a greener Wales. For the better off, we expect the market to provide solutions to enable retrofit of homes. 'Energy as a Service' is likely to play a significant part, implementing energy saving measures, thereby reducing costs of heating the home, with the savings used to pay for the retrofit.

Policy 43 – The Optimised Retrofit Programme (ORP)

The ORP underpins our ongoing development of retrofit policy and practice across all sectors. The ORP seeks to understand the best value combination of fabric, space and water heating improvements for individual properties and set out a route to net zero for each home. This draws on the principles set out in the Better Homes, Better Wales, Better World report[66].

The 'passport' approach reflects the fact homes will generally undergo retrofit interventions on an iterative basis, incrementally moving along the path to net zero.

Ministers launched the Optimised Retrofit Programme (ORP 1) in 2020-21, with £70m to be spent in the following two years. Nearly 2,000 social homes will be surveyed and provided with a bespoke 'home passport' setting out the works needed to make each property energy efficient and install an Intelligent Energy System (IES). The IES produces baseline measurements to allow the impact of energy efficiency works to be assessed over time. This will allow us to test different approaches and will report actual rather than estimated sector reductions in emissions. This reporting gives us a strong evidence base on which to make future investment decisions and to share with partners across the private rented and owner-occupied sectors (more below).

66 Independent review on decarbonising Welsh homes: report (gov.wales) (https://gov.wales/sites/default/files/publications/2019-07/independent-review-on-decarbonising-welsh-homes-report.pdf)

Policy 44 – Welsh Housing Quality Standard (WHQS) – Improving energy efficiency for existing social homes

We will lead the way on retrofit by continuing to improve the fabric of our existing social homes. We will continue to invest £108m per annum as a minimum, to support social landlords in meeting the new WHQS standard. Drawing on evidence from ORP the new WHQS 2022 standard will focus on Fabric First principles and seek to bring all social housing as close as feasible to EPC A or equivalent within a decade.

The new standard will require the achievement of both affordable warmth and decarbonisation of homes, with a target date of 2033. It will also mandate a process and route map for each social landlord to achieve the standard. By 2023 a PAS 2035 survey (the Publicly Available Specification that lays out a consistent assessment for energy retrofit measures) and a clear plan for individual homes will be required.

It is accepted that not all existing homes may be able to reach EPC A, but each home should reach the highest possible rating through bespoke targeted interventions. However, this is an ambitious target, which continues to position WHQS ahead of others in terms of the quality standard expected of existing homes.

Proposal 5 – Supporting Private Rental Sector (PRS) landlords to improve energy efficiency

UK regulations mean that PRS property owners are required to meet Minimum Energy Efficiency Standards (MEES), including a minimum EPC E, before they are legally allowed a let a property (unless a property exemption applies).

The UK Government has completed a consultation on proposals to increase the minimum standard required for any property to be rented in the private rented sector (PRS) to EPC C or above. Current indications are that a formal response, followed by revised regulations will be published toward the end of 2022. According to data from Rent Smart Wales there are currently around 109,000 PRS homes in Wales with an EPC rating below C, and a further 60,000 without any EPC at all. Most landlords in Wales own only one or two properties.

Pending publication of the UK Government's response and intentions regarding future MEES Regulations, we will review the support package available to landlords joining our PRS Leasing Scheme to ensure it also supports fabric first improvements. In seeking to decarbonise PRS stock we must avoid losing stock, which could risk reducing housing options and choice, especially for black, Asian and minority ethnic households and those with lower incomes[67].

67 https://gov.wales/sites/default/files/statistics-and-research/2020-06/coronavirus-covid-19-and-the-black-asian-and-minority-ethnic-population-154.pdf

Following publication of the UK Government's response and Regulatory plans, we will consult on measures to support the PRS to achieve the MEES standards as a minimum in a way that delivers both affordable warmth and decarbonisation of homes. We will also work with Rent Smart Wales to ensure PRS landlords are signposted to high quality advice and guidance on how to approach decarbonisation of their properties to meet regulations and prevent their tenants from falling into fuel poverty.

Proposal 6 – Supporting the owner-occupied sector to improve energy efficiency and shift to low carbon heat

The owner occupier sector is a tenure which is more difficult to influence in terms of standards as it contains the largest number of homes, and a broad demographic. The principal challenges for decarbonising owner-occupied homes are social and financial, but success is vital as, approximately 900,000 homes in Wales in Wales fall into this category. Delivering for this sector will require a paradigm shift, moving from smaller-scale interventions that trial new approaches to a far larger programme for change that ensures interventions are effective and timely.

Decarbonisation of the owner-occupied housing sector cannot be delivered by Welsh Government alone. Success depends on a recognition of the drivers where Welsh Government support can drive or amplify change, and where influencing other actors is more appropriate. Welsh Government action includes direct investment in energy efficiency measures, targeted at those in fuel poverty. The recently published Fuel Poverty Strategy (https://gov.wales/tackling-fuel-poverty-2021-2035-html) sets out the approach to identify those in fuel poverty and focus government support on the 'worst first', tackling the fabric of homes with the lowest energy efficiency ratings. It also describes future action that will positively impact on household carbon emissions in fuel poor homes.

The Warm Homes Programme is our key delivery mechanism in this area. Since 2011, Welsh Government has invested over £394m, benefitting more than 67,000 homes. We will continue to fund the current programme until at least May 2023, delivering improvements to a further 12,000 homes. The Warm Homes Programme continues to have the effect of reducing carbon emissions alongside tackling fuel poverty. The Warm Homes Nest scheme currently reduces carbon emissions by approximately 2 tonnes of CO_2 per year for each home supported. This effort will result in projected carbon savings of over 190,000 tCO_2 in the homes supported over the last two years alone, when projected over the life of the assets installed.

In addition to the installation of measures to improve energy efficiency, we recognise that high-quality advice and information is critical for guiding householders' decisions and helping Welsh citizens to realise their own energy efficiencies. In 2019-20, the Nest scheme provided 15,823 households with free, impartial advice and in September 2020, we introduced an in-home advice and support pilot, which will run until March 2022. This includes supporting people to:

- Get a better energy deal;
- Adopt new technologies such as smart meters;

- Move away from pre-payment meters; and,
- Apply for home energy efficiency measures.

In line with the objectives of the new Fuel Poverty Plan, we will consult on how to build and strengthen the Warm Homes Programme by the end of 2021, aiming to maximise the benefits for both tackling fuel poverty and climate change. The consultation will include questions on both measures and advice, and we will publish the findings in the spring of 2022 before taking the new programme forward from 2023. This will also inform the work on wider public engagement we take over Carbon Budget 2.

Turning to financial drivers, we recognise the cost of transition will be significant. The public sector will lead the way, providing some of the early investment and creating structures to measure and capture success and learning. This will be delivered through the initial phases of the Optimised Retrofit Programme, with social landlords working in partnership with innovators in the sector to establish appropriate, cost-effective interventions which can be scaled up and delivered in owner occupied homes. The creation and maintenance of demand at scale is intended to give investors confidence, to spur innovation and reduce costs and to help to make retrofit more affordable.

Welsh Government recognises the very recent publication of the UK Government's Heat and Buildings Strategy, and is working through the detail. It must enable the change we wish to see, offering financial incentives to enable the transition, helping to stimulate business models which enable everyone to improve the efficiency of their homes, and creating scale to reduce costs. The creation and deployment of funding models that leverage and maximise the impact of investment from all sectors to reduce the cost of financing are needed. We will work with UK Finance, The Development Bank of Wales and sector stakeholders to consider how we can **develop and trial alternative finance products** to support owner occupiers undertaking retrofit works. We will draw on the findings of the recent report from the Future Generations Commissioner for Wales[68] to inform this work.

To further support and enable this shift, we will:

- support and commission further research, building on work already undertaken through the Welsh School of Architecture, the Active Building Centre Research Programme[69] and others. Continuing the Optimised Retrofit Programme, which utilises large-scale field trials to test ideas will enable us to continue to test and iterate;
- work with the Regional Skills Partnerships to explore ways to upskill local actors in places across Wales such as builders' merchants, who are often a household's first port of call for energy efficiency advice;

68 10 Point Plan Summary (futuregenerations.wales) (www.futuregenerations.wales/wp-content/uploads/2019/06/10-Point-Plan-Summary.pdf)

69 Active Building Centre Research Programme – Swansea University (www.swansea.ac.uk/cia/researchgroupsandinitiatives/active-building-centre-research-programme/)

- introduce of a quality framework to drive up and enforce standards that work well for homeowners and for SMEs;
- implement standards for the documentation of retrofit projects to make it easier for investors to invest in large portfolios of residential energy efficiency projects;
- use feedback mechanisms that make a national residential retrofit programme self-correcting and continuously improving;
- working with others, we will support the implementation of the smart metering framework and the development and implementation of the Energy Company Obligation scheme and other UK Government initiatives in relation to Wales.

Proposal 7 – Bringing empty homes back into use and helping owners to start their journey to net zero

Empty homes are not only a wasted resource and a blight on their communities, but given that around c50% of all the carbon a house creates throughout its whole life will have been produced in construction before the first resident moved in then bringing these empty homes back to life (vs building new homes) is in itself, positive.

We have proposed a national roll out of the Valleys Task Force empty homes grant to focus on bringing 5,000 long term empty homes back to life. This would allow applicants a grant of up to £20,000 to improve the fabric of the building. Homes engaged in this programme would be able to access an ORP Building Passport to ensure grant is invested in efficiency measures.

New build homes

Policy 45 – Part L Building Regulations

Part L of the Building Regulations provides guidance on the conservation of fuel and power. It is our primary tool for raising minimum standards for new build housing and conversions.

We have published our response to the 2020 review of Part L for new homes setting out our decision to introduce a 37% reduction (compared with current standards) in carbon emissions for new dwellings from 2022. In the medium to long term, we expect the electricity grid to decarbonise (see Electricity and Heat Chapter) but in the meantime all new homes will also need to be future-proofed, to make it easier to retrofit low carbon heating systems. Improving building fabric and designing heating systems now to operate at lower temperatures, incorporating underfloor heating and/or larger radiators means systems would be ready to retrofit heat pumps in the future as well as providing improved efficiency to condensing boilers today.

We will make further changes to energy efficiency in Building Regulations in 2025 raising the bar to require new homes to produce a minimum of 75% less CO_2 emissions than ones built to current requirements.

Policy 46 - Social homes will lead by example being built to standards in excess of Part L

Social housing in Wales is already built to higher space and insulation standards than those set for market homes. These standards are set out in the Design Quality Requirements (DQR).

We consulted on new, higher DQR standards in 2020 and published the outcome of that consultation in July 2021. We have made a commitment in our PfG and we will build 20,000 low carbon, social homes during this government term. The revised standards will be effective from 1st October 2021 and will drive change beyond the social housing sector.

Welsh Development Quality Requirements 2021 – *Creating Beautiful Homes and Places* will significantly improve energy efficiency in social homes and reduce carbon emissions by requiring higher fabric standards. Further greening of the electricity grid and the use of onsite renewable energy with energy storage and intelligent controls will lead to the net zero carbon homes we are aiming for.

It will require housing providers to adopt best practice and encourages whole life carbon assessment and post occupancy evaluation of the homes' performance. Our goal is for the same standards to be applicable to all new homes from 2025, as recommended by the Independent Review of Affordable Housing Supply (2019).

The new standards specifically require new builds to[70]:

- Achieve EPC A (SAP92 or greater) through adopting a fabric first approach.
- Use non- fossil fuel fired boilers to provide domestic hot water and space heating.

Wider benefits of this change include:

- Growing green skills required to support a green recovery and new business opportunities for Welsh SMEs moving to a circular economy.
- Supporting more remote working through a requirement for broadband in new schemes.
- Strengthening funding terms and conditions for capital programmes to include specific environmental factors to mitigate climate change.

We will closely monitor the impact and in 2023, will review the energy efficiency and net zero carbon requirements to ensure they remain relevant.

Policy 47 – Developing innovative construction techniques and increasing the use of sustainable materials

While Part L sets the standard for what needs to be achieved in the construction of new build homes, we have also invested £145m in the Innovative Housing Programme (IHP) over the last four years to work out how to best meet these standards. We are now mainstreaming the lessons learned in our affordable housing capital programmes to ensure the best practice we have identified becomes the default way we build future homes going forward.

70 Alternative proposals will be acceptable where it can be demonstrated by suitable energy modelling that the building's energy demand is reduced in accordance with the Energy Hierarchy for Planning in Welsh Government's Planning Policy Wales. This supports Passiv Haus approaches.

We published our Modern Methods of Construction (MMC) strategy *'Re-imagining social house building in Wales – A Modern Method of Construction Strategy for Wales'*, in February 2020. It encourages social housing providers to re-examine the construction of new social housing and consider complementing traditional construction methods with new technologies and approaches to house building. Over 700 homes are now in production with Welsh based MMC producers, following £55m investment in MMC via IHP. We will increase the proportion of homes built by social landlords using MMC, by incorporating it into our funding models and by promoting MMC as a preferred approach to low carbon building.

Policy 48 – Incentivising energy efficiency of homes through our Help to Buy Wales (HtBW)

HtBW allows eligible purchasers to buy new-build homes with assistance from Welsh Government in the form of a shared equity loan. These homes must meet any terms and conditions set by the Welsh Government and so offer an opportunity to drive up standards and promote best practice in the wider housing market. This is important because homes purchased using an HtBW loan are market homes; they are not specifically developed for the scheme. This means builders will need to ensure all market homes meet new standards.

The current phase of HtBW runs to 2023 and homes offered through the scheme must already meet higher standards for space, carbon and connectivity than set by Building Regulations. When the current phase of HtBW was announced, the then Minister for Housing and Local Government signalled that should the scheme continue beyond 2023, homes will be required to be compliant with the new WDQR.

Proposal 8 – Water efficiency and water labelling

Around 6% of UK carbon emissions arise from hot water use, with 89% arising from heating water in homes. Using more water efficient products such as showers and dishwashers in our homes, we not only save water but will also reduce energy use, reduce our carbon emissions and energy bills.

The Welsh Government commissioned the Energy Saving Trust to undertake a cost-benefit analysis for Wales, exploring the different options for improving the labelling of water fittings and appliances. This assessment concluded that a government-led mandatory fitting and water fitting appliance label scheme, linked to minimum standards for new build properties, was the most effective and cost-effective option.

A mandatory water labelling scheme linked to minimum fittings standards was introduced in Australia in 2005. A similar scheme in Wales could reduce emissions by 3.07 $MtCO_2e$ over 25 years.

We will work with the UK Government to explore the options of developing a mandatory fitting and water fitting and appliance label scheme.

Low carbon heat

In future buildings are increasingly expected to be heated using electricity rather than gas and oil, for example by heat pumps. This transition depends on:

- Significantly increasing renewable energy generation.
- Future decarbonisation of the power network. Marginal supply, required during peak demand for power, is largely supplied by fossil fuelled power generators. Whilst heat pumps powered from electricity are currently lower carbon to operate than a high performing gas boiler, this advantage only becomes substantial when the marginal supply is decarbonised. The UK Government has a responsibility to Wales to deliver this transition.
- Ensuring supply chains in Wales and elsewhere are primed and scaled for delivery.
- Building a skills base in Wales to support the transition.

In moving to low carbon heat we need to ensure we transition in a fair and just way as electric heating is currently more expensive than gas. This is discussed elsewhere in this chapter.

Much of the work to address low carbon heat builds on the previous sections in this chapter. For example, the next iteration of the Warm Homes programme, will have low carbon heat as a key element of its scope. Our new build standards for social homes cover both energy efficiency and phasing out fossil fuelled heat by 2025. Our policies on generating and supplying heat to communities are outlined in the Electricity and Heat chapter.

Decarbonising heat requires urgent action from the UK Government to provide clarity on the steps it will take to ensure rapid gas grid decarbonisation including the details behind the recently published Heat and Buildings Strategy. UK Government investment must support innovation and research.

Further to the above measures we supporting innovation activity in low carbon heat through:

Policy 49 – Piloting smart, flexible and digitalised systems to [maximise use of assets] and help reduce demand

The Welsh Government's Smart Living (SL) initiative continues to provide early support to develop place-based and innovative solutions to supply flexible, digital development pathways across Wales. It aims to make life more efficient, more controllable, economically productive, integrated and sustainable by using smart technologies to reduce demand for energy and associated greenhouse gas emissions for low carbon heat.

The Smart Living clean and green energy developments start from a place-based and needs-led basis. The initiative works in partnership "bottom-up" with local authorities and other key stakeholders to define innovative solutions using a whole system concept. It designs support and introduces new services and solutions for local communities before they are available and affordable from the commercial market.

Sixteen local authority areas have benefited from different elements of the Smart Living programme, which in total has covered 21 different types of innovative development.

Case Study – Smart Living

Public sector chapter – Smart Living Whole System Business Research Innovation for Decarbonisation (WBRID)

Smart Living is supporting Welsh Local Authorities to issue challenges to businesses with innovative products, processes and services. The aim is to help communities and the public sector adapt to the challenge of net zero developments and integrate different energy sources and sectors on a whole system basis.

The WBRID scheme, is in its phase 2 demonstrator phase, applying the tested principles of Small Business Research Initiative schemes. The WBRID Challenges will run until the late spring of 2022. Benefits include reduced carbon emissions, energy savings and business economic support with the testing of new technology, products, systems and processes.

Smart Living is supporting the Blaenau Gwent County Borough Council's WBRID challenge for developing Smart Industrial and Commercial Energy Platform Model Solutions to achieve net zero outcomes. Working with two suppliers, Blaenau Gwent will focus on whole system development of a publicly owned demonstrator business park to maximise effective use of energy efficiency, generation, use, storage and distribution. IBECCS will use smart gateways energy management, combined with a top-down whole systems approach to empower council tenants with hybrid heating systems providing a cost-effective fast path to decarbonisation and future-ready for the onset of gas alternatives. Their heating solution includes an innovative algorithm to switch between a bolier and a heat pump based on cost, carbon and electricity network constraints. This hybrid heating system will also work with hydrogen and bio methane, aligned to emerging energy resources in Wales. Stortera will demo in parallel at the same site a combination of lithium ferrous phosphate battery technology at scale to supply electric heating, linking to solar PV and an intelligent control system for a whole system solution.

In Carbon Budget 2 we will continue to support the innovation programme, sharing lessons across all housing tenures in collaboration with ORP to drive widespread decarbonisation of heat in Wales.

Behaviour change

There are several ways households can reduce emissions by behaving differently. These include interventions such as pre-heating (ahead of peak times, assuming homes are sufficiently insulated and have smart meters), turning off lights when not in use, take up of smart meters to encourage smarter use of heating and management[71] and choosing more energy efficiency appliances. In driving forward behaviour change, consumers need options to choose energy efficiency products and appliances. More efficient products reduce demand for power, reducing costs to consumers in bills. Responsibility for the efficiency of products rests with the UK Government, who published their policy framework for energy-related products in September 2021. The policy framework resulted from our departure from the EU, with the UK no

71 Smart meters and real time displays have been found to result in energy savings of around 3%.

longer subject to EU product standards set through the Ecodesign and Energy Labelling framework. Welsh Government is still assessing the policy framework.

Building on the behaviour change actions discussed elsewhere in this chapter, including the Nest advice services pilot and using local suppliers and builders merchants as conduits for good advice. We will:

Policy 50 – Develop behaviour change interventions alongside our wider programmes

We have developed a £1.2m Innovative Housing Programme monitoring and evaluation programme, run independently and using a consortia of 10 leading UK universities. As well as evaluating building performance including energy efficiency and low carbon measures, the tenants lived experience will be explored. This will help increase understanding of how residents have adapted to living in new ways to live comfortably and affordability, whilst reducing emissions.

We will continue to invest in specific behaviour change research relating to low carbon living. We will invest £350,000 with University College London over the next 2 years to understand pull and push factors to win hearts and minds about having low carbon measures installed in homes. We will look to secure a further £600,000 to examine how residents with heat pumps can benefit from low carbon energy. Funding will be sought with private organisations with the purpose of designing new consumer energy tariffs that mitigate fuel poverty when customers switch from gas to electric heating.

We will increase investment nationally in the Energy Wardens Scheme being trialled by a collaboration of North Wales social landlords. Energy wardens work directly with residents to help them understand their energy system and train them how to operate it optimally. This is reducing fuel bills and carbon emissions on a home by home basis.

Once the scheme is formally evaluated in 2022, positive outcomes and learning will underpin a national model for roll out across Wales.

This work will inform our Public Engagement Strategy. Look at our Working with People Section and the Team Wales approach below for more detail.

5. Team Wales approach

We need everyone to play their part in decarbonising the residential building sector. This includes the UK Government in areas where key powers remain reserved, the public sector, business and individuals. Collective action is needed to decarbonise across the three broad areas of the buildings Ambition Statement and while the detail is set out below, the Team Wales approach is also summarised at the end of this chapter. In addition the *Working Together to Reach Net Zero document* accompanying Net Zero Wales sets out where our partners have committed action through their Pledges, alongside additional case studies to demonstrate the action already taking place across Wales.

The Ask of Others

Individuals/households

We will support individuals to decarbonise their homes in the way that works best for them. By incentivising and enabling the social housing sector to lead the way in decarbonisation of homes, the Welsh Government will develop a clear framework of “no regrets” interventions that will enable landlords in the private rented sector, and owner occupiers, to retrofit their properties successfully. Clearly articulated standards for existing and for new build affordable homes will ensure that in future residents have access to low carbon homes as a matter of course.

Retrofitting a home is a significant undertaking, requiring financial outlay and, in many cases, intrusive building work, but undertaking effective retrofit, or buying/living in a low carbon home, brings many benefits to individuals and communities, including:

- reducing fuel poverty;
- creating sustainable growth of jobs, training schemes and supply chains particularly in local communities;
- promoting good health and well-being for everyone; and,
- building more cohesive communities with better environments.

For more information on our approach to engaging with society see Part 2.

Well-being Goal Spotlight – A More Equal Wales

In 2021 under the Innovative Housing Programme Optimised Retrofit Programme we funded a collaboration of four housing associations –United Welsh, Tai Calon, Linc Cymru and Melin Homes – working in partnership with Cynnal Cymru and the Electoral Reform Society to hold a Citizens Assembly. The Assembly brought 50 citizens together to discuss the question:

What should we do in Blaenau Gwent to tackle the climate crisis in a way that is fair and improves living standards for everyone?

The recommendations from the Citizens Assembly will be used to shape the retrofit, decarbonisation and adaption plans for Communities – to fit with people's lives and aspirations. Recommendations will also inform wellbeing plans and Public Service Board priorities.

Public sector organisations

Public sector organisations have a key role to play both in reducing emissions under their direct control as well as their role in influencing and enabling wider emissions reductions across society.

Stock holding local authorities (those who have social housing) will play a key role in delivery of a number of the policies in this chapter, including ensuring their properties meet the Welsh Housing Quality Standards requirements on low carbon (when these are introduced in 2022), that their new build affordable housing meets Welsh Development Quality Requirements from 1st October 2021, and through their engagement with the Optimised Retrofit Programme to retrofit their housing stock.

Local authorities also have a role to play as exemplars, championing the decarbonisation of housing and making the case for change. By advocating the benefits of decarbonisation, they can support the behavioural and cultural changes needed to make our ambitions into reality.

Welsh businesses and industry

Welsh businesses are integral to the successful implementation of all the policies in this chapter, and provide a key delivery vehicle for many of them. The decarbonisation of Welsh homes also offers opportunities for businesses, especially SMEs, in Wales, as well as the potential to boost economic growth. Programmes like Optimised Retrofit and Innovative Housing are designed to be both easily expandable and sustainable to ensure they build sufficient knowledge and Welsh expertise to configure a larger roll-out and help meet our 2050 decarbonisation targets.

We pledge to have consent for 1,000 true zero carbon homes that actively help a renewable energy grid by 2022.

Sero

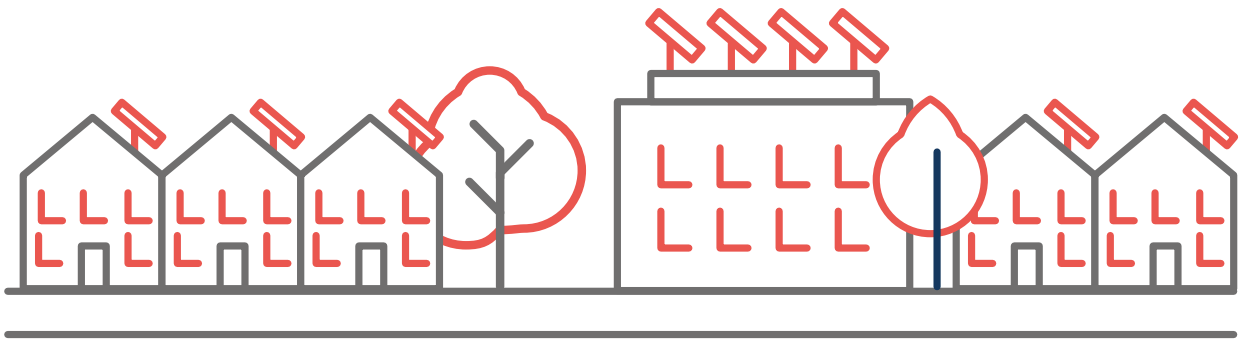
While the Welsh Government can demonstrate a pipeline of demand for the skills and supplies needed to decarbonise housing, Welsh businesses and industry will need to be proactive in stepping up to fill these gaps, generating the momentum needed to keep decarbonisation of Welsh homes on track. Without active engagement from businesses (training apprentices, being vocal about the demand for new training where none exists, upskilling themselves and become advocates for decarbonisation) and from industry (exploring and seizing opportunities to manufacture the supplies needed to decarbonise Welsh homes) our objectives will not be achieved.

The opportunity for 'smart' (i.e local where possible) procurement will enable the delivery of wider benefits embedded in local communities and businesses, creating local wealth, providing supply security and also minimising our carbon footprint by reducing the impact of transportation of goods and services, but achieving this relies on proactive engagement from businesses and industry.

Ask of the UK Government

Government has a key role to play in helping achieve net zero in Wales. Our asks are as follows:

- Take into account Wales' unique needs and specific context when setting policy, which applies across the whole of UK, and work with the Welsh Government to help support analysis on the impact of UK Government decarbonisation policy on Wales.
- Publish the Heat and Buildings Strategy and fully engage Welsh Government on next steps.
- UK Government to take the lead in shaping policy to overcome the barriers to decarbonisation of homes including the cost of technology, consumer awareness/ behaviour change.
- Take action to address the market distortion resulting from an unequal application of carbon price and other green levers applied to electricity.
- Establish a supportive regulatory and fiscal environment – levers include MEESs and mandatory disclosure requirements for lenders on energy performance of homes.
- Ensure ECO works with our investment programmes.



Residential Buildings

Ambition Statement

Three broad areas of mitigation

Energy Efficiency

- **Policy 43 –** The Optimised Retrofit Programme (ORP)
- **Policy 44 –** Welsh Housing Quality Standard (WHQS) – Improving energy efficiency for existing social homes
- **Policy 45 –** Part L Building Regulations
- **Policy 46 -** Social homes will lead by example being built to standards in excess of Part L
- **Policy 47 –** Developing innovative construction techniques and increasing the use of sustainable materials
- **Policy 48 –** Incentivising energy efficiency of homes through our Help to Buy Wales (HtBW)

- **Propsal 5 –** Supporting Private Rental Sector (PRS) landlords to improve energy efficiency
- **Proposal 6 –** Supporting the owner-occupied sector to improve energy efficiency and shift to low carbon heat
- **Proposal 7 –** Bringing empty homes back into use and helping owners to start their journey to net zero
- **Proposal 8 -** Water Efficiency and Water Labelling

Low Carbon Heat

- **Policy 49 –** Piloting smart flexible and digitalised systems to [maximise use of assets] and help reduce demand

Behavioural Shift and demand Reduction

- **Policy 50 –** Develop behaviour change interventions alongside our wider programmes

Team Wales approach – The Ask of others

1. Our Ask of the Welsh Public *(Individuals & Households)*	We ask the public to consider ways in which they can retrofit and decarbonise their homes.
2. Our Ask of the Public Sector	We ask that stock holding local authorities (those who have social housing) ensure that their properties meet the Welsh Housing Quality Standards requirements on low carbon (when these are introduced in 2022), that their new build affordable housing meets Welsh Development Quality Requirements from 1st October 2021, and through their engagement with the Optimised Retrofit Programme to retrofit their housing stock.
3. Our Ask of Welsh Business & Industry	We encourage businesses & industry in Wales to recognise the future demand for skills and supplies needed to decarbonise housing. We require businesses to be vocal about the demand for new training, especially where none currently exists, ensuring they are proactively upskilling themselves and become advocates for decarbonisation. Equally, Industry need to explore and seize opportunities to manufacture the supplies needed to decarbonise Welsh homes and meet future demand.
4. Our Ask of UK Gov *(Call for UK action)*	We call on UK Government to: • Take into account Wales' unique needs and specific context when setting policy, which applies across the whole of UK, and work with the Welsh Government to help support analysis on the impact of UK Government decarbonisation policy on Wales. • Fully engage with Welsh Government on the next steps for the Heat and Buildings Strategy. • UK Government to take the lead in shaping policy to overcome the barriers to decarbonisation of homes including the cost of technology, consumer awareness/behaviour change. • Take action to address the market distortion resulting from an unequal application of carbon price and other green levers applied to electricity. • Establish a supportive regulatory and fiscal environment – levers include MEESs and mandatory disclosure requirements for lenders on energy performance of homes. • Ensure ECO works with our investment programmes.

Industry and business

1. Introduction

Scope

The industry and business sector includes manufacturing, construction, operation of machinery, food processing and the extraction and production of fossil fuels. The Sector also covers emissions arising from industrial and commercial buildings.

Vision

The CCC has been clear that Wales has the ability to achieve its net zero ambitions by 2050 if everyone plays their part in the process. The policies we put in place now must reflect the urgency of the situation, help shape the nation and drive the pace of change across all aspects of life in Wales in a decade of action. How we achieve the change will define its fairness and the economic sustainability of industry and business in Wales. **Our approach will sustain existing jobs and create new employment opportunities and ways of working, leaving no-one behind**.

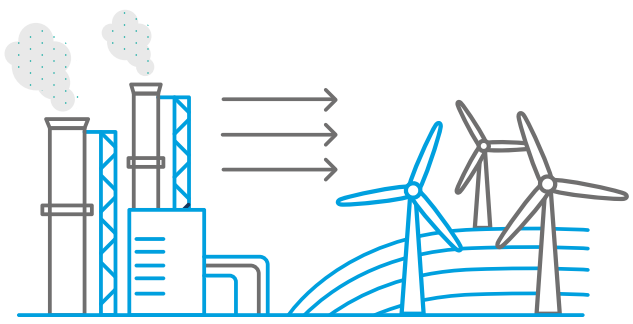
Our industrial sector faces decarbonisation challenges, which require long-term targeted **and symbiotic action to ensure their international competitiveness**, including fuel switching, carbon capture and storage or other new technology solutions and raw material substitution with waste streams from other industries requiring less energy to process. This approach will have a **strong focus on place**.

The 2020s will be the period where substantial resource efficiency improvements are made and we develop and scale up new options for industrial decarbonisation such as carbon capture and storage, low-carbon hydrogen and engineered emissions removals. This period will also enable us to understand the costs, supply chain implications and where costs fall. Flexibility will be required as appropriate decarbonisation pathways for regions and industrial sectors are developed.

The scaling up of new options for industrial decarbonisation will then have a transformative impact on emissions from the end of the current decade and through the 2030s.

This transition will need to be supported by progress in:

- **collaboration** through, for example, industrial clusters;
- a robust **carbon pricing** approach;
- **a comprehensive circular economy policy approach**;
- **a decarbonised energy network** with enhanced grid infrastructure; and,
- access to UK-wide funding for the implementation of decarbonisation plans.



Where Welsh Government's powers and levers related to newer and uncertain technologies such as Carbon Capture Utilisation & Storage (CCUS) and hydrogen are limited, **we will work together with stakeholders in Wales, with the UK Government and wider partners**. We will also encourage and engage across government on the development of strategic policies, to ensure market pull for low carbon products and protect our industry from carbon leakage.

Beyond heavy industry, Wales' business community, including SMEs, will also need to incorporate energy efficiency, resource efficiency and new low carbon technologies into their work spaces and manufacturing facilities and develop new ways of working. This is alongside the need for a fair transition and ensuring that employees have the skills that enable all generations to benefit and contribute to this transition.

In the period of 2021-25, we will review a number of our key interventions with business such as Business Wales to ensure climate change aspirations are embedded at the heart of our operations. We will build on many of our strong academic initiatives and clusters to achieve a cohesive approach within regions and between our academic and business sectors to ensure that we maximise the opportunities for our communities.

As described in Part 2 of this plan, we have identified a **Just Transition as a Priority Area for Action**. We know delaying climate action risks affecting business competitiveness as other nations support their businesses to develop the products and services of the future. However, this transition also brings risks as existing products and services are adapted or replaced. **We will embed the concept of a Just Transition in our Social Partnership** approach. We will bring together government, trade unions and employers, to identify areas of opportunity and risk with the aim of integrating fairness across all levels of governance and decision making and supporting our businesses in the transition to a clean future.

Over the period of Carbon Budget 2 we will work closely with our key partners including the Wales TUC to improve our understanding of the distributional impacts of our net zero pathway on business and wider society. We want to use this knowledge to target further action in areas such as skills, which will underpin Wales' decarbonisation ambitions. The challenge to government and employers alike is **to upskill and expand the existing workforce in green sectors**. We will therefore optimise existing programmes, adapting training provision and increase delivery in areas leading to low carbon employment. The Skills Strategy described in Part 2 will be an important step in unlocking this challenge.

Building on our **Foundational Economy** programme and the Manufacturing Action Plan, we will continue to find ways to redirect the flow of public procurement expenditure where it currently leaks outside of Wales, retaining value for greater prosperity.

Our approach will also be informed by a need to recover from the economic damage of the pandemic set out in our *Economic Resilience and Reconstruction Mission*[72], a response to the challenges faced by business following our departure from the EU and building on the foundations of *Prosperity for All: The economic action plan* (EAP)[73]. These factors have shaped an

72 Economic resilience and reconstruction mission | GOV.WALES (https://gov.wales/economic-resilience-and-reconstruction-mission)
73 Prosperity for All: economic action plan | GOV.WALES (https://gov.wales/prosperity-all-economic-action-plan)

economic development programme, which invests in people and businesses and drives prosperity whilst reducing inequality across Wales and tackling the major environmental challenges we face.

2. Emissions

Where the emissions come from

At 14.83 $MtCO_2e$ the industry and business sector accounted for 38% of Welsh emissions in 2019. Industrial emissions in Wales are dominated by iron and steel production and petroleum refining.

Wider industry including manufacturing and construction, solid fuel production, cement, gas production and distribution, operation of machinery, minerals and mines, chemical production, the processing and manufacture of food and drink as well as paper and pulp also account for a significant proportion of emissions. Industrial emissions are largely comprised of emissions of carbon dioxide (93%), with smaller amounts of methane (3.31%) and nitrous oxide (0.44%).

37% of emissions from the industry and business sector come from the iron and steel industry followed by petroleum refining (15%).

Figure 14: Graph to show industry and business sector emissions in 2019 ($MtCO_2e$)

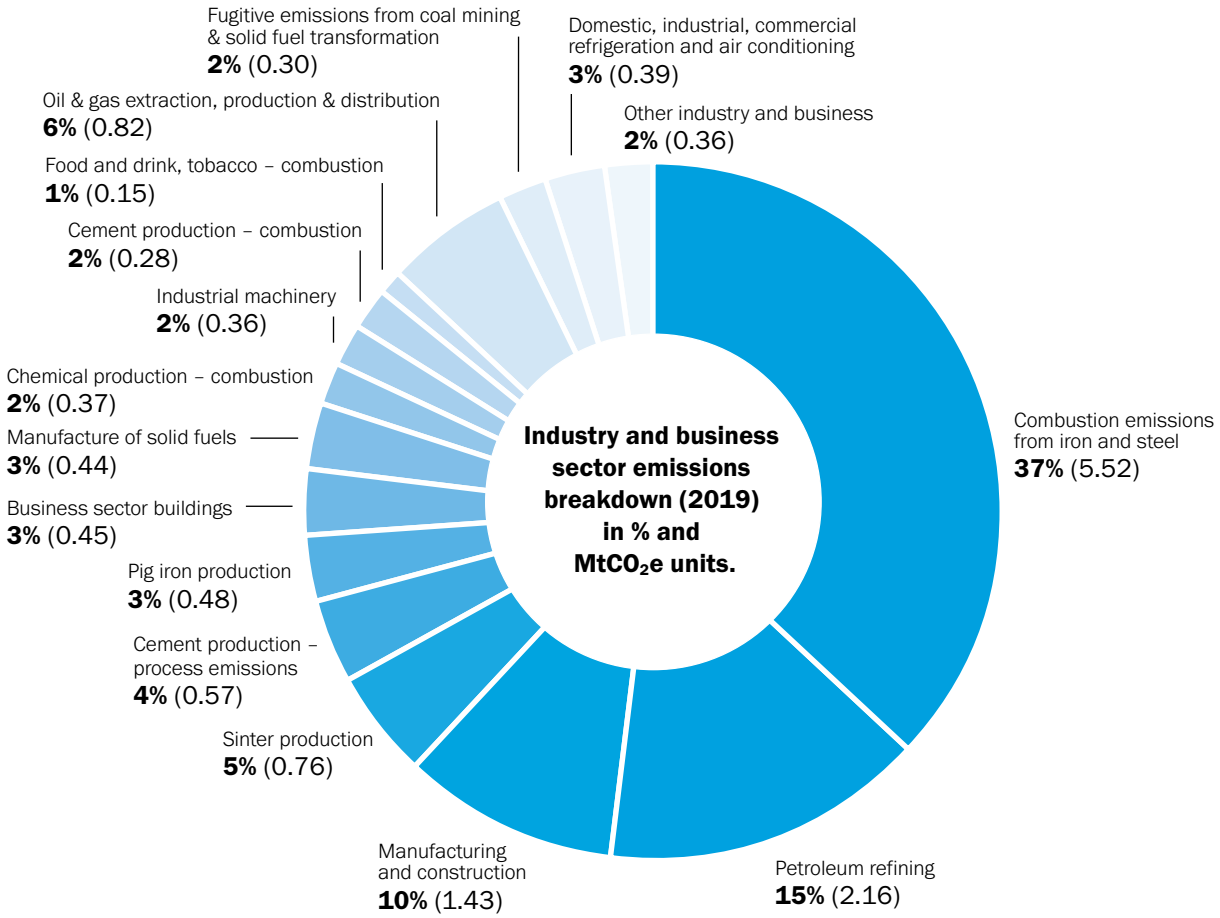


Table 5: How the biggest emissions sources in the industry sector contribute to the Welsh total

Source	% of total Welsh emissions
Iron and Steel Industry	37%
Petroleum Refining	15%
Manufacturing and Construction	10%

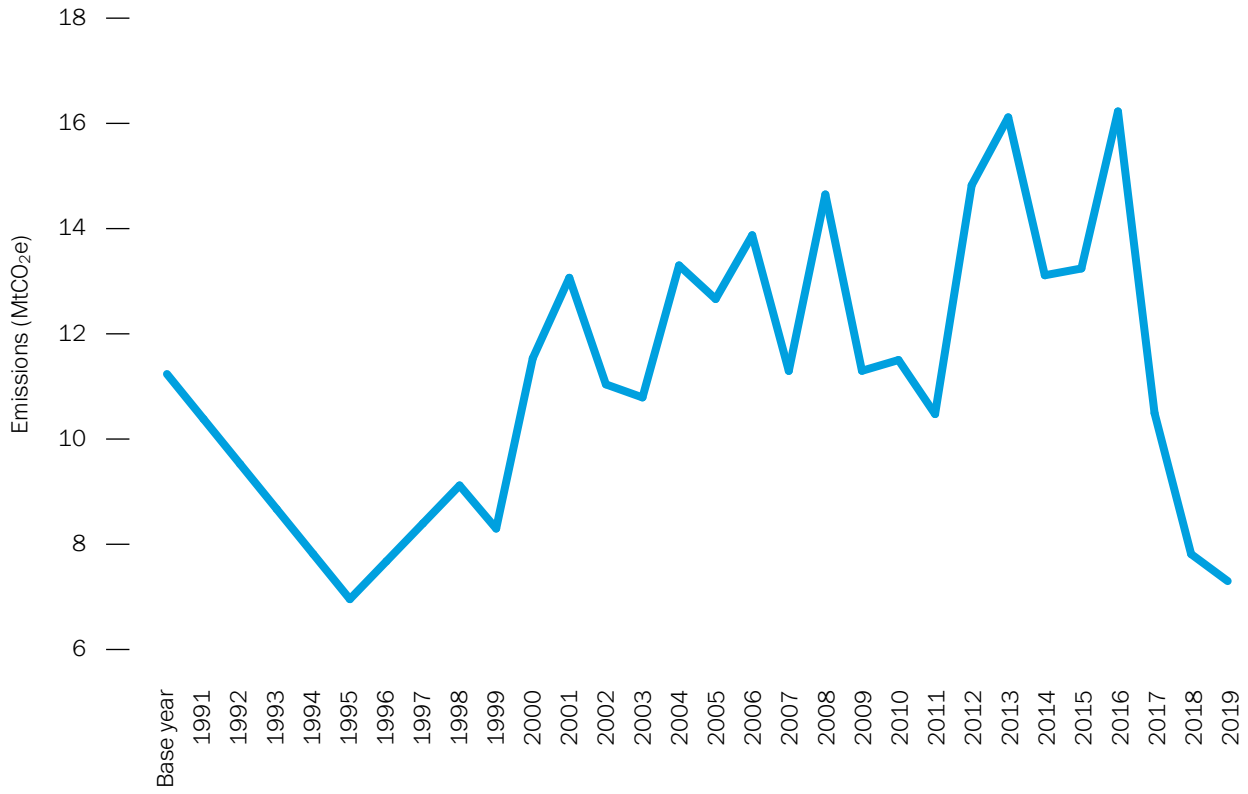
Summary of progress to date

Total emissions from the industry and business sector in Wales have decreased by 36% between the base year (1990) and 2019, driven largely operational changes, fuel-switching to less carbon intensive fuels and improvements in efficiency of production.

In 2019, emissions from the Welsh industry and business sector saw a 5% increase compared to 2018 driven by a significant increase in emissions from the iron and steel sector. Our industry sector is strongly influenced by variation in outputs at individual sites located in Wales and within the overall declining trend in emissions there can be significant year-to-year variability.

A progress report setting out more detail alongside the actions taken so far will be published in 2022.

Figure 15: A graph to show 1990-2019 historic Welsh emissions for the industry and business sector



3. Ambition statement

Meeting Carbon Budget 2 and entering onto a pathway for delivering net zero emissions across for Wales by 2050 will require mitigation action in four broad areas:

- Resource and energy efficiency – product replacement, material substitution, waste reduction, energy efficiency – equipment, heat recovery, clustering;
- Fuel switching – the change to low carbon fuels including hydrogen;
- Carbon capture storage/utilisation and storage– carbon capture and storage (CCS), bioenergy with carbon capture and storage (BECCS), and hydrogen plants; and
- Commercial buildings – increase efficiency of our commercial buildings stock.

These broad areas for mitigation align with the levers in our Wales 2050 calculator, which we have used to set the Wales 2050 pathway. These inform our ambition statement for the industry and business sector.

Industry and Business sector ambition statement

By 2025 we expect to see a decrease in energy usage in industry of 4% as a result of energy efficiencies whilst building a well-being economy.

By 2025 we want to see an increase in electrification in industrial processes by an average of 3%; and grow hydrogen as a fuel by an average of 3%. In addition, over CB2 the primary foundations for further industrial transformation will be laid through our UK ETS policies and we expect UK Government's net zero Industrial Strategy to enable increased electrification, fuel switching and CCS from the 2030s.

4. Policies and proposals

Overview

The following policies and proposals are set out under the broad mitigation areas of **resource efficiency, fuel switching, carbon capture utilisation and storage (CCUS)** and **commercial buildings**. Additional sections on evidence and finance **are relevant to all these broad mitigation areas**.

The Ask of the UK Government

The CCC's Wales Progress Report reinforced that, whilst some of the levers are devolved, a coherent and comprehensive UK industrial strategy will be necessary to ensure that Wales' industry and business sector is able to play its full role in our net zero ambition.

The UK Government will play a crucial role in reducing industrial emissions in Wales given the powers and levers it holds. There are a number of areas where we need to see further action or clarity from the UK Government in Wales.

Long-term and consistent policy

Many of our key sectors face complex and deep decarbonisation challenges. Without long-term clarity on policy and funding, international headquarters are reluctant to commit investment in emerging technologies.

The Welsh Government calls on the UK Government to ensure that businesses and industries based in Wales continue to be eligible for any future Climate Change Agreement scheme beyond March 2025.

Support for innovation at the right scale

We need to see increased funding of key programmes, including the Industrial Energy Transformation Fund and the Clean Steel Fund, to enable new technologies and fuel switching to be adopted.

As described in Part 2 of this plan (Policy 10 – Carbon Pricing), the UK ETS is policy of all four UK Governments. With a carbon price of greater than £40 per tonne being realised in the UK ETS since its inception, revenues of over £0.5bn are being generated monthly for HM Treasury in auctions. Due to the industrial strength of the Welsh economy, Welsh participants in the power and industrial sectors are bearing a greater per capita proportion of this cost than any of the other UK Nations. Distribution of these revenues is the responsibility of the UK Government. The power and industrial sector in Wales needs transparency on how funding streams, including the use of UK ETS revenues will be made available by the UK Government to enable decarbonisation and move the Welsh power and industrial sectors beyond simply paying the carbon price. Welsh participants need to be assured support will be available to all sectors in every region if we are to strengthen the UK industrial base by decarbonising the goods they produce. The ability of industry to switch to lower carbon fuels will be dependent upon affordable alternative fuels. Currently the alternatives to natural gas are significantly more expensive. The current high electricity prices in the UK also act as a barrier to switching to electricity. The UK Government must develop a solution to this issue which does not result in the operating environment in the UK being significantly uncompetitive.

We also need to work with the UK Government to develop symbiotic and circular economy approaches in industry, their current and future supply chains and in the communities which host industrial operations. A hydrogen economy and utilisation of waste streams can be stimulated by creating supply and demand incentives until full commercialisation is achieved. The design and delivery of a CCUS shipping and transportation business model will enable competitive industrial solutions in Wales. Without this, industry, particularly in south Wales is likely to be at a competitive disadvantage to other regions of the UK.

Global leadership

The EU has set out initial thoughts for a Carbon Border Adjustment Mechanism (CBAM), which will place a carbon price on imported goods from jurisdictions without a carbon price. This will have the dual effect of levelling the playing field for EU ETS participants and also generating revenues on imported goods with no carbon price, providing further vital funds for decarbonisation. The UK Government must follow this lead.

Building our evidence base

Proposal 9 – Develop evidence and analysis of the industry and business sector to ensure cost effective and rapid emission reduction

Improving our evidence base over Carbon Budget 2 will enable us to maximise the opportunities for deeper action for our energy intensive industries later in the decade, help us to understand the potential costs and secure the necessary support and investment from the UK Government and industry.

Critically it will also enable us to understand the costs and benefits of decarbonisation for different businesses and how to better target and measure the impact of our carbon pricing policy, UK ETS and business support services such as Business Wales.

We will build our evidence across the four mitigation areas of resource and energy efficiency, fuel switching, carbon capture utilisation and storage and commercial buildings.

The additional research will be developed with the UK, Scottish and Northern Ireland Governments and our trade and social partners. We will work to better understand the challenges and opportunities, as well as the actions required from Welsh and UK Governments and from the sector, to assist on our transition to a net zero economy.

We anticipate that initial research will be completed by 2022. As this is an iterative process, additional areas of research will be commissioned in parallel and sequentially based on emerging evidence and need.

Proposal 10 – Prioritise financial, and other, support for clean and green jobs leading to a decarbonised economy

We have put in place indicators and performance measures for the climate and biodiversity emergencies, to guide Welsh Government departments in their financial decision making processes.

By 2023 we aim to have developed a range of indicators and performance measures to make sure that our direct financial support assists projects which help Wales become a net zero economy, making carbon reduction and high quality clean and green jobs a priority in our financial decision making. By prioritising our support we aim to set a clear direction towards net zero. This is a complex area requiring further work and we will engage with stakeholders and social partners to help shape our future policy.

Resource and energy efficiency

Resource efficiency covers the actions to lower energy and material use of, for example, industrial processes.

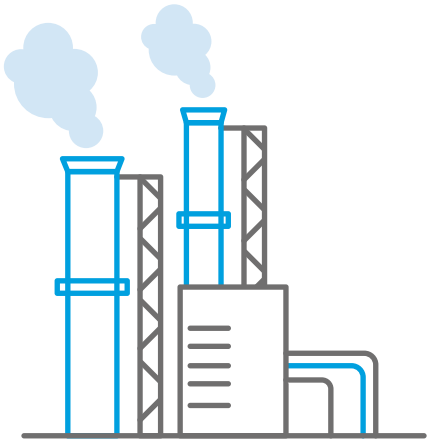
As described in Part 2, by 2050, we aim to use only our fair share of the planet's resources, have 100% recycling (zero waste) and net zero carbon. Keeping resources in use, used efficiently and avoiding waste will reduce the carbon and ecological footprint of Wales as a nation – reducing its impact both within and outside our borders.

Manufacturers can reduce direct and indirect emissions through using more recycled materials in their production and energy generation processes. However, as around 80% of all emissions occur in supply chains, significant reductions could be made by using lower carbon materials when producing goods and avoiding transporting them over long distances.

Ensuring that products and goods used are durable and are repairable reduces both upstream supply chain emissions, and downstream emissions through avoiding waste. As discussed in Part 2, focussing on indirect emissions means considering emissions inside and outside of Welsh borders, and is important if we are to prevent the 'off-shoring' of emissions and remain faithful to the goal of a globally responsible Wales as set out in the WFG Act.

The UK Government and Welsh Government have a suite of existing and developing policies crucial to reduce emissions from Welsh businesses over Carbon Budget 2 and lay the foundations for deeper mitigation for the remainder of the decade and towards 2050.

We will take forward the action in *Beyond Recycling*[74] to increase improvements in resource and energy efficiency and material substitution in the industry and business sector including implementation of new technologies, policy, resource efficient business model approaches, and development of infrastructure and supply chains, to reduce their carbon footprint. This will enable our businesses to be more productive and competitive, particularly in a decarbonising global economy whilst increasing their resilience.



Sectoral approaches

Policy 51 – Drive decarbonisation through the manufacturing sector

In 2021, Welsh Government published a new Manufacturing Action Plan. Through the plan we will futureproof manufacturing in Wales, make use of new technologies and importantly, drive down emissions. Supporting manufacturers to export is an important part of the Manufacturing Action Plan, and the Export Action Plan[75] sets out how we will do this. Export Clusters will help businesses transition from a reliance on sales to fossil fuel sectors overseas.

We will work with our manufacturing companies to develop a true circular economy within Wales through support provided by Business Wales and Food & Drink Wales. Industrial decarbonisation clusters will play a key role in this effort. The business support programmes will work with the Welsh supply chain to assist them in moving into new sectors. Manufacturing companies must also play their part by fully engaging with the opportunities available from the UK Government to invest in and explore new technologies to decarbonise, and Welsh Government will highlight opportunities to do this.

Proposal 11 – Develop a Decarbonisation Action Plan for the food & drink manufacturing sector by 2026, to be underpinned by research and evidence

The food and drink sector employed 33,600 people across Wales in 2019 (in manufacturing, production of packaging, equipment manufacture and servicing). This increases to over 239,000 when we include agriculture, retail and hospitality. The Welsh Government has published a headline vision and mission for the food and drink sector which reaches the highest levels of environmental, economic and

74 Beyond recycling | GOV.WALES (https://gov.wales/beyond-recycling)
75 41045 International Action Plans – Export Action Plan (gov.wales) (https://gov.wales/sites/default/files/publications/2020-12/export-action-plan.pdf)

social sustainability. Businesses will be encouraged and supported to develop their production practices to improve carbon footprints and resource use and the established 'Economic Contract', will be used as a tool to secure commitment and defined changes.

One of the success measures of the strategy for the food and drink sector is to increase the proportion of businesses which hold independent accreditation, demonstrating adherence to specific, monitored standards. We have mapped existing accreditation schemes relevant to decarbonisation and will be supporting businesses to commit to them, requiring businesses to commit to membership of such schemes as a condition of other support.

We will set ambitious targets to both halve food waste and prevent biodegradable materials going to landfill by 2025.

To support this aim, Welsh Government will undertake research over the next five years to better understand the carbon impact of the food chain and supply system in Wales, including packaging. Critical to this will be identifying new technologies to reduce the carbon impact at all levels of the food system in Wales.

The outcomes of the research will enable Welsh Government to develop an action plan covering resource, process and energy efficiency and waste minimisation, in the food and drink sector with implementation by 2026.

Proposal 12 – Fishing and fish supply chain decarbonisation

Wild capture seafood does not require land, feed, land cultivation or fertilisation, while aquaculture such as seaweed production has potential for carbon sequestration as well as its benefits as a source of nutrition and as a raw material.

We will support research into the sources and sinks of carbon across the fishing and aquaculture industries, and the potential and opportunities for decarbonisation of fishing activities, aquaculture and the fish supply chain supporting the priorities of the current Welsh Marine Evidence Strategy to 2025.

We will work in partnership with the fishing industry and others to identify the consequences of changes in consumer behaviours on decarbonisation (including the potential for a change in protein sources to seafood, which is naturally low fat, high in protein and high in omega -3) and to promote the health benefits and low carbon credentials of sea food products to the public.

By March 2022, we will investigate how the Groupage Export Facilitation Scheme (GEFS) or Logistic Hubs for export to EU can contribute to decarbonisation of the seafood sector.

Welsh Government support, incentives and regulation

Policy 52 – Increased resource efficiency in industry and business through regulation and funding

Remaining competitive, resource efficient and energy efficient are a key component of our business support programmes, including Business Wales, and Food and Drink Wales. We will secure greater recycling in businesses through the introduction of the new Business Recycling Regulations in early 2022 and the introduction of extended producer responsibility for packaging in 2024 (which will also secure an increase in the recycling of business-to-business packaging). Businesses will also be able to more closely monitor their wastes, helping them to reduce and recycle more, through the introduction of a mandatory waste tracking system, including the specific reporting of food waste by food businesses. Increasing quantities of high quality recycling will help provide a source of lower carbon raw materials for our manufacturers, further saving them on energy use and reducing emissions.

The Circular Economy Fund will support manufacturers to use a higher recycled content, support businesses engaged in repair and remanufacturing and support food businesses to valorise their unavoidable food waste. This will follow on from the initial 3 year £6.4 million fund, using the knowledge gained, particularly from case studies.

Policy 53 – Implement a new regime for pollution control Best Available Techniques (BAT) for industry

The environmental permitting regime regulates a range of industry types in respect of their emissions to air, water, land and also energy efficiency and waste. At the heart of the regime is the requirement for BAT to be applied. BAT has previously been driven by decisions at the EU level. We now have the opportunity to more closely align the permitting regime with our net zero, clean air and circular economy ambitions.

Engaging closely with the other administrations in the UK, we will implement a new UK-wide regime for developing and adopting pollution reduction techniques (the UK BAT regime), on which we recently consulted alongside the other administrations of the UK. This regime will account for our net zero commitment in the development of new BAT for each regulated sector. The first phase of the regime will be implemented in 2022. We will also explore the scope for more broadly reviewing whether environmental permitting requirements need to be strengthened in order to deliver our net zero, clean air and circular economy ambitions.

Policy 54 – Business Wales – using our financial and advice services to encourage business emission reduction

Business Wales supports new entrepreneurs, micro-businesses and SMEs to embed sustainable development practices in the fabric of their venture. This helps Welsh businesses exploit new opportunities and take proactive steps to realise the business benefits of resource and energy efficiency, as well as joining a growing community of forward-thinking organisations working towards a zero carbon future.

Business Wales encourages the business community to take action to improve resource efficiency throughout our business support programmes, with investment to date through the European Regional Development Fund (ERDF). Over 2,500 businesses, many within the foundational economy, have improved or adopted sustainable development practices, using the Green Growth Pledge. The Green Growth Pledge can help business realise the financial, environmental and societal benefits of operating more efficiently, taking practical steps to reduce and reuse, source responsible suppliers, innovate and win more business.

Proposal 13 – Review and development of Business Wales

We will take further steps to strengthen the approach of Business Wales in tackling the climate emergency, for example by providing enhanced information, guidance and support not only to help businesses reduce their carbon emissions but also to adapt to the impacts of climate change.

We will refresh the Business Wales website to reflect the priorities for Net Zero Wales, signposting SMEs to business support programmes, key websites, online tools, regulatory guidance and case studies to share the experiences of businesses in Wales.

With EU funding in place until 2022, our expert resource efficiency advisers will continue to upskill our wider adviser network and support a further 1,500 businesses to improve or adopt sustainable development policy through the Green Growth Pledge.

We will help Welsh businesses access public and private supply chains through opportunities on Sell2Wales and develop their policies and practices through tendering advice.

Through Social Business Wales, we will continue to enable the social enterprise sector that has a positive impact on our communities, to develop policies and practices to help them realise their ambitions on their triple bottom line: people, planet and prosperity.

As we transition from EU funding support in 2022, further investment is required to accelerate the support for entrepreneurs and SMEs to exploit new opportunities, start, develop and grow their ventures in an inclusive and sustainable way.

To enable us to do this effectively there is a need for greater evidence and understanding of how to support and measure carbon reduction in businesses, especially SMEs. We will draw on the evidence work set out in this Plan to consider:

- How greater information on climate change can be communicated through the Business Wales digital channels.
- How advisory services delivered through Business Wales can support SMEs to understand better how to reduce their carbon emissions, including an enhanced programme of support on energy efficiency and resource efficiency.

Proposal 14 – Build on our Foundational Economy

Building on our Foundational Economy Programme and the Manufacturing Action Plan, we have worked with five clusters of Public Service Boards to explore opportunities to redirect the flow of public procurement expenditure where it currently leaks outside of Wales.

We will further examine historic expenditure profiles, provide clarity of future contracting pipelines and investment priorities and develop action plans. The plans will be used to identify current and potential local supply capability and capacity and inform the nature of business development support required to accelerate their involvement in public sector supply chains.

The Backing Local Firms Fund, to be introduced as soon as practicable during the term of this carbon budget, will form part of the potential support available to businesses who share Welsh Government's net zero ambition. The carbon reporting dashboard held within Welsh Government's procurement spend database will be utilised to provide focus on those areas which will have greatest impact on carbon reduction. The shortening of supply chains in key categories of public sector expenditure will help embed the principles of the Economic Action Plan and Circular Economy Strategy and has the potential to lower carbon emissions associated with extended supply chains whilst increasing resilience.

We will also continue to develop our approach to implementing Community Wealth Building across Wales, including exploring further opportunities of reshoring manufacturing, building of the successful approach deployed as part of our response to Personal Protective Equipment (PPE) supply at the outset of the Covid pandemic. This approach offers the potential to reduce carbon emissions further by producing goods closer to where they will be used.

UK wide approaches

Policy 55 – Climate Change Levy (CCL) and Climate Change Agreements (CCAs) – UK Government

The CCL is a tax on energy delivered to businesses in the UK designed to incentivise energy efficiency and reduce carbon emissions. The levy applies to most business users across industry, commercial sectors, agriculture and public services and is charged on taxable commodities for heating, lighting and power. Climate Change Agreements (CCAs) are voluntary schemes in which operators of facilities receive a discount from the levy in return for agreeing to energy efficiency improvement targets.

In the Spring Budget 2020, the UK Government announced that the current CCA scheme would be reopened to new entrants for a set period and extended for a further two years until March 2025. The recent UK consultation showed strong support from businesses and industry for continuation of the scheme. Almost 9,000 facilities across the UK currently benefit from participation in the scheme, and a recent evaluation of the scheme found that in most participating sectors participation was between 80-100% of eligible businesses[76]. The Welsh Government calls on the UK Government to ensure that businesses and industries based in Wales continue to be eligible for any future CCA scheme beyond March 2025.

76 www.gov.uk/government/publications/second-climate-change-agreements-scheme-evaluation

Policy 56 – Improvements to the Energy Saving Opportunity Scheme (ESOS)

ESOS is a mandatory energy assessment scheme for large UK businesses that employ 250 or more people or have an annual turnover in excess of £44,845,000. Qualifying organisations must complete an audit, which involves calculating total energy consumption, identifying areas of significant energy consumption, and appointing a lead assessor to carry out energy audits and the ESOS assessment. Audits are carried out every four years and used to identify energy efficiency opportunities.

The UK Government is currently consulting on changes to the ESOS scheme. Proposals include the publication of company performance against recommendations. Following consultation, the UK Government must implement changes to make ESOS more impactful.

Policy 57 – Streamlined Energy and Carbon Reporting (SECR)

Since 2013 all UK quoted companies (whose shares can be bought or sold on the Stock Exchange) have been required to report on their greenhouse gas emissions as part of their annual Directors' Report. From April 2019, quoted companies must report on their global energy use and large businesses must disclose their UK annual energy use and greenhouse gas emissions. Other companies are encouraged to report similarly on a voluntary basis.

Fuel switching

Activity supporting industrial fuel switching is underpinned by many of the actions set out in the Energy Chapter of this Plan, including the development of renewable energy and a hydrogen pathway. Activity will also be underpinned at a UK level by innovation support and funding. Fuel switching will also be dependent upon the long term availability of an affordable fuel supply.

Fuel switching to low carbon fuels, for most industrial processes, will be a challenge both technically and in relation to infrastructure and operations. Industry will need to conduct research and development to understand the implications, evaluate options and in some cases processes will need costly re-designs. This is not a challenge unique to Wales and learning from others will be crucial. Collaboration across industries can help reduce the commercial, technical and safety risks associated with fuel switching. Industry is already working with the Welsh research base where we have expertise in areas such as combustion, hydrogen production and metals processing. We need to continue encouraging collaboration, internationally, with academia and across industry and facilitate access to funding to support the transition.

We will continue to engage with the UK Government around the future costs of electrification or other fuel switching to ensure our industries and businesses remain competitive and are sustainable over the long term. Currently the alternatives to natural gas can be significantly more expensive. The current high electricity prices in the UK act as a barrier to switching to electricity. The UK Government must develop a solution to this issue and support business competitiveness.

Hydrogen, whilst subject to uncertainty in cost and deployment trajectory, is considered a leading technology option in particular for decarbonising heavy industry,

and reduction of emissions in hard-to-abate modes of transportation, notably in heavy goods vehicles, aviation and shipping. To facilitate the development of hydrogen activities and opportunities in Wales, we will set out a pathway for hydrogen development in Wales to 2025 (Policy 25).

Development of hydrogen and the infrastructure necessary to distribute it in Wales will have a strong 'place' focus. We will ensure that its development in Wales and associated developments in offshore renewable energy and the mobility sector take account of individual industries and industrial clusters. We will continue to work to understand the challenges and opportunities and consider them alongside other technologies including CCUS and wider supply chain aspects.

One of the elements of our Hydrogen Pathway is to support industrial decarbonisation through skills for hydrogen development and research and development. Further research and development is required alongside the need to address the skills gap for industrial fuel switching and the wider scale use of hydrogen as a fuel for industry. There is an opportunity for Wales to develop expertise focused on industrial decarbonisation and export these skills and offer training to other industrial clusters.

Significant increases in renewable energy are also critical to facilitate fuel switching. We have the opportunity to generate substantial amounts of hydrogen alongside electricity from a range of renewable energy technologies around Wales. The Celtic Sea alone has the potential to generate 70 GW of electricity from floating offshore wind in UK waters[77]. This close proximity of our potential generation capacity to our large energy users provides the opportunity of linking our generation to our industrial users.

There is a symbiotic nature to the challenge around fuel switching for companies and the need for systems change and regional infrastructure planning. Engagement with the substantial expertise we have in industrial clusters is particularly important in helping us to scope the systems challenge and changes that will be required to enable fuel switching by industry. Developing our Regional Economic Frameworks in light of this knowledge will also be important.

Proposal 15 – Industrial clusters – fuel switching

The latest CCC Advice Report[78] reaffirms the importance of industrial clusters in Wales.

Stakeholders consider the development of the emerging industry-led South Wales Industrial Clusters as a focal driver for the decarbonisation of industry across the breadth of South Wales, building on the existing hydrogen and offshore renewable energy capacity. In North Wales, working with regional partners, we are investigating a range of multi-vector opportunities which could support the development of a cross border Hydrogen, Carbon Capture and Storage economy.

In March 2021 companies in the South Wales Industrial Cluster (SWIC) were awarded £1.5 million to develop a cluster plan (February 2021 – March 2023) and nearly £20 million of UK funding for a deployment project (March 2021 – March 2024) from the UK Industrial Decarbonisation Challenge.

77 Source: Offshore Renewable Energy Catapult
78 www.theccc.org.uk/wp-content/uploads/2020/12/Advice-Report-The-path-to-a-Net-Zero-Wales.pdf

The deployment project aims to create a sustainable plan for the region through the production and distribution of hydrogen power, cleaner electricity production that uses carbon capture technologies and large industry decarbonisation through fuel switching and the production of cleaner transportation fuels.

In North Wales, cross border engagement on hydrogen is taking place with the North West cluster. The North West are considering an integrated network in North West England/ North East Wales and we will work with the cluster to see how this can benefit industry in Wales.

The knowledge and potential pathways developed by Industrial Clusters will be essential in helping stakeholders in Wales to consider fuel switching issues such as future electricity demand, grid infrastructure and our hydrogen pathway.

Proposal 16 – Engage with the UK Government on their policies in support of fuel switching

The UK Government holds many of the powers that will enable fuel switching by industry including energy prices, hydrogen business models, and many of the powers related to carbon capture. It is essential that these policies take account of the needs of Wales and Welsh industry. Over Carbon Budget 2 we will continue to engage with stakeholders in Wales and with the UK Government to ensure that the Wales perspective is heard in the process of UK policy development.

Case Study – Fuel switching

A collaboration between researchers at the Energy Safety Research Institute at Swansea University and cement producer Hanson UK has seen the installation of a new green hydrogen demonstration unit at the company's Regen GGBS plant in Port Talbot. It is part of the £9.2m Reducing Industrial Carbon Emissions (RICE) project which has been part-funded by the European Regional Development Fund through the Welsh Government, and is aimed at the deployment of industrial-scale demonstrations of new technology.

Cement production is energy intensive due to the high temperatures required to produce clinker – the main component of Portland cement. Hanson's Port Talbot plant produces Regen GGBS, ground granulated blast furnace slag, which is used as a replacement for up to 80% of the cement in concrete. Although Regen is also an energy intensive product using large amounts of natural gas and electricity, its carbon footprint is about one tenth of Portland cement. The aim of the demonstration unit is to replace some of the natural gas used at the plant with green hydrogen, which is considered a clean source of energy as it only emits water when burned, reducing CO_2 emissions from the burner and reducing the carbon footprint of Regen even further.

The demonstration unit is producing hydrogen at Hanson's Port Talbot plant through the process of electrolysis. Renewable energy is generated through wind and solar on site and the energy is directed into the electrolyser or water splitting device. The electrolyser can efficiently utilise this energy to split water into hydrogen and oxygen. The hydrogen is then passed into the burner to enrich the combustion mixture, saving carbon emissions from the burning of natural gas.

Carbon Capture Utilisation Storage (CCUS)

As described later in this document, the Land Use, Land Use Change and Forestry sector is the only sector currently able to remove emissions from the atmosphere. However, longer term, the CCC has been consistent in stressing the necessity of CCUS to achieving net zero emissions. The CCC recognises the Welsh Government is not able to meet its target without the right policy and financial commitments from Westminster as the UK Government holds many of the powers and levers related to CCUS. We will continue to engage with the UK Government on its developing CCUS policies to ensure they take account of the needs of Wales.

We have recently completed research reviewing the viability of a CCUS network in Wales and how it might contribute to achieving net zero in Wales.[79] The report concluded that CCUS is a feasible technical option to support Wales in its ambition to reach its statutory emissions reduction targets. CCUS is technically challenging and expensive, and therefore must be used alongside other technologies including energy demand reduction, energy efficiency, recycling and alternative energy sources including electrification or hydrogen. Where other solutions cannot be deployed, CCUS may have a role.

South Wales has less opportunity for CO_2 storage than other areas of the UK due to the lack of suitable nearby geological stores and will therefore need to transport CO_2 to storage sites. North East Wales has the opportunity to associate with the HyNet CO_2 storage and hydrogen production project being developed cross-border in North West England, described in more detail below.

The research evaluated technology options along the entire CCUS value chain. Whilst utilisation of CO_2 is possible, and should be encouraged as a preferable option to storing CO_2, the report concluded that it will not make a substantial impact upon overall CO_2 emission levels in Wales. We will need to use this carbon budget period to work with stakeholders and understand more about the potential role of carbon capture utilisation.

The following policies and proposals set out the actions relating to carbon capture and storage and usage.

Proposal 17 – Continue to build our evidence base on Carbon Capture Utilisation and Storage (CCUS) over Carbon Budget 2

Early in this carbon budget period we will build on our existing evidence base, undertaking further research including:

- An economic impact assessment of the deployment of hydrogen and CCUS using existing and new evidence sources.
- Development of a potential infrastructure plan to facilitate transport and storage of CO_2 produced in Wales.

The development of CCUS in Wales will be driven in large part by the needs of industry and the decisions that they take regarding their most optimum pathways. These critical decisions from industry will influence our next steps.

79 https://gov.wales/carbon-capture-utilisation-and-storage-network-wales-report

Proposal 18 – Industrial Clusters – Carbon Capture Utilisation & Storage (CCUS)

Aligned with proposal 9 and our commitment to continue to work with the South Wales Industrial Cluster (SWIC) and stakeholders on fuel switching, we will also work together on CCUS. Utilising funding from the UK Industrial Decarbonisation Challenge, the SWIC deployment project aims to create a sustainable plan for the region through the production and distribution of hydrogen power, cleaner electricity production that uses carbon capture technologies, and large industry decarbonisation through fuel switching and the production of cleaner transportation fuels.

As many of the powers related to carbon capture technology are reserved to the UK Government we will also work with the SWIC to understand what support may be needed at a UK level and promote the needs of South Wales.

The HyNet project in Ellesmere Port will produce, store and distribute hydrogen to decarbonise the North West of England and North Wales. This will be coupled with carbon capture and storage (CCS) with the waste CO_2 being piped into the repurposed gas and oil fields at Liverpool Bay. The HyNet project presents significant opportunities to businesses across North Wales to decarbonise existing industrial processes.

Given the developmental nature of both projects it is difficult to set out at this point the timeline for any CCS deployment that may be required. We also recognise the need for further research into the infrastructure requirements and costs for CCS in Wales.

Proposal 19 – Greenhouse gas removals

Alongside CCUS and removals from forestry and soils, there are more technological methods of removing greenhouse gases from the atmosphere. They include Bioenergy with carbon capture and storage (BECCS) and Direct air capture and carbon storage (DACCS). These are known as 'engineered removals' and require considerable development before they can remove emissions at scale. There are also issues to address relating to public awareness and acceptability, sustainability of biomass supply, and monitoring, reporting and verification (MRV). It is essential to avoid over reliance on assumptions about the performance of these technologies to prevent unnecessary delays to emissions reductions in this decade.

In the last year the UK Government has published a call for evidence on removals,[80] announced funding for innovation and research programmes,[81] and established a Task and Finish Group on MRV.
The UK Government has a key role in the development of engineered removals, not least because of the reliance on carbon capture and storage.

80 Greenhouse Gas Removals: call for evidence (publishing.service.gov.uk) (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/941191/greenhouse-gas-removals-call-for-evidence.pdf)

81 Direct Air Capture and other Greenhouse Gas Removal technologies competition – GOV.UK (www.gov.uk) (www.gov.uk/government/publications/direct-air-capture-and-other-greenhouse-gas-removal-technologies-competition)and CO_2 Removal Hub | Research | Smith School of Enterprise and the Environment | University of Oxford (https://www.smithschool.ox.ac.uk/research/co2re-hub/)

During Carbon Budget 2 we will engage in UK-wide activity on removals to give Wales a voice in decision-making, for example on legal and regulatory frameworks or governance principles. We will also undertake a feasibility study of the different removals approaches, building on existing work in the LULUCF and agriculture sectors. We will use this evidence to inform development of our net zero pathway.

Industrial and commercial buildings

We must consider the amount of heating, cooling and hot water used in both industrial and commercial buildings and the materials used to construct them. This includes industrial premises and well as shops, hotels and offices in the private sector.

Proposal 20 – Property Delivery Plan

All projects in receipt of Welsh Government funding under the plan will be required to comply with the Welsh Government's Sustainable Buildings Policy. However, in this carbon budget period, all Welsh Government direct build commercial projects undertaken as part of the Welsh Government's Property Delivery Plan will aim to achieve a net zero carbon in use standard, with the approach currently being piloted.

Proposal 21 – Property Energy Efficiency Rating Scheme (PEERS)

Of the 1.6m commercial and industrial buildings in England and Wales, 7% are larger than 1,000m^2 and these buildings account for 53% of energy demand across the stock[82]. Much of this energy is produced from fossil fuels. Providing landlords and businesses with information on the performance of their buildings is a vital step in enabling improvements to reduce emissions. It will also assist the Welsh Government in tracking progress and targeting interventions.

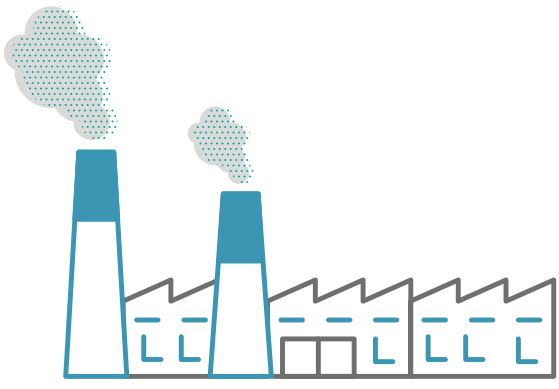
We will collaborate with the UK Government to develop an England and Wales scheme, allowing businesses to compare their performance with a greater number of their peers.

We will:

- Launch a year-long pilot within the office sector in early 2022 to operationalise and test the scheme.
- Work with the UK Government on provisions in the UK Energy Bill 2022.
- Launch the mandatory scheme for the office sector in 2023.
- Expand the scheme to other commercial buildings from 2024.

The UK Government is also leading a research project aimed at developing and piloting a methodology to make use of the existing datasets to remotely evaluate the condition of existing non-domestic buildings.

The aim is to develop a methodology which will enable targeted policy interventions. Welsh Government are supportive of the project and assisting the UK Government to guide the project.



82 Introducing a performance-based policy framework in large commercial and industrial buildings in England and Wales (publishing.service.gov.uk) (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/970519/performance-based-policy-framework-ci-buildings--strategy-paper.pdf

Government finance and funding

Policy 58 – Development Bank of Wales (DBW) – decarbonisation to be included as a policy priority within the next remit letter to be issued in autumn 2021

DBW already plays a vital role helping businesses address their finance needs, unlocking the potential to bring about change. Its primary role is to address the space between businesses demand for finance and the willingness of the mainstream market to meet those demands. DBW already works with many businesses to support their ambitions to decarbonise or develop new products with a sustainable focus.

The Welsh Government's ambition for DBW's role in supporting decarbonisation will be expressed through the priorities set out in the forthcoming Term of Government remit letter to be issued in autumn 2021. Ministers expect to see a strategic response and focus on decarbonisation detailed in the core strategic objectives of DBW's forthcoming Corporate Plan 2022 – 2027, due to be published in spring 2022 with more specific operational activity identified within Annual Operational Plans.

In addition to specific investments supporting decarbonisation, DBW is currently:

- evolving its signposting mechanisms to encourage more businesses to embed decarbonisation planning as part of their development and growth strategies;
- identifying pilot projects such as (in 2022-23) housing retrofit solutions and energy generation support aimed at building capacity and capability; and,
- undertaking research to inform development of potential project support areas. DBWs research unit, Economic Intelligence Wales (EIW), undertake bespoke research to inform financial solution needs including consideration of barriers, best practice and business sentiment.

In a challenging economic climate, demand for products specifically targeting decarbonisation may take time to build. Collaboration with local and national expertise will be critical in optimising delivery and impact and ensuring Wales is reactive as incentives change at a UK level.

Corporately DBW will continue to demonstrate leadership. In 2021-22 DBW has committed to offsetting its own carbon footprint in and implement measures and policy guidance to reduce carbon outputs by 25% from 2019-20 levels.

Proposal 22 – Develop new support mechanisms to encourage and support innovation in industrial decarbonisation

As set out elsewhere in the Plan, innovation will be essential if we are to achieve net zero, including in industry. Fuel switching, building efficiency, process energy and resource efficiency, carbon capture utilisation and storage are all not without challenge, and industry will need to engage in research and innovation to develop their ideas. This can happen at individual site level as well as within clusters such as the South Wales Industrial Cluster (SWIC).

This is not just about technology and process improvement. Innovation is also essential in areas such as business model development and novel financial instruments. Welsh businesses are currently supported to develop their ideas through the Smart Cymru Programme, which offers financial support to develop, implement and commercialise new products, processes and services. Funding is provided using the European Regional Development Fund (ERDF) until the current round ends in 2022-23. The use of ERDF has encouraged collaboration with academia through Smart Expertise and funded large scale projects. These have built critical mass in our research capability and encouraged commercialisation through programmes such as FLEXIS and SPECIFIC.

As we transition from ERDF funding in 2022, we will develop new support mechanisms that will build on current programmes. These must continue to address the needs of industry, bringing research closer to commercialisation and ultimately scale-up and deployment.

Policy 59 – Economy Futures Fund (EFF)

The EFF, which is discretionary and demand led, was established in May 2018 by consolidating a number of existing funding streams into one fund. As part of the EFF application process, businesses that wish to apply for support must set out how their investment proposal addresses one of the five Calls to Action outlined in the Economic Action Plan.

We will seek to prioritise the decarbonisation call to action, where Welsh Government are looking for applications that enable more of the business base to become carbon light or free. There are a number of activities that a business could be involved in such as:

- Investing in technology aimed at reducing the carbon footprint of goods and services;
- Introducing process changes to drive carbon from supply chains;
- Investing in research and development aimed at reducing the carbon footprint of goods and services; and,
- Reducing energy and resource usage/ consumption.

The assessment of any application will include how the application will deliver on the decarbonisation call to action and meet the relevant wellbeing indicators and objectives and goals. The award of funding will detail the specific project related conditions of the support, for example carbon reduction and/ or reduced energy consumption, alongside the standard terms and conditions.

We will continue to explore further opportunities for supporting businesses when reviewing the new Subsidy Control energy and environment principles.

Policy 60 – UK Government funding streams for industrial decarbonisation and energy efficiency

As discussed at the start of this chapter, the UK Government holds many of the powers and associated levers and funding to support industrial decarbonisation. The UK Government has put in place a number of programmes and funding initiatives, many of them focussed on the innovation support necessary for industry decarbonisation. They must work collaboratively and proactively with Welsh Government to ensure funding meets the needs of Welsh industry.

To ensure that Wales benefits from the support available, we must work together to maximise the opportunities from UK initiatives. For example, Welsh Government has been working closely with stakeholders to maximise funding from the UK Government led Industrial Energy Transformation Fund for Welsh businesses. This has included holding workshops, sharing information and through the provision of support for application preparation.

Welsh industry has had success in accessing funding from the UK Industrial Decarbonisation Challenge. Welsh universities have also been successful in securing funding from Innovate UK and the UK Research Councils.

Funds available from the UK Government include:

- Industrial Energy Transformation Fund;
- Net Zero Innovation Portfolio;
- Proposed Clean Steel Funding;
- Transforming Foundation Industries;
- Industrial Decarbonisation Challenge; and,
- Net Zero Hydrogen Fund.

Whilst public funding and finance can provide a stimulus, we fully expect the economic benefits and consequently much of the cost, to lie with business and industry. Therefore we expect to see public funding blended with private funding, with business and industry taking the lead on development and deployment projects.

5. Team Wales approach

We need everyone to play their part in decarbonising the industry and business emissions sector. This includes the public sector, business and individuals, and the crucial role of UK Government as described in the policies and proposals section of this chapter. The *Working Together to Reach Net Zero* document accompanying this Net Zero Wales Plan sets out where our partners have already committed action through their pledges together with additional case studies to demonstrate the action already taking place across Wales.

"It's our ambition to become a world class, resilient and sustainable water service for the benefit of future generations. As part of this ambition, Dŵr Cymru Welsh Water is targeting full carbon neutrality by 2040 and to achieve a 90% reduction in its total carbon footprint (operational & embedded emissions) by 2030. Dŵr Cymru Welsh Water will build on the 65% reduction it has achieved since 2010/11 and commit to inspire our customers, regulators and other stakeholders to actively support us in delivering these ambitious targets, whilst pursuing their own carbon agendas".

Tony Harrington,
Director of Environment,
Dŵr Cymru Welsh Water

There are clear contributions and linkages with policies in other sectors and chapters in the Plan. As other parts of society decarbonise it will create opportunities for the economy as part of the transition. As we build new low/zero carbon homes, and look to retrofit energy efficiency measures into the existing housing stock, this will create opportunities in the supply chain, as will our transition to electric vehicles and as consumers demand more efficient appliances and goods.

The challenge for us all is to make sure that we are ready to respond to the net zero transition in a way which maximises the economic opportunity for all in a just transition.

The next section captures the collective action needed to decarbonise across the four broad areas of tmitigation, which is also summarised at the end of the chapter.

The Ask of Others

Individuals/households

The pandemic has influenced the way we all shop and consume goods and services. This offers opportunities for a more blended approach to where we can work, with the potential to reduce the need to travel and allowing us to shop for goods and services closer to home, supporting local town centres and our Foundational Economy.

By adopting resource efficiency and the circularly economy approach, consumers have a direct role in not only saving money but also in extending the economic life of products and reducing waste at the same time. They can also use their buying power to support businesses which are leaders in tackling the climate challenge.

Public sector organisations

Procurement is a key lever for the public sector to utilise to encourage business and industry to decarbonise. The refreshed Welsh Procurement Policy Statement (WPPS) emphasises prioritising carbon reduction and zero emissions through more responsible and sustainable procurement to deliver the net zero public sector Wales by 2030 ambition. We want the public sector to procure from businesses that strive to reduce their carbon emissions and in doing so support low carbon suppliers as part of our wider transition.

Welsh businesses and industry

South Wales hosts the UK's second largest industry cluster, through high value primary manufacturing operations including steel and oil refining. Elsewhere, our business base provide innovative solutions across the food, chemicals and financial service sectors.

Business and industry sit at the heart of Wales' response to the net zero challenge. A collaborative approach between the sector and Welsh and UK Governments is critical to enable and empower Welsh businesses to deliver the change we need from now until 2050.

As identified by the CCC, decarbonisation of industrial processes is a particular challenge for Wales and it is important to develop appropriate plans to ensure a fair sharing of costs to enable the transition. As policy is developed and infrastructure is deployed to support the transition to a low carbon future, industry has an important role in developing more efficient manufacturing processes, increasing energy efficiency and recycling.

Consumer demand is already driving change, but many businesses have already started and many are already committed to net zero targets as part of their corporate social responsibility. The Welsh Government has been clear that we want to encourage responsible business practices as part of our 'something for something' relationship with business though our Economic Contract, calls to action and access to funding through our EFF.

We are working with the industrial sector to ensure it has a role to play in decarbonising industrial processes and is aware of the support being offered at Welsh and UK level to enable the transition to a net zero future. The Welsh Industrial Decarbonisation Task and Finish Group (WIDeG), was established in 2021 to provide a forum for industry across Wales to input into the development of this Plan.

International engagement

The technologies required for significant reduction in carbon emissions including CCUS and hydrogen are being developed across the world. These are global challenges and it is essential that we maximise our links across the world to learn from others and develop new business opportunities.

We will use the opportunity presented by COP26 in Glasgow to build on our international engagement.

Welsh Government has been participating in a transnational project between governments looking at the issues of industry decarbonisation. The Industry Transition Platform (ITP) was a joint project between the Climate Group and North Rhine-Westphalia that worked with eleven state and regional governments from highly industrialised regions. The project came to an end in July 2021 but we will continue to maintain and develop the network of contacts that we have and build on our joint learning.

We also recognise the importance of continuing to develop our engagement overseas, to explore new market opportunities for Welsh companies and ensure that Wales plays its part in a global transition to net zero.

Industry and Business

Ambition Statement

Four broad areas of mitigation

Resource and energy efficiency

- **Policy 51 –** Drive decarbonisation through the manufacturing sector
- **Policy 52 –** Increased resource efficiency in industry and business through regulation and funding
- **Policy 53 –** Implement a new regime for pollution control Best Available Techniques (BAT) for industry
- **Policy 54 –** Business Wales – using our financial and advice services to encourage business emission reduction
- **Policy 55 –** Climate Change Levy (CCL) and Climate Change Agreements (CCAs) – UK Government
- **Policy 56 –** Improvements to the Energy Saving Opportunity Scheme (ESOS)
- **Policy 57 –** Streamlined Energy and Carbon Reporting (SECR).

- **Proposal 9 –** Develop evidence and analysis of the industry and business sector to ensure cost effective and rapid emission reduction
- **Proposal 10 –** Prioritise financial, and other, support for clean and green jobs leading to a decarbonised economy
- **Proposal 11 –** Develop a Decarbonisation Action Plan for the food and drink manufacturing sector by 2026, to be underpinned by research and evidence.
- **Proposal 12 –** Fishing and fish supply chain decarbonisation
- **Proposal 13 –** Review and development of Business Wales
- **Proposal 14 –** Build on our Foundational Economy

Fuel Switching

- **Proposal 15 –** Industrial clusters – fuel switching
- **Proposal 16 –** Engage with the UK Government on their policies in support of fuel switching

Carbon Capture storage, utilisation and storage

- **Proposal 17 –** Continue to build our evidence base on Carbon Capture Utilisation and Storage (CCUS) over Carbon Budget 2.
- **Proposal 18 –** Industrial Clusters – Carbon Capture Utilisation & Storage (CCUS)
- **Proposal 19 –** Greenhouse gas removals

Industrial and Commercial Buildings

- **Policy 58 –** Development Bank of Wales (DBW) – decarbonisation to be included as a policy priority within the next remit letter to be issued in autumn 2021.
- **Policy 59 –** Economy Futures Fund (EFF)
- **Policy 60 –** UK Government funding streams for industrial decarbonisation and energy efficiency

- **Proposal 20 –** Property Delivery Plan
- **Proposal 21 –** Property Energy Efficiency Rating Scheme (PEERS)
- **Proposal 22 –** Develop new support mechanisms to encourage and support innovation in industrial decarbonisation

Team Wales approach – The Ask of others

1. Our Ask of the Welsh Public *(Individuals & Households)*	We ask the public to shop and consume goods and service closer to home, supporting local town centres and to also use their buying power to support businesses which are leaders in tackling climate change.
2. Our Ask of the Public Sector	We ask the public sector to procure from businesses that strive to reduce their carbon emissions and in doing so support low carbon suppliers as part of our wider transition.
3. Our Ask of Welsh Business & Industry	We ask Welsh businesses to commit to net zero targets and introduce responsible business practices as part of their corporate social responsibility. We also ask that the industrial sector decarbonise industrial processes to enable the transition to a net zero future.
4. Our Ask of UK Gov *(Call for UK action)*	**We call on UK Government to:** • Ensure that businesses and industries based in Wales continue to be eligible for any future Climate Change Agreement scheme beyond March 2025; • Be transparent on how funding streams, including the use of UK ETS revenues will be made available to enable decarbonisation and move the Welsh power and industrial sectors beyond simply paying the carbon price; • Develop a solution to allow industry to switch to lower carbon fuels which does not result in the operating environment in the UK being significantly uncompetitive; • Develop symbiotic and circular economy approaches in industry, their current and future supply chains and in the communities which host industrial operations; • Follow the lead set out by the EU on a Carbon Border Adjustment Mechanism (CBAM), which will place a carbon price on imported goods from jurisdictions without a carbon price. This will have the dual effect of levelling the playing field for EU ETS participants and also generating revenues on imported goods with no carbon price, providing further vital funds for decarbonisation.
5. International Engagement	We ask the international community to maximise links across the world so we can learn from others, develop new technologies required to reduce carbon emissions, including CCUS and hydrogen, and help us to develop new business opportunities

Agriculture

1. Introduction

Scope

The agriculture sector covers soil, livestock, and waste and manure management.

Vision

Agriculture is at the heart of the economic, environmental, cultural and social fabric of Wales. Our farmers hold a unique position in society, recognised for their role in producing a supply of safe, high quality food from primarily marginal land using predominantly non-intensive systems with grass and rainwater to rear animals.

Agriculture and food production rely on natural processes, and so will always cause some degree of greenhouse gas emissions; in particular, livestock will always emit some greenhouse gases. Our ambition and challenge is to continue to reduce greenhouse gases by improving efficiencies on farm to achieve a cumulative effect whilst maintaining the production of high quality and sustainable food and it will be important for all farmers to continue to adopt low carbon technologies as they become available.

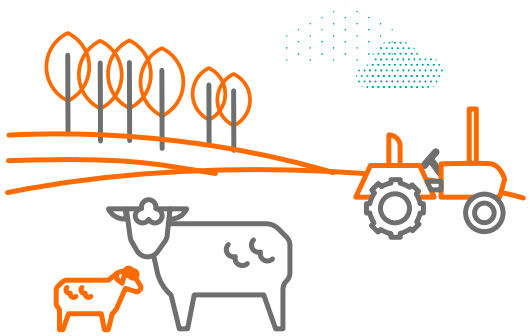
As described in the LULUCF chapter, delivering the reductions that are needed will mean our landscape will continue to evolve as our use of land changes. We will need to work collaboratively to deliver new woodland, creating the opportunity for communities, farmers and other land owners to be at the heart of creating a wood economy. Delivering this vision will require land use change equivalent to around 10% of agricultural land in Wales, and farmers have an important role to play.

It will involve planting of new woodlands and also increased planting of 'hedges and edges', such as trees along field boundaries, scattered trees and shelterbelts. We will **harness the enthusiasm of local communities** to find solutions which work for landowners while seeking to protect the most productive land for farming.

The changes to agriculture and land use will be complex and wide reaching and we must ensure **the changes are fair, creating opportunity for all**, not a select few.

More broadly, reducing emissions from our land will **create new economic opportunities, new skills and industries**, particularly in rural Wales, enabling communities to continue to thrive.

Our agriculture industry will transform into a low emissions, holistic and integrated food production and land management system that has a low environmental impact as well as **benefitting nature, restoring biodiversity and contributing to our economy**. The agriculture sector in Wales will have to adapt and be competently using all available low emission technologies throughout the whole sector, such as **minimising inputs, maximising efficiencies and outputs**, precision farming and optimal slurry and manure usage and storage. There will also be **increased**



innovation in areas such as feedstuffs and use of fertilisers, making a significant contribution to meeting our climate change targets as well as wider environmental and biodiversity targets.

New innovative technologies, to further reduce the greenhouse emissions associated with food production, will continue to emerge and these will be readily taken up by farmers. Farmers will have **sustainable businesses**, recognised for not just high quality, sustainable food, but also the delivery of **natural capital outcomes, including on climate, soils, air, water and biodiversity**. Continued professional development will be the norm to enable farming practices to continue to evolve and embrace new technologies. Consumers will recognise the value of high quality, sustainably produced local produce, and producers will be much more responsive to market demand. **Supply chains will be stronger and more localised, and value will be more fairly distributed**, and more responsive to market demand.

This carbon budget period (2021–2025) covers a time of transition for the sector as we develop and implement our future domestic agricultural policies outside the EU. The Agriculture (Wales) White Paper, published in December 2020, outlined our proposals for what may be the biggest change in agriculture policy for decades, setting out our proposal to introduce primary legislation which will establish **Sustainable Land Management (SLM)** as the framework for future agriculture support. This approach reflects the use of land for food production, whilst ensuring our natural resources are preserved and enhanced for future generations.

The farming sector has faced many challenges over the past few years and we are firm in our intention to support farmers to adapt to future land use changes. The multi-dimensional nature of farming and land use means this is complex and challenging. For this vision to become a practical reality, and whilst SFS is being developed, we intend to continue to provide regular reliable income support for our farmers but in exchange for that income we will expect them to farm in different ways in order to reduce emissions. We will work with and support farmers and land managers through this transition.

In 2022, we will launch a range of interventions which will help both prepare the ground for the new scheme and continue to help farmers reduce emissions. Significant and important land use change is coming which will provide a stable and sustainable future for the industry and rural communities in Wales. In the meantime, subject to sufficient funding being provided by the UK Government, it is our intention to continue with the Basic Payment Scheme until 2023 to provide support for farmers as we work together to transition to the Sustainable Farming Scheme.

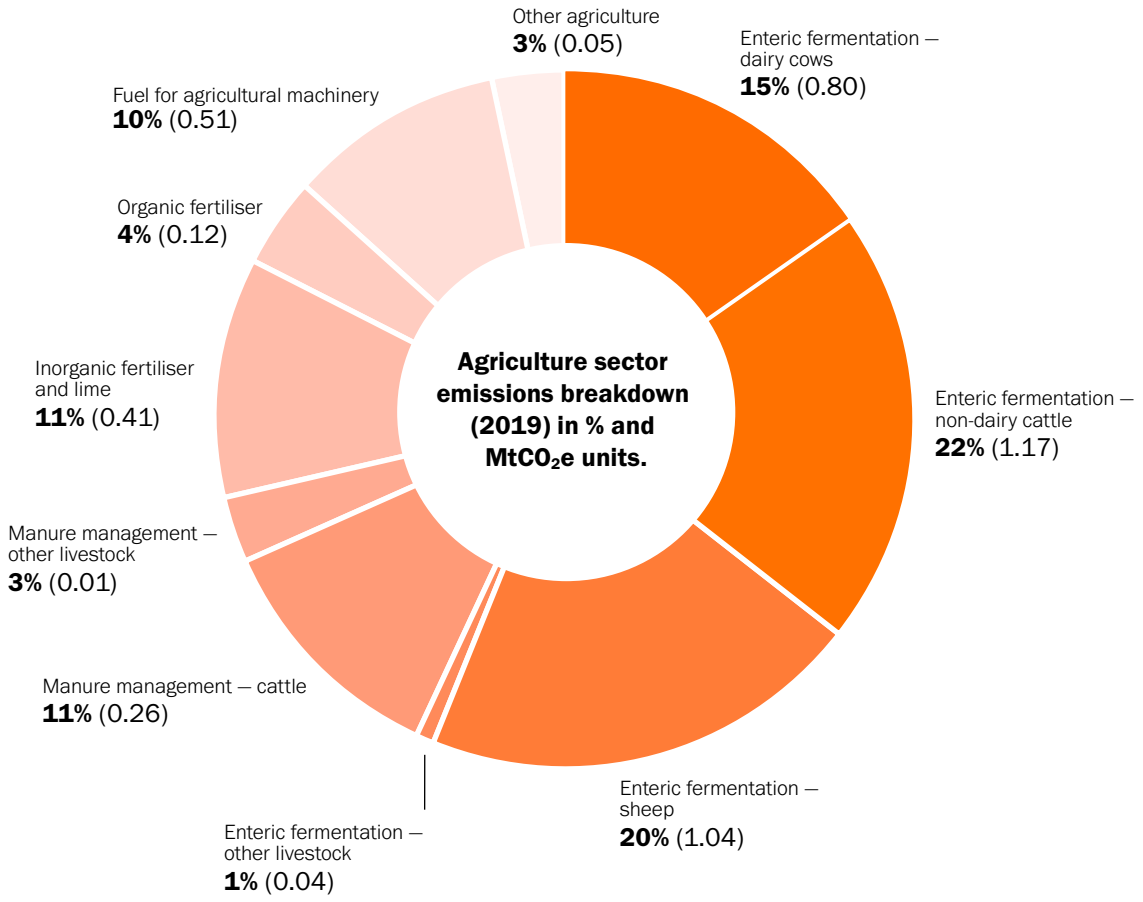
We will continue to develop our proposals to create a new system of farm support with a view to beginning the transition to the proposed new Sustainable Farming Scheme (SFS) towards the end of this carbon budget.

2. Emissions

Where the emissions come from

At 5.3 $MtCO_2e$, agriculture accounted for 14% of Welsh emissions in 2019. Agriculture emissions are dominated by methane (66%) and nitrous oxide (22%), with only 12% of sector emissions as carbon dioxide. Livestock enteric fermentation emissions (largely from cattle and sheep), accounts for 58% of the sector's emissions in 2019, and manure management (16%). The application of inorganic fertilisers and lime on agricultural soils as well as fuel for agriculture mobile machinery are other significant sources of emissions, comprising 11% and 10% of agricultural emissions, respectively.

Figure 16: Agriculture sector emissions in 2019 ($MtCO_2e$)[83]



83 The emissions data is sourced from the Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019 and aligned to the Welsh Government definition as described in Annex 4.

Table 6: How the biggest emissions sources in the agriculture sector contribute to the Welsh total

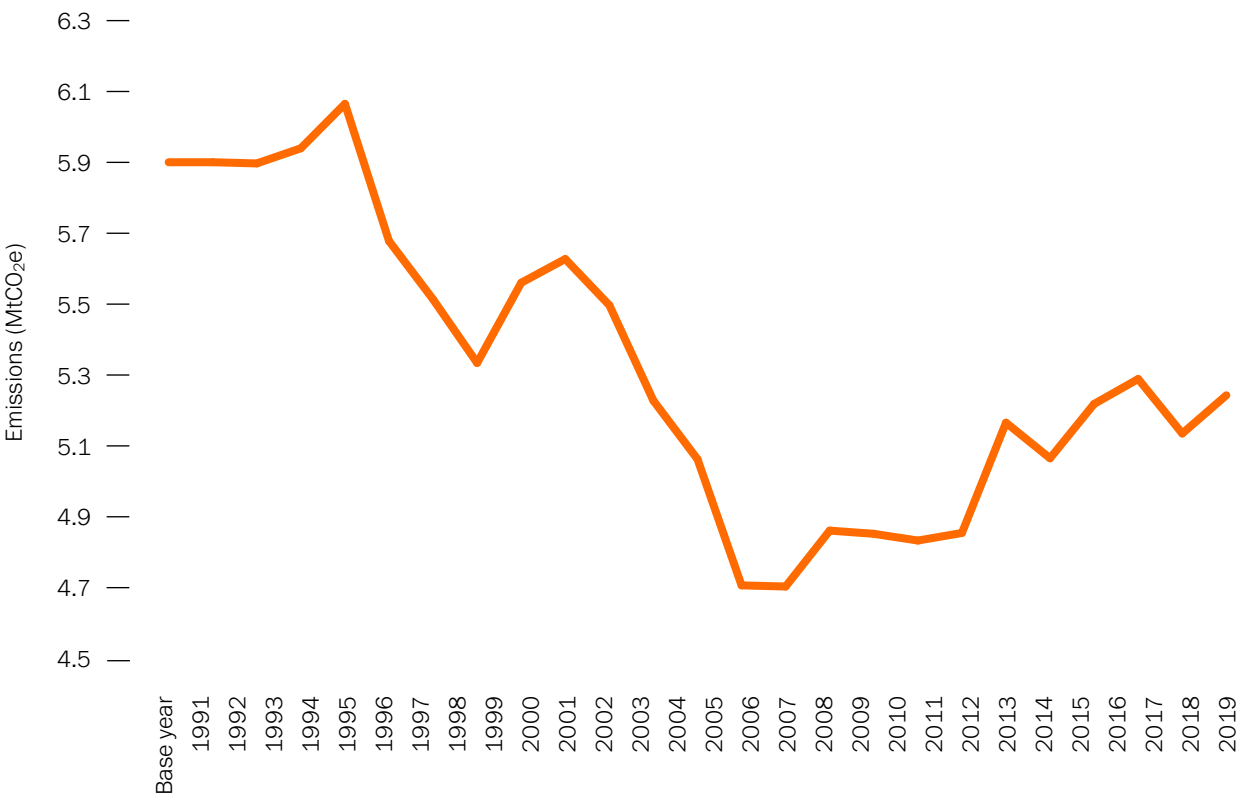
Source	% of total Welsh emissions
Enteric fermentation – non-dairy cattle	3%
Enteric fermentation – sheep	2.66%
Enteric fermentation – dairy cows	2.04%
Inorganic fertiliser and lime	1.57%
Fuel for agricultural machinery	1.38%

Summary of progress to date

Total emissions from the Agriculture sector in Wales have declined by 10% between the base year (1990) and 2019, driven largely by a general decline in livestock numbers and nitrogen fertiliser use. In 2019, Welsh Agriculture sector emissions increased by 2% compared to 2018.

This is largely the result of a significant increase in sheep enteric fermentation (2.9%) as well as liming activity (49%), with the latter generally displaying high year-to-year variability. Overall, the enteric fermentation of non-dairy cattle, sheep, and dairy cows remain the top contributors of Welsh emissions within the agricultural sector.

Figure 17: A graph to show 1990-2019 historic Welsh emissions for the agriculture sector



3. Ambition statement

Meeting Carbon Budget 2 and entering onto a pathway for delivering net zero emissions across Wales by 2050 will require mitigation action in two broad areas:

- **Low Carbon Farming Practices** – increasing measures on farm which reduce emissions from soils (e.g. grass leys and cover crops), livestock (e.g. diets, health and breeding) and waste and manure management.
- **Measures to release land** – Changes in consumer and farmer behaviour can release land from agriculture while maintaining a strong food production sector.

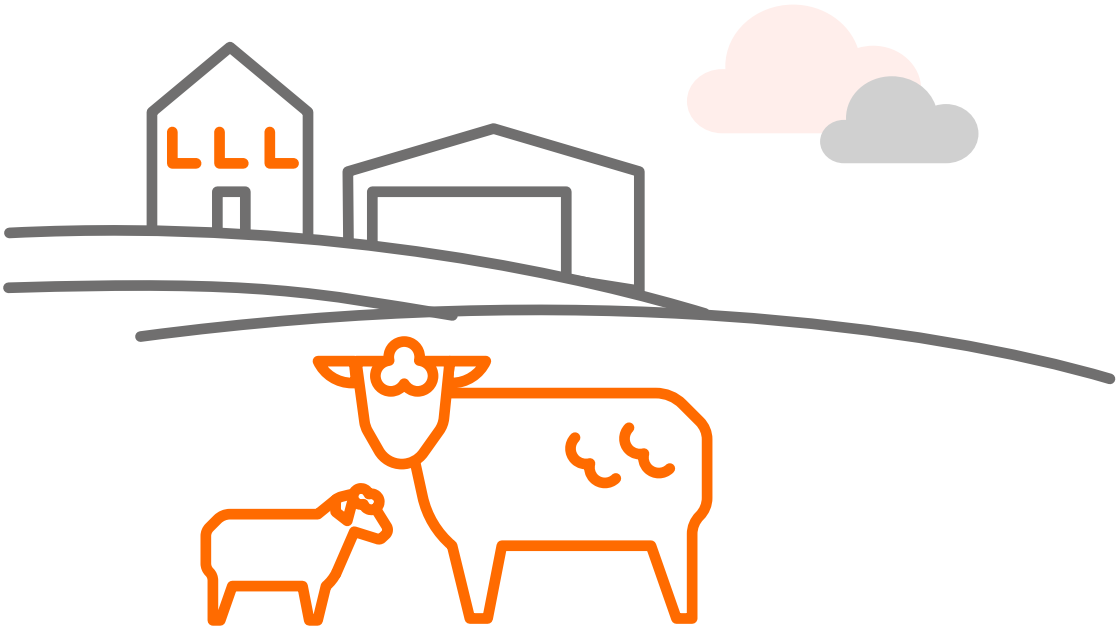
These two broad areas for mitigation align with the levers in our Wales 2050 calculator which we have used to set the Wales 2050 pathway. These inform our ambition statement for the agriculture sector.

Agriculture sector ambition statement

The new Agriculture Bill will be the biggest policy change the agriculture sector has seen in decades, our main goal within this carbon budget period will be supporting and preparing the sector to transition into a new way of working, reducing their overall business carbon footprint.

During Carbon Budget 2 we will be developing our Sustainable Farming Scheme and enabling the transition through a range of pilots and interventions supporting low carbon farming practices and land use change. By introducing low carbon farming practices as scheme requirements to all farms across Wales, we will reduce on farm emissions through improved livestock, land and manure management.

10% of agricultural land will be shared to support tree planting by 2050 while maintaining a strong food production sector across Wales.



4. Policies and proposals

Agricultural greenhouse gas emissions are very different from other sectors of the economy such as electricity generation, transport and manufacturing. The principal greenhouse gas emitted by most industries is carbon dioxide (CO_2) from fossil fuel combustion, while for agricultural systems the two main greenhouse gases are methane (CH_4) and nitrous oxide (N_2O). Reducing these emissions is more difficult than cutting CO_2, because they result from complex and imperfectly understood natural soil and animal microbial processes, a changing climate and the limitations of measurement. These processes are affected by other nitrogen compound air pollutants from agriculture like ammonia (NH_3) or oxides of nitrogen (NO_x) through complex processes like acidification.

A supply of nitrogen from organic or inorganic sources is necessary for the growth of crops and pasture, and it is an unavoidable consequence of soil processes that an amount of nitrogen in an agricultural system will be emitted as nitrous oxide by soils. However, understanding the causes of these gases and where we can reduce the emissions will ensure more informed production decisions are taken.

Approximately half of all anthropogenic emissions of nitrogen compounds are due to losses from farms either as N_2O, nitrate runoff, or ammonia, and result from fertiliser practices or animal wastes. Likewise, methane is produced by bacteria as cattle and sheep break down the cellulose in their diet, producing milk and meat for human consumption from large areas of grassland that would be unsuitable for arable farming. Unlike most sectors, the agricultural industry has the opportunity to sequester carbon in trees, hedges, peatlands and soils. This is addressed further in the Land Use, Land Use Change and Forestry chapterThere is now an opportunity, as we support farmers through the impacts of post-EU trade deals and recovery from COVID, for agricultural transformation. Our ambition and support for transformation is reflected in the policies and proposals set out to support the uptake of low carbon farming practices quickly and at scale to reduce the overall farm carbon footprint.

We are already working in partnership to develop new measures that will result in a rapid and widespread uptake, to transition to a sustainable sector that more directly and explicitly supports our climate and environmental ambitions.

Low carbon farming

Our planned support for transformation in the sector is reflected in the range of policies and proposals set out below which, together with a range of pilots and interventions supporting the transition to the Sustainable Farming Scheme, will encourage the uptake of low carbon farming practices quickly and at scale. Widespread adoption of all appropriate low carbon practices will combine to reduce overall farm carbon footprint.

Policy 61 – Regulations to reduce agricultural pollution

The Water Resources (Control of Agricultural Pollution) (Wales) Regulations 2021 came into force on 1 April 2021. The Regulations include transitional periods and will be fully implemented by 1 August 2024 and apply across the whole of Wales.

Whilst developed primarily to prevent the pollution of watercourses, the Regulations are also a key part of reducing atmospheric emissions from agriculture. Increasing nutrient efficiency will reduce losses of pollutants to the environment, including 319 tonnes of Nitrous Oxide (N_2O) and 343 tonnes of Ammonia (NH_3-N) annually. The Regulations are expected to reduce annual nitrous oxide emissions from agriculture by approximately 2.7% by the end of 2024.

£3.5m was made available to support on-farm infrastructure investment (through the Farm Business Grant- Yard Coverings) to reduce the volume of rainwater entering slurry stores and assist compliance with the Regulations.

Policy 62 – Glastir

Glastir is our current five year whole-farm sustainable land management scheme, offering payment for the delivery of specific environmental goods and services and contributes towards tackling emissions from agriculture. The main aims of the Glastir scheme are to reduce the impacts of climate change within agriculture and reverse biodiversity loss, whilst improving water, air and soil quality. Whilst the majority of Glastir Advanced contracts expire in December 2021, any remaining contracts will come to an end by 2023.

The Glastir Small Grants scheme provides support for farmers to undertake investments on farms to enhance their environmental performance, including the restoration and creation of hedgerows and small-scale tree planting.

Further information in relation to Glastir Woodland Creation and Glastir Woodland restoration schemes are discussed in the LULUCF chapter.

Policy 63 – Farm Business Grant (FBG)

A total of £40m was made available under the FBG through the EU Rural Development Programme to help farmers invest in new equipment and machinery. Grants of up to £12,000 were available to buy equipment to support farm efficiencies such as animal handling, energy efficiency, storage and management of nutrients – all of which contribute to lowering on farm emissions.

Policy 64 – Sustainable Production Grant (SPG)

A total of £22m was made available through the last three rounds of the SPG, with the last funding window having closed in March 2021. The scheme offered a maximum 40% grant contribution (from £12,000 to £50,000) towards capital investments in equipment and machinery which have been pre-identified to specifically support famers to address and safeguard nutrient management and improve water, soil and air quality by reducing the impacts of agriculture pollution.

Policy 65 – Wales Animal Health and Welfare Framework (WAHWF)

The WAHWF sets out our plan for continuing and lasting improvements in standards of animal health and welfare for kept animals, whilst also helping to protect public health and contributing to tackling the climate emergency.

Healthy animals help protect the productivity and production levels of farmers, reduce capital losses, minimise negative trade impacts as well as reducing pollution and greenhouse gas emissions. Greenhouse gas emission benefits that accrue from improved health vary between diseases. For example, a detailed and

comprehensive Life Cycle Analysis study found that completion of the Wales TB eradication programme would result in a 2% saving of emissions from the cattle sector in Wales, compared to a 2016 baseline. For other endemic diseases that are currently common and adversely impact productivity, control is likely to result in greater reductions in emissions from the sector.

Improving the health status of farmed animals can significantly reduce their carbon footprint, particularly when managed alongside actions to optimise feeding and breeding of animals for longevity – health benefits accrue most if animals are correctly fed, bred and accommodated.

Our goal is for all livestock farms in Wales to use Animal Health Planning as an integral part of their business management.

Policy 66 – Red Meat Development Programme

Hybu Cig Cymru are delivering the five year, £9.2m Red Meat Development Programme funded by the EU Rural Development Programme, which comes to an end in 2023.

The programme has three strands crucial to the red meat sector's future competitiveness, success and sustainability. From farm to fork, the projects contribute to an efficient red meat industry, leading to less wastage and therefore a reduction in greenhouse gases emitted from the supply chain.

Performance recording and using Estimated Breeding Values (EBVs) enables a robust and faster rate of genetic improvement and is a proven, cost-effective and long-term way of improving animal production efficiency. Identifying optimal genetics is crucial for the long term sustainable objective for improving the overall performance of any farming business, and offers both economic and environmental benefits enabling lambs to reach market specification sooner and with less inputs, thus improving a farm business's carbon footprint.

Policy 67 – Dairy Improvement Programme (DIP)

The DIP, funded by the Welsh Government through the Rural Development Programme is a £6.5m, five year programme (2014-2020) delivered by the Agricultural and Horticultural Development Board (AHDB). It delivers two distinct projects, Herd Advance and Strategic Dairy Farms which aim to increase the performance, health and resilience of the Welsh dairy sector. Healthy animals help protect the productivity and production levels of farmers, reduce capital losses, minimise negative trade impacts as well as reducing pollution and CO_2 emissions.

With funding available until 2023, AHDB Dairy will embark on several additional work packages from 2021 which will involve:

(i) addressing gaps in evidence and providing more insights on how to accelerate the uptake of the latest innovations and practices towards net zero;

(ii) providing baseline data for Welsh dairy farms via carbon audits and action plans; and,

(iii) modelling of a net zero dairy farm and other scenarios.

Policy 68 – Farming Connect

We will continue to work with farmers and their representative bodies to implement programmes in a way that provides the time, advice, and capacity to be effective.

Contracted from October 2015 until August 2022, Farming Connect is a £28m programme, providing subsidised independent, tailored business support and technical advice. The Advisory Service, an element of the wider Farming Connect Programme, provides advice on how to achieve optimum results from livestock, which in turn helps to reduce emissions.

Outcomes from projects and trials are shared widely to raise awareness amongst famers of the importance of emission reduction activities, changing behaviours and improving farming practices.

Also available through Farming Connect is the Greenhouse Gas Emissions Interactive Farm – a tool developed to demonstrate different examples of how a typical Welsh farm could reduce its greenhouse gas emissions (demonstrated as carbon dioxide equivalents, CO_2e) while also increasing profitability (either through saving money or increasing revenue).

The existing contract comes to an end in March 2023, and we aim to offer a future programme to ensure there will be no gap in support for farmers and foresters.

Policy 69 – Agriculture Bill

Following publication of the White Paper, we will introduce the Agriculture Bill to create a new system of farm support that will maximise the protective power of nature through farming. It is proposed that this new system will reward farmers who take action to meet the challenges of responding to the climate and nature emergencies, supporting them to produce food in a sustainable way. We will also seek to replace the time limited powers in the Agriculture Act 2020 which we took to provide continuity and some much needed stability for our farmers as we left the EU.

Proposal 23 – Sustainable Farming Scheme (SFS)

The SFS will continue to be developed throughout this carbon budget.
The proposed SFS will provide support to farmers – both financial and advisory – which will be targeted at outcomes not currently rewarded by the market. It is proposed the fundamental change to the current Basic Payment Scheme will be the level of payment being linked to the outcomes delivered by a farmer through undertaking a range of management actions on farm. The proposal is to go beyond an income foregone/costs incurred model and reflect the value of environmental goods provided through future payments. It is also proposed outcomes from existing good practice requiring continued maintenance should be recognised and rewarded as well as creation of new outcomes. This will ensure active farmers who are working to benefit the environment are supported.

The design of the SFS is underpinned by a range of evidence, analysis and modelling which helps us to understand the environmental and economic impacts of potential farm interventions. These interventions (actions farmers can take to deliver the outcomes we are seeking) will support farms to, amongst other things, reduce on farm emissions and maximise carbon sequestration. A range of interventions is proposed including:

- Increased livestock performance by improving animal health;
- Managing and reducing inputs such as artificial fertiliser;
- Improving soil health and soil carbon content;
- Increased energy efficiency and use of renewables, reducing reliance on fossil fuels;

- Increased tree cover through agroforestry; and,
- Restored and well managed natural habitats such as peatland.

We expect to commence this transition in 2024.

Proposal 24 – Work with farmers and the waste sector to improve resource efficiency and increase circularity on farms

In March 2021 we published 'Beyond Recycling – to make the circular economy in Wales a reality'. The strategy sets the pathway to a zero waste, net zero carbon Wales that keeps resources in use and avoids waste. Supporting better resource efficiency in agriculture is vital to achieving our aims.

There are a number of actions within the Beyond Recycling Strategy, which will support farms to be more resource efficient and require changes in approach. Over the course of this carbon budget period, the principles set out in the Waste Strategy will be integrated into agricultural policy to encourage behaviour change at the farmer level. These are:

(a) **Eradicate food waste**
The strategy includes an action to 'eradicate avoidable food waste' by working with businesses across the whole supply chain from farm to fork. Specific targets have been set including halving avoidable food waste by 2025 and 60% by 2030. We will work across supply chains to embed good practices whilst helping farmers become more efficient and adding value for local and regional producers and processors. During the pandemic, we have supported the expansion of organisations, which redistribute surplus food, particularly to those in need. We will work with farms to connect them to these networks reducing the amount of food that is wasted.

(b) **Improve business advice on resource efficiency to farmers**
Being more resource efficient is important for our environment and reducing emissions, but efficiency can also offer opportunities and increase resilience which is why the strategy commits to ensuring that businesses including those in the agricultural sector will be able to access support and advice through our services such as Farming Connect and Business Wales.

(c) **Introduce Extended Producer Responsibility for Packaging**
The Beyond Recycling Strategy commits to radically improve the recycling of packaging, by introducing an Extended Producer Responsibility (EPR) scheme to ensure producers bear the full end of life costs of their packaging and that they report on and meet packaging recycling targets set for Wales. This will include mandatory universal labelling to ensure it is easy for people to understand what can and cannot be recycled. This will incentivise better design and the use of more sustainable materials. We will work with farms and others who produce packaging to be aware of and ready for these changes.

(d) **Take action on single use items, especially plastic**

The strategy commits us to further action to reduce the environmental impacts of unnecessary single-use plastic to help meet our ambition of a litter and fly-tipping free Wales. We have been gathering evidence about the potential impacts of introducing bans or restrictions on several single-use items and considering how we can use these to encourage a switch to re-usable alternatives.

In terms of farms, this could include reducing the amount of single use plastics used and ensuring what plastic is used is recycled effectively such as bale wraps.

Net Zero Agriculture 2040

Pledge NFU Cymru

Proposal 25 – Fuel efficiency

In their December 2020 advice, the CCC explain improving fuel efficiency on farm will require transitioning from fossil fuel machinery to the use of electric mobile and stationery machinery. The CCC recommend encouraging the take up of low carbon technology such as robotics and improving/ updating on farm technology to reduce the use of fossil fuels for heating, cooling and lighting farm buildings.

Policies and proposals in the Electricity and Heat Generation Chapter set out how we will decarbonise electricity and heat generation, and this will underpin many of the actions set out on agricultural fuel efficiency. Wales has established targets for 70% of Wales's electricity needs to be met by renewables by 2030, which will contribute to decarbonising electricity use on-farm. The development of renewable energy and a hydrogen pathway will also identify opportunities for low carbon hydrogen to replace fossil fuels and contribute to reducing emissions on-farm activities. Activity in the agricultural industry will be aligned and supported by innovation support and guidance.

We will support agricultural businesses to exploit opportunities for use of low carbon farm technology and on farm renewable energy generation. Fossil fuel use on-farm will decrease as renewable energy, electrification of transport and heat and hydrogen and bio methane, from anaerobic digester, technology develops.

Zero emission technological advances in the transport sector will progress the technology available for use in agricultural machinery. A wider shift towards zero emission technologies in vehicles will bring down the cost of technology making it more accessible for use on-farm. It is anticipated, electric agricultural vehicles will primarily recharge on-farm from on-farm renewable energy generation in the future, whilst the roll out of electric vehicle charging infrastructure will support the use of these vehicles off farm.

Proposal 26 – Support innovation in renewable energy/technology

We have committed in our PfG to support innovation in new renewable energy technology. Some of the more innovative decarbonisation solutions in the energy sector have yet to be proven at scale. Over this period, we will work with Welsh businesses already leading the way in the development of low carbon mobile machinery, such as agri-tech and consider how we can support and share knowledge on the latest and most cost effective equipment for farmers through the Farming Connect Demonstration Network. Farming Connect will support farmers with improving on-farm fuel efficiency and identifying opportunities for large scale on farm renewables.

Welsh Government will explore support for small-scale renewable energy projects for on farm energy use and to encourage collaboration between land owners and local communities on larger scale renewable energy generation projects to feed into the grid. This is explored further in the Electricity and Heat Generation Chapter.

Hydrogen in farming

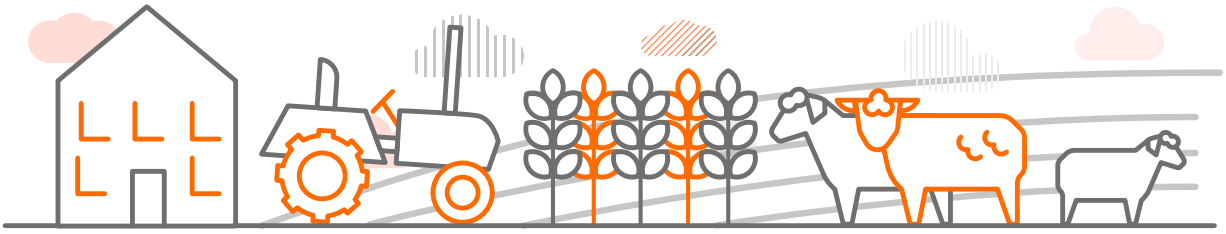
Hydrogen is a flexible fuel which will be important in our future low carbon economy. It has the potential to provide delivery solutions across power, heat and transport. Hydrogen is considered a leading technology option in particular for decarbonising heavy industry, and reduction of emissions in hard-to-abate vehicles including agricultural machinery. To facilitate the development of hydrogen activities and opportunities in Wales we are setting out a pathway for hydrogen development in Wales to 2025.

The development of hydrogen as low carbon energy vector, especially for heavy transport vehicles will create significant opportunities for farmers in Wales over the next five years. Direct farm uses for hydrogen will develop with renewable energy generation on site to produce green hydrogen through electrolysis of water, which can be stored, used as fuel and also sold onto different markets.

This will be especially advantageous in rural areas where grid connection is prohibitively expensive or where there is insufficient capacity. Advances in fuel cell technology and further cost reductions will open the door for hydrogen-powered tractors and other farm equipment. Several international specialist manufacturers have already started to develop this market.

Work is also under way to explore the feasibility of using hydrogen to produce ammonia fertiliser by combining it with atmospheric nitrogen and carbon dioxide on farming sites.

Welsh Government welcomes this existing work and asks industry to continue to develop low carbon agricultural machinery, this might include, for example, developing electric agricultural machinery and tractors. Further detail in relation to Hydrogen is available in the Electricity and Heat Generation chapter.



Case Study – Low Carbon Agriculture Show

Welsh Government will showcase policies at the Low Carbon Agriculture Show in March 2022. The show will highlight the work of Welsh Government in the spheres of decarbonisation and climate change mitigation against the backdrop of the biodiversity challenge in Wales.

The Low Carbon Agriculture Show is in place to help increase sustainability and drive down harmful greenhouse gas emissions in the agricultural and rural communities of the UK, through the generation of renewable energy, environmental best practice and the adoption of low carbon technologies/ practices. The event is made up of:

- Energy Now Expo – showcasing renewable & low carbon energy solutions, ways to optimise existing assets, plus best practice in energy management;
- Low Emission Vehicles Expo – exploring the decarbonisation of the transport sector, the vehicle/machinery options available and the related opportunities;
- Environmental Business Expo – focussing on emission control, environmental land management, regenerative farming and the achievement of net zero in agriculture;
- Farm Technology Expo – highlighting the agri-tech innovations, designed to boost productivity and further reduce harmful emissions.

An exhibition featuring all of the above will be accompanied by a multi-streamed conference, in which policy updates, practical guidance and further insight will be presented and discussed. These will be accompanied by demonstrations of the latest, low-carbon agri-tech and the opportunity to test drive the vehicles and/ or machinery in attendance.

Proposal 27 – Organic conversion

We are investigating the merits of a transitional scheme to provide financial support to farmers who are converting their operations to organic farming.

Farmers lose revenue during their period of conversion to organic, as livestock stocking densities are reduced and costlier organic feed and seed needs to be used. By providing farmers with a payment during the conversion process, Welsh farms will be able to meet part of the growing demand for organic products sold in the UK and hence shorten supply chains. The reduced stocking density of animals on farms will mean lower carbon emissions from farms themselves, while not using farm chemicals such as fertiliser will further reduce a farm's carbon footprint, because of the emissions caused during the production of such chemicals.

The proposed organic conversion scheme would segue into the introduction of the long-term SFS.

Proposal 28 – Precision farming

The uptake of new technology and precision farming techniques will be crucial in climate change mitigation.

From soil and grassland management, animal health, genetics and feed conversion, applying innovative practices on the ground will support the industry as it adapts to the challenges ahead. Extensive work already undertaken through schemes such as Farming Connect, the Red Meat Development Programme, Dairy Improvement Programme and EIP Wales, will be built upon. For example through:

- grassland utilisation – promoting and supporting better grassland utilisation through precision grazing techniques, including the use of data and IT to support decisions;

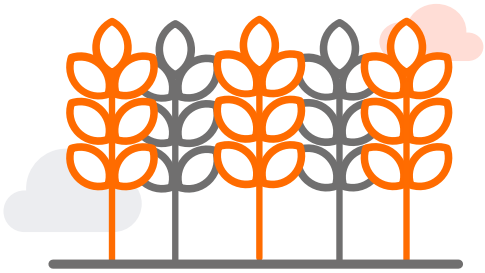
- use of satellite imagery to support farm grazing options;
- continuing to promote the understanding and uptake of EBVs to enable a robust and faster rate of genetic improvement; and,
- optimising inputs through the application of new technology.

As part of the All Wales Digital Strategy, Welsh Government wishes to create a cohesive approach to the development of the agri-tech sector in Wales, and to exploit precision agri-tech for the betterment of the agricultural economy and environment. A mapping exercise is being undertaken to assess the availability and use of agri tech in Wales with the intention of identifying opportunities for Welsh agriculture and to inform future decisions.

This proposal is subject to budget availability following the Comprehensive Spending Review in autumn and subsequent Ministerial approval. If approved, this proposal will be developed into a policy over the carbon budget period.

Measures to release land (sharing agricultural land in Wales)

Changes in consumer and farmer behaviour can release land from agriculture whilst maintaining an improved food production sector. Improving efficiencies on farm as well as some small changes over time to diet can also release land within Wales.



Developing our evidence base

In order to develop policies that build social, economic and environmental resilience and to evaluate programme implementation, we require a robust Environment and Rural Affairs Monitoring & Modelling Programme (ERAMMP).

Our ERAMMP aims to deliver a programme of monitoring and modelling, which collects data across the Welsh landscape and links any changes to their impacts on a wide range of benefits including decarbonisation and economic consequences.

The programme will also undertake modelling for the design and evaluation of programmes building a strong evidence base to deliver decarbonisation and natural resources policy.

In addition to ERAMMP, the Food, Agriculture, Biodiversity, Land-Use, and Energy (FABLE) Consortium is convened as part of the Food and Land-Use Coalition. It aims to understand how countries can transition towards sustainable land-use and food systems. FABLE modelling accounts for trade-offs between the competing land uses for food production, carbon sequestration, and biodiversity conservation. It also accounts for our dependency on food imports and the impact of this demand on other countries.

We are using this approach to understand and map out the policy and societal landscape to find a system based approach for land use in Wales. The modelling considers land use for farming, woodland and forest, biodiversity, peatland restoration, food production, food waste and change to human diet. This work will establish the best fit between our policy objectives and will be used to inform future scheme design by identifying both competing and complementary demands

on our land. The model will also inform possible future schemes, for example, for tree planting outside the SFS, additional biodiversity support, support for the food and drink sector, timber processing, anaerobic digestion, biomass and alternative energy generation.

Proposal 29 – Land sharing

The CCC recommends converting some of our agricultural land to woodland, shifting some agricultural land to biofuel production and the restoration and sustainable management of our peatland.

We have set out our proposal to establish SLM as the framework for future agriculture support by way of the Agriculture Bill. It is proposed that SLM will reflect the use of land for production, whilst ensuring our natural resources are preserved and enhanced for future generations. The intention is that SLM will incorporate the whole farming system. Farms will be incentivised to make best use of their land to deliver economic, social and environmental outcomes through a land sharing approach (which can be achieved, for example, through more diverse cropping, reducing the use of agrichemicals, planting more trees in and around fields and introducing more diverse species in a grass sward), as opposed to a land sparing approach (which can be categorised as intensifying farming practice to obtain the same yield from a smaller area of farmland so that less productive areas can be released specifically for conversion away from food production).

We are undertaking a range modelling and analysis (see evidence section below) into ways we can release land, continue to produce food sustainably and have resilient and productive farm businesses in Wales in support of our ambition for SLM. Information on other land use measures such as tree planting and peat restoration, is discussed in the following Land Use, Land Use Change and Forestry Chapter.

Proposal 30 – Explore the potential to support horticulture

We are currently exploring establishing interim schemes, to provide capital and revenue financial support for new and existing agro-ecological horticulture businesses, including support for indoor horticulture.

The horticulture sector in Wales takes up only a small area of agricultural land and a small number of agricultural businesses, but has a very high output per hectare. The June Agriculture and Horticulture Survey estimates horticultural land coverage of around 1,500 hectares in Wales out of a total utilised agricultural area of around 1.5 million hectares, or 0.1% as a proportion contributing to an estimated 3% of the nation's fruit and vegetable requirement. To cover the equivalent of 100% of our fruit and vegetable requirements we would need just 2.8% of Wales' agricultural land, or 12.8% of Wales' grade 1-3 land. One hectare of land produces an average of 18 tonnes of food per year when in agro ecological horticultural food production which far exceeds the output per hectare of any other farming method.

Conversion of suitable land to horticulture, combined with Controlled Environment Agriculture, which could take place in an urban or rural setting, gives the opportunity to free up land for tree planting. Controlled Environment Horticulture can be scaled up without being reliant on grade 1-3 farmland and good weather whilst poly-tunnels can provide shelter needed to efficiently produce crops in Wales.

5. Team Wales approach

We need everyone in the food system to play their part in decarbonising the agriculture sector. This includes farmers, the public sector, business and individuals. The collective action needed to decarbonise across the two broad areas of the Agriculture Ambition Statement is set out below and summarised in a diagram at the end of this chapter. In addition the *Working Together to Reach Net Zero* document accompanying *Net Zero Wales* sets out where our partners have already committed to taking action alongside additional case studies to demonstrate the action already taking place across Wales.

The Ask of Others

Individuals/households

Consumer choices will have a significant bearing on decarbonisation of the agriculture sector. The CCC advice report, 'The path to a Net Zero Wales Balanced Pathway recommends a **"20% cut in meat and dairy consumption by 2030, rising to 35% by 2050 for meat only, with meat and dairy being replaced with plant based products."**

Balancing this with the CCC 2020 report 'Land use: Policies for a net zero UK which noted, **"agricultural emissions should not be off-shored. Achieving emissions reduction should not be at the expense of producing less food in the UK and increasing imports. As the UK is a relatively low-greenhouse gas producer of ruminant meat compared to global averages, this risks exporting emissions abroad and increasing consumption emissions.''**

Welsh Government has agreed to develop a long-term strategy to promote a dietary shift toward the UK Governments 'EatWell Guide' (EWG) by encouraging Welsh consumers to eat healthier, more sustainably sourced food, to eat and waste less. We would further encourage the people of Wales to consider the positive impacts of eating locally sourced food and, crucially, minimising food waste. Through buying high quality local Welsh produce, we can work with our food production sector to ensure it is produced in a truly sustainable manner and avoid simply off-shoring emissions to other countries. Creating greater security and resilience in our food supply chains will also create opportunities for innovation, skills and jobs in the wider food and drink sector.

Public sector organisations

Regional Energy Strategies have been produced for four regions of Wales (North, Mid, South West and Cardiff Capital Region). The role of agriculture has been considered in the strategies within the wider regional context and where appropriate, agriculture has been identified as a priority. For example, one of the priorities of the Mid Wales Energy Strategy is to develop and harness the potential of agriculture to contribute to zero carbon goals.

Local Area Energy Planning (LAEP) builds on the work of the regional energy strategies, taking a more detailed approach to identify the low regret actions to decarbonise a local energy system. We are supporting two LAEP pilots in the Conwy and Newport Local Authority areas, with further roll-out during 2021-22. Farmers and land

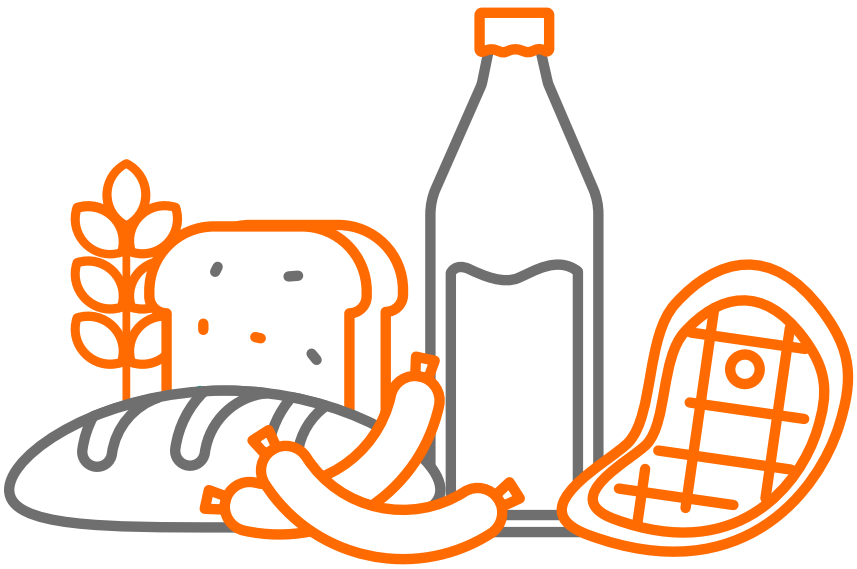
owners will be integral to developing and implementing the plans covering Wales' rural areas. LAEP is covered in more detail in the Power Sector Chapter.

We call on local authorities to ensure policies align to incorporate efforts in the agriculture sector. Local authorities should explore how they can support their farms/ land estates to decarbonise, retain existing carbon stores and capture carbon. Public sector net zero carbon reporting guidelines request local authorities report on land use and land use change within their control and these reports should reflect a clear trajectory to net zero.

Welsh businesses and industry

Increasing farm efficiency can improve productivity and reduce costs for farm businesses. Sustainable production of food can shorten and improve the resilience of supply chains.

The private sector also has a role in supporting investment in nature based solutions, supporting the circular economy and bringing forward novel approaches for natural accounting investment vehicles that farmers and land managers can access Welsh Government will continue to work with farmers, processors, retailers and industry representatives to support decarbonisation across the supply chain. Several have already made public pledges to decarbonise with some aiming to reach net zero as early as 2030. Welsh Government would welcome net zero commitment from all Welsh farm businesses, processors, retailers and industry representatives, including a commitment to support delivery of net zero carbon throughout the supply chain, including farm input supply chains (for example animal feed, fertiliser and machinery).



Case Study – Smart Living Net Zero Farm

The Smart Living Whole System Business Research Innovation for Decarbonisation (WBRID) scheme supports Welsh local authorities to issue challenges to businesses with innovative products, processes and services. The aim is to help communities and the public sector adapt to the challenge of net zero developments and integrate different energy sources and sectors on a whole system basis.

It is funding the North Wales Economic Ambition Board (representing six North Wales Local Authorities) to develop a net zero farm, using the Coleg Cambria farm at Llysfasi as a test bed for innovative solutions in both energy and land strands of their growth deal programme. The Net Zero Farm WBRID Challenge will address market failures associated with decarbonising agriculture in a commercial setting by piloting and developing innovative, place-based technological solutions replicable ways across Wales.

The three projects of the challenge will respond to action areas identified by National Farmers Union (NFU) Cymru:

1. improving farming's productive efficiency – the MSParc project will explore the potential for artificial intelligence to strengthen productive efficiency, supported by engagement with the Promar emissions foot-printing work (point 3 below);
2. boosting on-farm renewable energy and the bioeconomy – the BioFactory project will prototype promising low-cost, small-scale Anaerobic Digester technology, supported by engagement with the Promar emissions foot-printing work; and
3. farmland carbon storage in soils and vegetation – the Promar project will support regional farms exploring options for on-farm carbon sequestration by foot-printing emissions.

Lasting outcomes of this challenge will include a platform that can be used by Llysfasi and other livestock farms in Wales to confirm an emissions baseline and explore scenarios for net zero operations; a prototype for low-cost, small-scale AD technology and pioneering AI prototypes tailored to real farming market needs.

We will support the private, public and third sectors to innovate and develop sustainable products from Welsh Agriculture. An example is the project 'Welsh Wool Cluster – Gwlad y Gwlân'. This project aims to develop a vision for Welsh wool, bringing together an extensive network of stakeholders that represent every part of the wool supply chain. Developing and mainstreaming products made from wool has the ability to support agriculture in Wales and improve circularity. Welsh Government have committed, where possible, to:

- consider wool for insulation on their estate;
- work with the construction industry to develop sustainable building materials for future housing stock; and
- work with the Project Innovation Team at British Wool, academia and the Wool Testing Board on innovative pre commercial ideas for wool such as woollen tree guards which support the life cycle of a young sapling and have a significant impact on the reduction of plastic usage in the forestry industry.

Ask from the UK Government

We ask the UK Government to ensure future trade deals do not undercut the high agricultural and environmental standards delivered by Welsh farmers. We are working to ensure that sustainability and inclusion lie at the core of future trade policy and we want the emission intensity of agricultural goods, and livestock in particular, to be a consideration when assessing future trade deals.

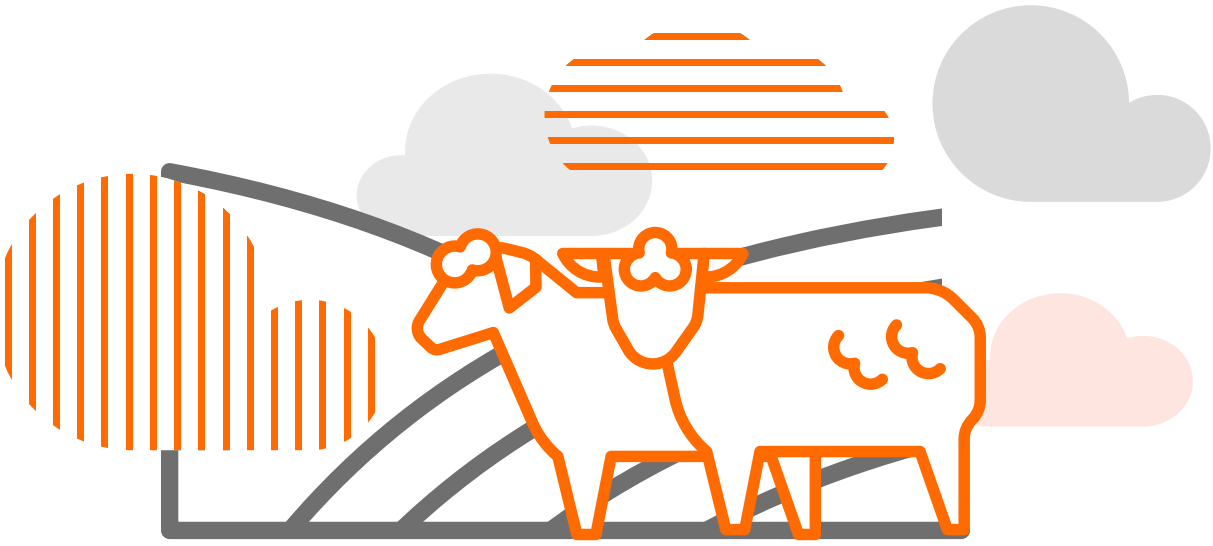
Inter-governmental co-operation and collaboration is key to building strong working relationships to ensure a strategic approach to delivery. The agri- food supply chain is complex and operates across government borders. In order to achieve greater impact, each organisation has the ability to effect change and only by working together can Wales and the UK deliver real change across our agricultural industry.

This collaborative approach has already commenced in some areas. For example, as described in the LULUCF chapter, we are already working alongside the UK Government to consider the ban of the sale of peat in compost.

Alignment and a collaborative approach would also be beneficial to support the use and development of technology and research, such as genetics, methane reducing feed, feed additives and manure remediation to minimise methane and nitrous oxide release with a view to minimising overall carbon footprint and environmental impact.

International engagement

Welsh Government asks the international community to match Wales' standards with regards to decarbonisation of agriculture and food safety and to commit to halting deforestation.



Agriculture

Ambition Statement

Two broad areas of mitigation

Low Carbon Farming Practices

- **Policy 61 –** Regulations to reduce agricultural pollution
- **Policy 62 –** Glastir
- **Policy 63 –** Farm Business Grant (FBG)
- **Policy 64 –** Sustainable Production Grant (SPG)
- **Policy 65 –** Wales Animal Health and Welfare Framework (WAHWF)
- **Policy 66 –** Red Meat Development Programme
- **Policy 67 –** Dairy Improvement Programme (DIP)
- **Policy 68 –** Farming Connect
- **Policy 69 –** Agriculture Bill

- **Proposal 23 –** Sustainable Farming Scheme (SFS)
- **Proposal 24 –** Work with farmers and the waste sector to improve resource efficiency and increase circularity on farms
- **Proposal 25 –** Fuel Efficiency
- **Proposal 26 –** Support innovation in renewable energy/technology
- **Proposal 27 –** Organic conversion
- **Proposal 28 –** Precision Farming

Measures to release land

- **Proposal 29 –** Land Sharing
- **Proposal 30 –** Explore the potential to support horticulture

Team Wales approach – The Ask of others	
1. Our Ask of the Welsh Public *(Individuals & Households)*	We encourage Welsh consumers to eat healthier, more sustainably sourced food and to actively consider the positive impacts of eating locally sourced food and minimising food waste.
2. Our Ask of the Public Sector	We want Local Authorities to explore how they can support their farms, land and estates to decarbonise, retain existing carbon stores and improve carbon capture.
3. Our Ask of Welsh Business & Industry	We would welcome net zero commitments from all Welsh farm businesses, processors, retailers and industry representatives, including a commitment to support delivery of net zero carbon throughout the supply chains, including farm input supply chains (for example animal feed, fertiliser and machinery).
4. Our Ask of UK Gov *(Call for UK action)*	We call on UK Government to: • To ensure future trade deals do not undercut the high agricultural and environmental standards delivered by Welsh farmers. We are working to ensure that sustainability and inclusion lie at the core of future trade policy and we want the emission intensity of agricultural goods, and livestock in particular, to be a consideration when assessing future trade deals; • To ensure a collaborative approach to support the use and development of technology and research, such as genetics, methane reducing feed, feed additives and manure remediation to minimise methane and nitrous oxide release with a view to minimising overall carbon footprint and environmental impact.
5. International Engagement	We ask the international community to match Wales' standards with regards to decarbonisation of agriculture and food safety and to commit to halting deforestation.

Land Use Land Use Change & Forestry (LULUCF)

1. Introduction

Scope

The LULUCF sector covers carbon emissions and sinks associated with land use including from forestry, urban land use and peatland.

Vision

The LULUCF sector is the only one in the second carbon budget period with the capability to remove emissions from the atmosphere. Locking up atmospheric carbon through plant photosynthesis is the only available and functioning mechanism we have to tackle emissions from other sectors.

To meet our targets, Wales must protect ancient woodlands, manage our soils better and affect a step change increase in woodland creation.

We want to plant 43,000 hectares of new woodland by 2030 in this decade of action and 180,000 hectares by 2050, aligning with the Balanced Pathway set out by the CCC.

Planting more trees will capture and store carbon, but can at the same time provide **a wide range of other benefits to Wales, including creating 'green' jobs, helping to address the nature emergency, increasing well-being, and mitigating flooding and air quality issues.**

Many of the trees planted will contribute to the new National Forest for Wales. The National Forest will be made up of areas of high quality woodland, stretching from the north of Wales to the south. It will be made up of both existing woodlands and newly created woodlands. These will be multi-purpose woodlands, benefitting nature, and creating amenity to be enjoyed by the people of Wales and visitors.

Delivering this new woodland will require an alliance for change involving many partners. The vast majority of new woodland will not be planted on land owned by Welsh Government, but by the communities, farmers and other landowners across Wales. **Our approach will involve harnessing the enthusiasm of communities** and finding solutions which work for landowners while avoiding land most productive for farmers.

Delivering this vision will require land use change. 180,000 hectares is equivalent to around 10% of agricultural land in Wales, and farmers have an important role to play. It will involve planting of new woodlands and also increased planting of 'hedges and edges', such as trees along field boundaries, scattered trees and shelterbelts. We recognise the risks of investment which could potentially lead to undesirable large scale changes in land ownership. Meeting our woodland creation targets will not be possible without attracting private sector funding, but **we must ensure this investment takes place in a way which benefits local communities**.

Meeting net zero will require using more timber in sectors such as construction to replace currently high energy manufacture materials such as steel and concrete. 80% of timber used in the UK is imported and only 4% of the 1.5 million m^3 of harvested Welsh timber is processed to be used as construction graded timber. In the future we will need to grow more timber in Wales, and use a greater proportion of that timber in high value added, longer life uses. This creates **a real opportunity for timber processors and manufacturers in Wales to contribute to a 'wood economy' in Wales, creating new jobs in rural Wales**.

During Carbon Budget 2 we will need to clarify the role of biomass in reaching net zero. In general, we would like to see **wood used for products and purposes that maximise its useful life** and that have the potential to displace other higher carbon materials. We will need to carefully consider whether biomass has a long term role in a sustainable energy system so that, where possible, we avoid pollution and other unintended consequences. During Carbon Budget 2 we will be developing our position whilst working with other UK administrations.

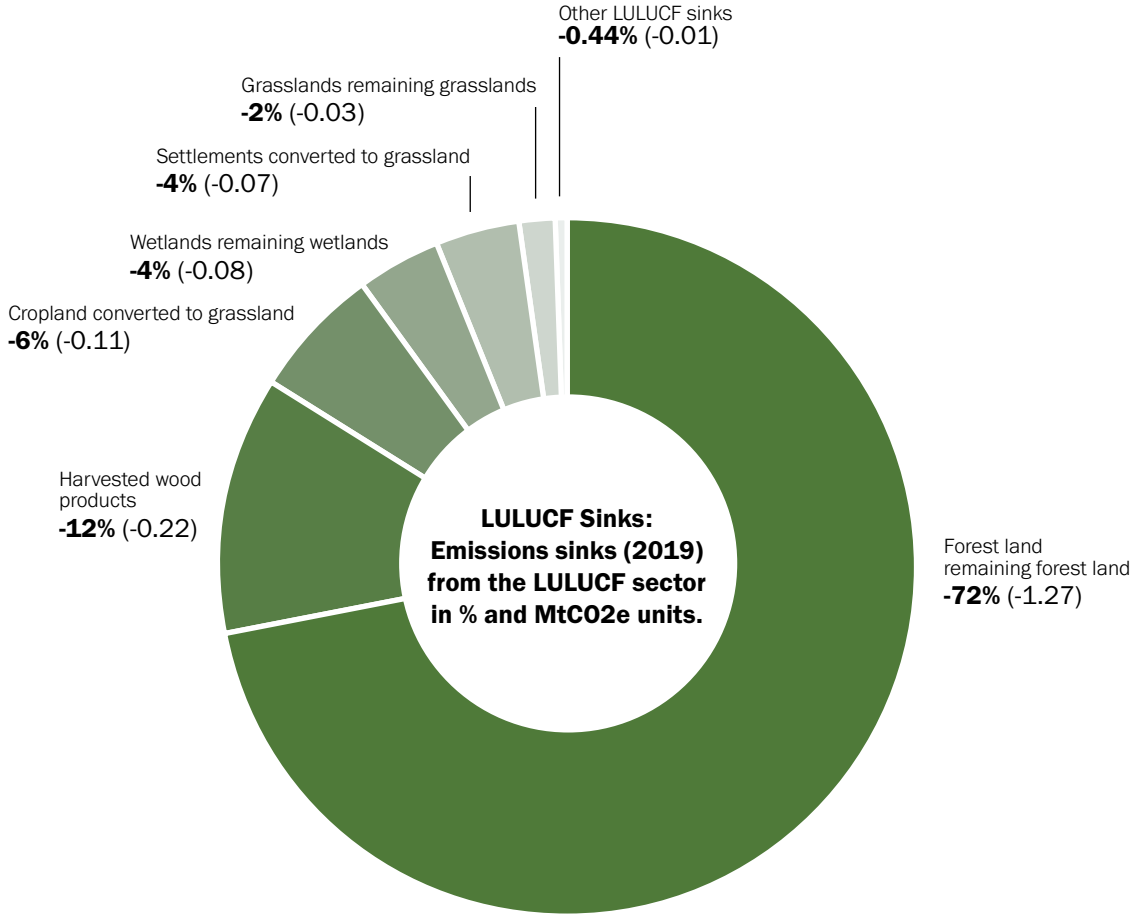
As well as increasing woodland creation we are committed to increasing other natural carbon stores. **Restoring and maintaining peatlands in good ecological condition will capture and store carbon, and also sustain their rich biodiversity**. Over the next 5 years **we will aim to restore 600-800 hectares of degraded peatland each year** through our National Peatland Action Programme. Blue carbon habitats such as seagrass and saltmarsh habitats currently sequester at least 26,100 tonnes of carbon per year and store at least 113 million tonnes of carbon in Welsh waters for the long term. We will begin targeted restoration of these habitats to capture and store carbon.

2. Emissions

Where the emissions come from

At -0.2 $MtCO_2e$, LULUCF provided a net reduction in Welsh emissions in 2019. The emissions reduction is largely due to the action of forest land removing carbon dioxide from the atmosphere. However, the sector comprises both sinks (activities that remove carbon dioxide from the atmosphere) and sources of emissions. In 2019, the largest sinks are existing forest land (72%), harvested wood products (12%), and cropland conversion to grassland (6%). The largest emission sources in the sector arise from grassland conversion to cropland (33%), grassland conversion to settlements (18%), existing cropland (15%), and existing settlements (11%).

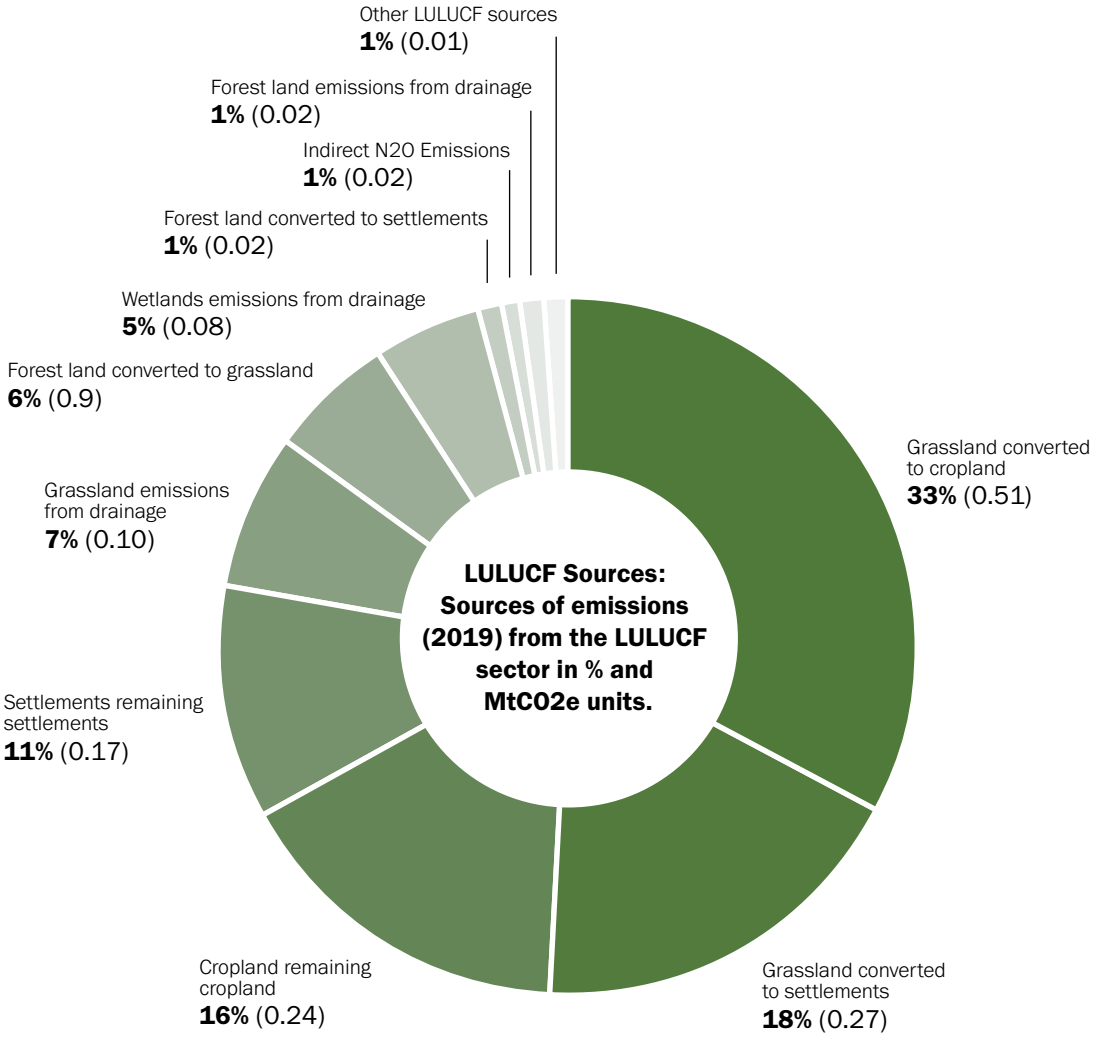
Figure 18: Graph – LULUCF sector sinks in 2019 ($MtCO_2e$)[84]



Total sink (2019): -1.78 $MtCO_2e$

84 The emissions data is sourced from the Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019 and aligned to the Welsh Government definition as described in Annex 4

Figure 19: Graph – LULUCF sector sources in 2019 ($MtCO_2e$)[85]



Total source (2019): 1.53 $MtCO_2e$

85 The emissions data is sourced from the Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019 and aligned to the Welsh Government definition as described in Annex 4.

Table 7: How the biggest emission sources in the land use and forestry sector contribute to the Welsh total

Source	% of total Welsh emissions
Grassland converted to Cropland	1%
Grassland converted to Settlements	0.69%
Cropland Remaining Cropland	0.60%

Summary of progress to date

Between the base year (1990) and 2019, the LULUCF net sink has changed from being a source of emissions at 78 $MtCO_2e$ to a sink of emissions at -245.99 $MtCO_2e$. Since 2001, the LULUCF sector in Wales has been almost always a net sink of greenhouse gases , only being a net source in 1990, and then briefly between 1999 and 2000.

In 2019, the net sink has grown by 15% compared to 2018, driven largely by a change in the forest land sink.

When considering sinks and sources of the LULUCF sector separately, the emissions from the LULUCF sources have only slightly decreased by 1% compared to 2018, while the LULUCF sinks have grown by 1% compared to 2018. The main influence on the emissions trends for the LULUCF sector are emissions from cropland and settlements as well as removals from forest land which outweigh the sources of emissions.

Figure 20: A graph to show 1990–2019 historic Welsh emissions for the LULUCF sector

3. Ambition statements

Meeting Carbon Budget 2 and entering onto a pathway for delivering net zero emissions across for Wales by 2050 will require action in two broad areas:

- **Increasing Tree Cover** – policies and proposals to increase tree cover by planting new woodland and improved woodland management.
- **Safeguarding & Increasing other carbon stores in soils** – by restoration of peatland and 'blue carbon' habitats.

LULUCF sector ambition statement

Wales will increase woodland creation rates, committing to supporting a total of 43,000 hectares of new woodland by 2030 and 180,000ha by 2050. Over 3,000 hectares of Peatland will be on a recovery pathway by 2025.

4. Policies and proposals

The policy action in this area focuses on two broad areas of increasing tree cover and safeguarding and increasing carbon stores and reducing greenhouse gas emissions.

Increase Woodland Creation

Policy 70 – Create a National Forest for Wales

The National Forest will be made up both of woodlands on Welsh Government land and those planted by others, and will require a range of interventions and actions to create. In part it will be funded through existing woodland support schemes, and the woodland creation scheme. However, it will also require standalone delivery and funding mechanisms to enhance and deliver areas of woodland that would otherwise not be supported.

This year, we launched The Woodland Investment Grant scheme to support and enhance woodlands that have the potential to become part of the National Forest. We have also opened a Community Woodlands scheme to fund community groups to enhance and develop their woodlands to National Forest Status. There are currently 14 areas of National Forest, all located on the Welsh Government Woodland Estate. Later this year we will plan to begin awarding the National Forest brand to other woodlands that meet the National Forest outcomes.

Over the next five years we plan to create 30 new woodlands and 100 Tiny Forests to form part of the National Forest. This year we will consult on the long term strategy, organisational principles, delivery and funding models for the National Forest.

Policy 71 – Woodland Creation Scheme

The Welsh Government currently funds woodland creation through the Glastir Woodland Creation scheme, which provides grants to farmers and land managers to support planting of woodlands. In 2020 the Welsh Government allocated £17m to woodland creation through the Glastir Woodland Creation scheme – the largest allocation since devolution. The scheme will provide payments to landowners to plant trees in Wales over the next two years. We opened a new window in September 2021 to allow more applications for this funding and ensure the full budget is spent.

As we move beyond the Rural Development Programme we will introduce a new woodland creation funding offer. This will include separate funding for creating new woodland, to develop a regular stream of new projects and enable us to be more agile in allocating funding to woodland creation.

We will launch a pilot of this system this year (2021), making support available for at least 500 hectares of future woodland plans. Our new scheme will make funding for woodland creation available consistently through the year rather than in unpredictable windows. It will introduce a system of earned recognition which empowers woodland planners to design sustainable woodlands while ensuring there are appropriate checks that trees are planted in line with the UK Forestry Standard, as a means to demonstrate the Sustainable Management of Natural Resources in Wales.

We also provide support for the restoration of existing woodlands affected by tree disease through the Glastir Woodland Restoration scheme. £1m was allocated

to this scheme in 2021 and we will consider how to continue to support improved woodland management going forward with a view of publishing further detail with Carbon Budget 2 period.

Proposal 31 – Attracting private sector investment into woodland creation

Consistent public funding will be essential to reach our woodland creation targets. However as the CCC's report on land use makes clear, the level of woodland creation required will not be possible through public sector support alone but will require attracting private sector investment into forestry. We want to ensure this investment benefits local communities and does not lead to widespread changes in land ownership.

The Welsh Government supports the Woodland Carbon Code, which has been developed to provide a reliable and consistent method for measuring the CO_2 captured from the environment by trees, and issue verified carbon units to owners of woodlands. These carbon units can be sold to individuals and organisations wishing to offset their own emissions or invest in decarbonisation.

Future income from carbon units could make planting woodland more financially viable without the Welsh Government paying all of the full costs of planting. We established an experts working group in August 2021 to consider models to attract investment in woodland creation without disrupting existing communities and patterns of landownership. The group will report their findings before the end of 2021 which we will use to inform policy on woodland creation funding.

Proposal 32 – New Sustainable Farming Scheme (Woodland Strand)

We intend for the new sustainable farming scheme, discussed further in the Agriculture chapter, to provide payments to farmers who choose to deliver positive benefits from planting and managing woodland on their farms.

This support will build upon the progress which will be made under the new woodland creation funding scheme over the next four years.

We also want to support farmers in planting 'hedges and edges'. We will develop and implement mechanisms to improve support for this ahead of the Sustainable Farming Scheme being introduced.

Proposal 33 – Supporting tree planting by families and communities

The National Forest for Wales is an asset for everyone and we would like every family with a garden to plant more trees. We will provide more detail about the support we will provide to families and individuals in the winter of 2021-22. As part of this we would like every school and community group to sign up to the Woodland Trust free tree scheme. We will also be working with public bodies to map land they own to proactively identify where more trees can be planted, learning lessons from approaches like Belfast One Million Trees.

Well-being Spotlight – Healthier Wales

The health benefits of spending time in natural spaces such as forests are increasingly valued. By engaging communities in creating woodland, communities have the opportunity to build connection with nature and securing wellbeing benefits. Connecting communities with trees, woods and forests has become increasingly important in recent years due to widespread mental health difficulties and inactive and sedentary populations. The most vulnerable in society are often those who also experience mental and physical health problems. Access to woodlands can bring the most benefit to these groups. The Healthy and Active Fund (HAF) supports projects that aim to improve mental and physical health through enabling healthy and active lifestyles, with one such project being Smallwood Association's **Actif Woods Wales** project. This project aims to improve people's health and wellbeing through social prescribing to regular activities in woodlands, which incorporate physical activity, nutrition and woodland skills. It increases the understanding among health professionals of the benefits of woodland activities for health, and ways in which our local greenspace can be utilised as a community asset to improve long-term health in local populations.

Activities undertaken within forests can strengthen existing social relationships, while organised activities within forest environments can create the opportunity for new relationships, including people's involvement with volunteer groups and community forests (social capital). The types of benefit range from formal learning through Forest Schools to personal development gained through volunteering and apprenticeships. Studies show the long-term educational importance of connecting children and young people with nature.

Proposal 34 – Develop a New Timber Industrial Strategy for Wales

The Timber Industrial Strategy will seek to identify priority interventions across the timber supply chain to develop a wood economy and encourage greater use of timber in construction.

We will take action to increase the supply of timber available for long-life uses, including graded structural timber. This will include setting out the role of NRW, who have committed to selling up to 30% of their timber through alternatives to the current model focussed on sale for highest financial value. We will also take action to increase demand for timber in these markets. This will include encouraging developers to construct buildings with lower embodied carbon and identifying priority markets for Welsh timber.

We will publish the strategy by the end of 2022.

Safeguarding & increasing carbon stores in soils and biomass

Our planned support is reflected in the policies and proposals set out below, which will safeguard and increase carbon stores.

We will:

- Deliver 600-800 hectares of peatland restoration per year by implementing the National Peatland Action Programme.
- Convene a national peatland restoration practitioners group to help ensure consistency of delivery.
- Consult alongside the UK Government on a proposal to ban the sale of peat in compost.
- Establish a targeted scheme to support restoration of seagrass and saltmarsh habitats along our coastline.
- Deliver a shared blue carbon evidence plan through the Welsh Marine Evidence Strategy for 2019–2025.

Policy 72 - Implementing a peatland restoration Programme over Carbon Budget 2

Welsh Government aims to ensure wide scale peatland restoration and sustainable management through its National Peatland Policy Ambition. Working with N RW the two key elements are to produce a map to help baseline assessment of peatland in Wales and to implement the National Peatland Action Programme over its initial 5 year costed period, with formal programme review in 2024-25.

The new National Peatland Programme is expected to be published in Autumn 2021. The aim of the map is to incorporate all relevant Soil Survey data for England and Wales and other suitable peat mapping data for the development of new GIS data layers. These new layers will contain information on carbon stocks and greenhouse gas emissions from peat. The new peat map will be on a 50m gridded raster in order for each 50m square to be updated with real information as and when available on its condition, carbon stored, greenhouse gas releases and depth. Access to it will be free and made available to the public. It will also be used for NRW to report and monitor the benefits of peatland restoration activities.

Wales' first national peatland action progamme[86] (NPAP) outlines a plan of action to be taken over the next five years with six priority themes. The programme will target those peatland bodies most in need of restoration with the aim of delivering **600-800 hectares of restoration per year**. Welsh Government has allocated £1.5m for year 1, with a further £1m per annum for the remaining 4 years. Works began in September 2020. In addition, from July 2021 Welsh Government funded NRW to establish a National Peatland Team in NRW to deliver the NPAP.

Over the period of Carbon Budget 2 the programme will work closely with the existing Area Statement partnerships in Wales to stimulate and support peatland restoration activity by partners. This will ensure NPAP delivery is firmly based upon the Sustainable Management of Natural Resources principles and contributes to Welsh Governments Natural Resources Policy. NPAP will also convene a national peatland restoration practitioners group to help ensure consistency with delivery and monitoring, support collaborative effort, and share information about project plans and funding. A wider programme of communications and stakeholder engagement will also start later in 2021.

The first 5 years of the NPAP is as much about building capacity to restore for the future as it is about direct delivery itself – laying sound foundations for meeting the challenge ahead through investment in skills and infrastructure. As the NPAP develops and peatland restoration effort progresses year on year we will increasingly need to focus on sites that are more complex, costly and contentious to restore.

The ability to increase delivery against the carbon targets will be demonstrated as the NPAP progresses and as it gets to the formal year 4 review point (2024). We will develop plans for the next phase (2025–2030) before the end of this carbon budget period which set out how we will maximise the area of peatlands in Wales in good condition, in line with our aim to bring under sustainablemanagement all areas of peat supporting semi-natural habitat.

86 https://naturalresources.wales/about-us/strategies-and-plans/national-peatland-action-programme-2020-2025/?lang=en#:~:text=Wales%E2%80%99%20first%20national%20peatland%20action%20progamme%20outlines%20a,also%20safeguard%20those%20in%20good%20and%20recovering%20

Proposal 35 – The ban of the sale of peat in compost

We are working alongside the UK Government to consider the ban of the sale of peat in compost. Whist there is no commercial peat extraction for compost in Wales, banning the sale of peat in compost in Wales would support other countries to stop the release of carbon caused by peat extraction, supporting our commitment to global responsibility.

Proposal 36 – Investigating the potential contribution of blue carbon to achieve net zero

Marine and coastal habitats, including saltmarsh, seagrass, shellfish beds and subtidal sediments, sequester and store large amounts of carbon, referred to as blue carbon. These blue carbon habitats currently sequester at least 26,100 tonnes of carbon per year and store at least 113 million tonnes of carbon in Welsh waters for the long term.

Blue carbon is not currently included in the greenhouse gas Inventory so it cannot yet be accounted for in the net zero ambition for Carbon Budget 2. UK Government (BEIS) have commissioned work to understand the steps needed for the inclusion of saltmarsh and seagrass habitats (which, together with mangroves, the IPCC defines as coastal wetlands) in the LULUCF inventory in future.

The PfG 2021 – 2026 commits us to establishing a targeted scheme to support restoration of seagrass and saltmarsh habitats along our coastline.

The blue carbon potential of Welsh marine habitats has recently been estimated in an NRW report of 2020[87], and further work has been carried out to identify opportunities to restore vital marine habitats – including those identified as being valuable for blue carbon storage, including saltmarsh, seagrass beds, native oysters, horse mussel beds and intertidal mud flats.

Protecting blue carbon habitats will require us to take an approach informed by robust evidence. We will work with NRW and others to develop and deliver a shared blue carbon evidence plan through the Welsh Marine Evidence Strategy for 2019–2025, to include the impacts of human activity and climate change itself on blue carbon habitats and emissions. We will take action wherever necessary, informed on an ongoing basis by this evidence, to protect blue carbon habitats spatially and by activity.

5. Team Wales approach

We need everyone to play their part in decarbonising the LULUCF emissions sector. Collective action must include the public sector, business and individuals as well as the UK Government and international partners. The Working Together for Net Zero document accompanying Net Zero Wales sets out where our partners have already committed action through their pledges together with additional case studies to demonstrate the action already taking place across Wales.

The details of our ask of others is set out below and the Team Wales approach is summarised at the end of this chapter.

Ask of others

Individuals/households

We are engaging with a wide range of stakeholders to develop plans for the National Forest and will continue to encourage and support communities to create woodlands. The National Forest will

87 Armstrong, S., Hull, S., Pearson, Z., Wilson, R. and Kay, S., 2020. Estimating the Carbon Sink Potential of the Welsh Marine Environment. NRW, Cardiff, 74p

offer opportunities for people to engage with woodlands for education and recreation and we will seek to raise awareness of the benefits of woodland. We want everyone in Wales to have the opportunity to plant a tree in their garden. We also encourage every school and community group to sign up to the Woodland Trust free tree scheme.

Through the National Peatland Action Programme we want to increase public recognition of the importance of peatlands and the ecosystem services and benefits which they provide to the communities of Wales, thus increasing public interest in and support for restoration enabled by public funds. This will include raising public awareness in Wales of the damaging effects of using peat based compost and benefits of non-peat based alternatives. For further information on how we will involve people over Carbon Budget 2 see the Working with People section in Part 2.

Public sector organisations

Welsh Government will work with public bodies to map land they own to identify where more trees can be planted. We will work with housing associations to develop a strategic approach to demand for Welsh grown timber. The public sector chapter describes a commitment to take steps to understand the sequestration potential of land in their ownership by March 2023 and commit to taking action to realise this potential by March 2030.

We call on public sector organisations to produce costed action plans for the restoration of peatlands under their direct management or influence, and to allocate budgets to this purpose. This work will be supported by the national peat data portal under development by NRW as part of the NPAP. We also need them to develop approaches to "Green Prescribing" to encourage public access to and use of peatland sites across Wales, thereby contributing to national Well-being goals.

We have structured the NRW pledge around the priorities within the route map for decarbonisation across the Welsh public sector, particularly as they were based on those of NRW's Carbon Positive project. The pledge highlights just some of NRW's key decarbonisation actions during the timeframe of the Plan (2021–2026). As a net carbon positive organisation by virtue of the woodland estate that we manage, NRW will work to further reduce our emissions and manage the Estate to support the ambition for a carbon neutral Welsh public sector by 2030.

Natural Resources Wales Pledge [88]

Welsh businesses and industry

We call on businesses to consider the use of Welsh timber as a sustainable material, and to plant trees on their land if possible and appropriate.

We need businesses to support investment in peatland restoration, using validated mechanisms such as the Peatland Code and bespoke approaches where local businesses have a particular association with a site or group of sites.

We also need restoration of peatlands by the private forestry sector based on the approach developed by NPAP for the Welsh Government owned forestry estate. We also need the renewable energy sector to ensure developments pose a net negative peat soils emissions impact on peatland sites through implementing habitat restoration plans.

88 For full Pledge see All Wales Plan

Ask of the UK Government

Woodland creation and peatland restoration are both devolved policy areas. We will work with the UK Government and other devolved administrations on areas where cross-border collaboration is required, such as building the wood economy.

The UK Government must come forward with clear plans for how the European funds we historically utilised will be made available to Welsh Government.

We will continue to engage with the UK Government and other devolved governments to ensure a UK-wide approach to the phasing out of horticultural peat.

International engagement

We will continue to act as a globally responsible nation, building and growing sustainable partnerships in sub-Saharan Africa that support the delivery of the UN's Sustainable Development Goals. Working in partnership with the Size of Wales, the Mount Elgon Tree Growing Enterprise and local partners we have built strong links with local government, institutions and communities as they seek to cope with climate change.

To date nearly 18m trees have been distributed and we are on course to distribute 25 million trees by 2025, providing tree seedlings to farmers and land managers in the Mbale region of Uganda. We will continue to support the distribution of over 3 million trees per year in Uganda, one for every person in Wales. We will also support the development of a major pan African tree planting project.

LULUCF

Ambition Statement

Two broad areas of mitigation

Increase woodland creation

- **Policy 70 –** Create a National Forest for Wales
- **Policy 71 –** Woodland Creation Scheme

- **Proposal 31 –** Attracting private sector investment into woodland creation
- **Proposal 32 –** New Sustainable Farming Scheme (woodland strand)
- **Proposal 33 –** Supporting tree planting by families and communities
- **Proposal 34 –** Develop a new Timber Industrial Strategy for Wales

Safeguarding & increasing carbon stores in soils and biomass

- **Policy 72 –** Implementing a peatland restoration Programmeover Carbon Budget 2

- **Proposal 35 –** The ban of the sale of peat in compost
- **Proposal 36 –** Investigating the potential contribution of blue carbon to achieve net zero

Team Wales approach – The Ask of others	
1. Our Ask of the Welsh Public *(Individuals & Households)*	We encourage everyone in Wales to have the to plant a tree in their garden, school or community and to also better understand the importance of peatlands and the ecosystems services; and increase their awareness of the damaging effects of using peat based compost can have.
2. Our Ask of the Public Sector	We ask that public bodies map land they own to identify where more trees can be planted and to better understand the sequestration potential of their land. We also call on public sector organisations to produce costed action plans for the restoration of peatlands under their direct management or influence, and to allocate budgets to this purpose.
3. Our Ask of Welsh Business & Industry	We ask businesses to consider the use of Welsh timber as a sustainable material, and to plant trees on their land if possible and appropriate. We also need businesses to support investment in peatland restoration.
4. Our Ask of UK Gov *(Call for UK action)*	**We call on UK Government to:** • Come forward with clear plans for how the European funds we historically utilised, will be made available to Welsh Government; • Engage with us and other devolved governments to ensure a UK-wide approach to the phasing out of horticultural peat.
5. International Engagement	We would like to encourage other nations to follow its example by supporting tree planting projects across the world, buildings strong links with international institutions, local governments and communities to support them in dealing with climate change.

Waste management

1. Introduction

Scope

The waste management sector covers the collection and treatment of waste and recycling. It is an important economic sector in Wales, and a part of the foundational economy.

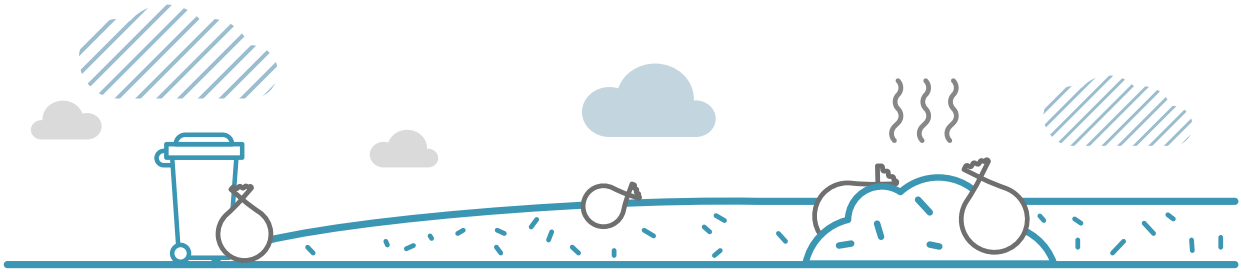
Vision

The vision for waste in Wales is clear: by 2050, there will not be any as everything will be reused or recycled. *Beyond Recycling – a strategy to make the circular economy in Wales a reality*[89] was published by the Welsh Government in March 2021 and sets goals for zero waste to landfill by 2025 and zero waste (100% recycling) by 2050. This means that after 2025, there will be no need for new landfills for waste generated in Wales. This vision **delivers all sorts of benefits to health, to the well-being economy, to society** as well as to our emissions.

In the short term and in this carbon budget, key actions from the strategy will drive further emissions reduction as part of the wider range of cross-government actions, which set us firmly on the path to a circular economy (there is more detail about this in Part 2). Although all waste is in scope, actions in this chapter are focused on further improving the management of any waste that arises, with an emphasis on biodegradable waste given its emissions footprint.

Wider actions from the Strategy are included elsewhere in this Plan for this carbon budget, including key PfG commitments to introduce an Extended Producer Responsibility Scheme for packaging, the delivery of re-use and repair hubs and community recycling facilities in town centres, together with action to bring forward Deposit Return Scheme for drinks containers, and new recycling regulations to require businesses and other non-domestic premises to separate their waste streams. These reforms will primarily deliver carbon savings against both our consumption emissions and our production emissions within the Business and Industry sector. However they will also benefit emissions in the waste sector as a consequence of preventing and further reducing waste landfilled. **These reforms will be brought forward within the first half of the budget period** – more on this in the business and industry chapter.

Wales already has global recognition as a leader in recycling – in 2019-20 we achieved a municipal recycling rate of 65%[90].



89 https://gov.wales/sites/default/files/publications/2021-03/beyond-recycling-strategy-document.pdf
90 https://gov.wales/local-authority-municipal-waste-management-april-2019-march-2020

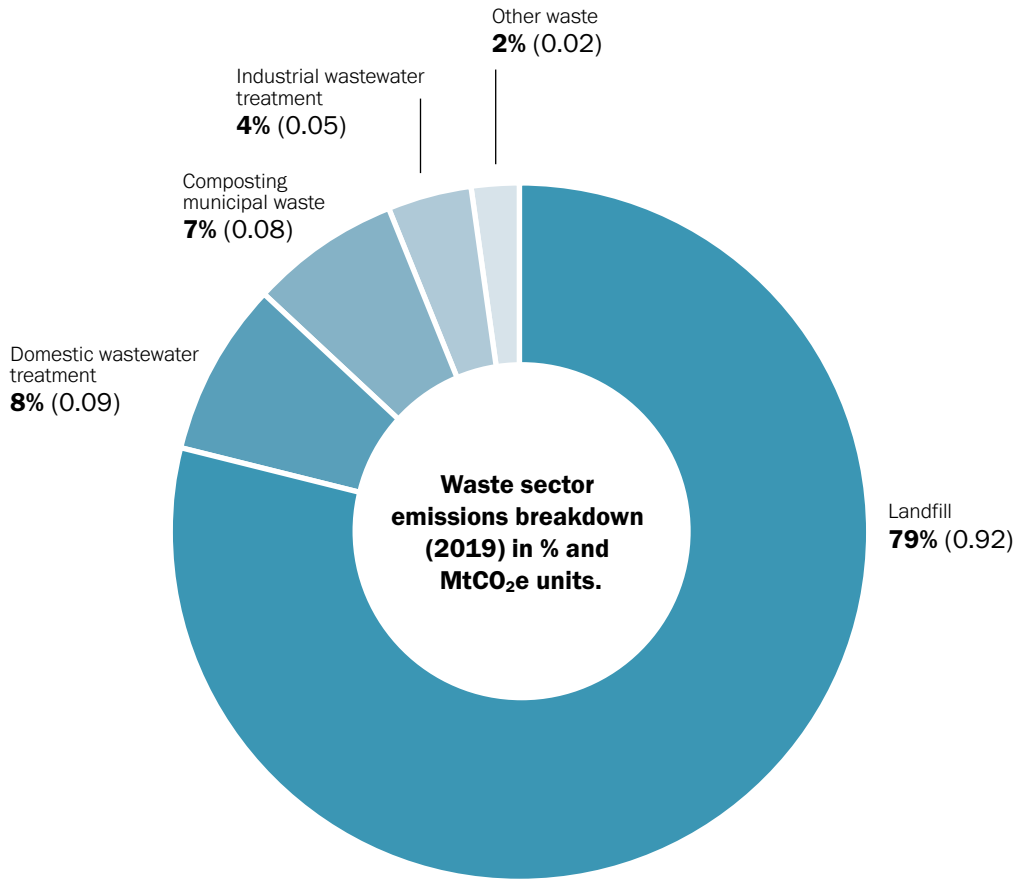
This includes universal food waste collection from households, which through anaerobic digestion generates valuable renewable energy. By increasing recycling further Wales will not only reduce emissions in the sector but will contribute to wider systemic change. Increasing recycling for example means making more recycled material available to be used in new products, thereby reducing emissions elsewhere and reducing the need for virgin raw materials. It can also **improve our communities and our economy by helping to shorten supply chains, improve efficiency, create employment and increase competitiveness.** Recycling, re-use and repair also provide opportunities for **communities to come together to share resources and revitalise the places we live in.** Fundamentally, reducing our waste and making things last longer can also save citizens and businesses money.

2. Emissions

Where the emissions come from

At 1.2 $MtCO_2e$, Waste accounted for 3% of Welsh emissions in 2019. Waste emissions are dominated by emissions of methane at 92% of the sector, followed by nitrous oxide (7%) and carbon dioxide (1%).

Figure 21: Graph – Waste sector emissions in 2019 ($MtCO_2e$)[91]



91 The emissions data is sourced from the Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019 and aligned to the Welsh Government sectoral definition as described in Annex 4.

Table 8: How the biggest emissions sources in the waste sector contribute to the Welsh total

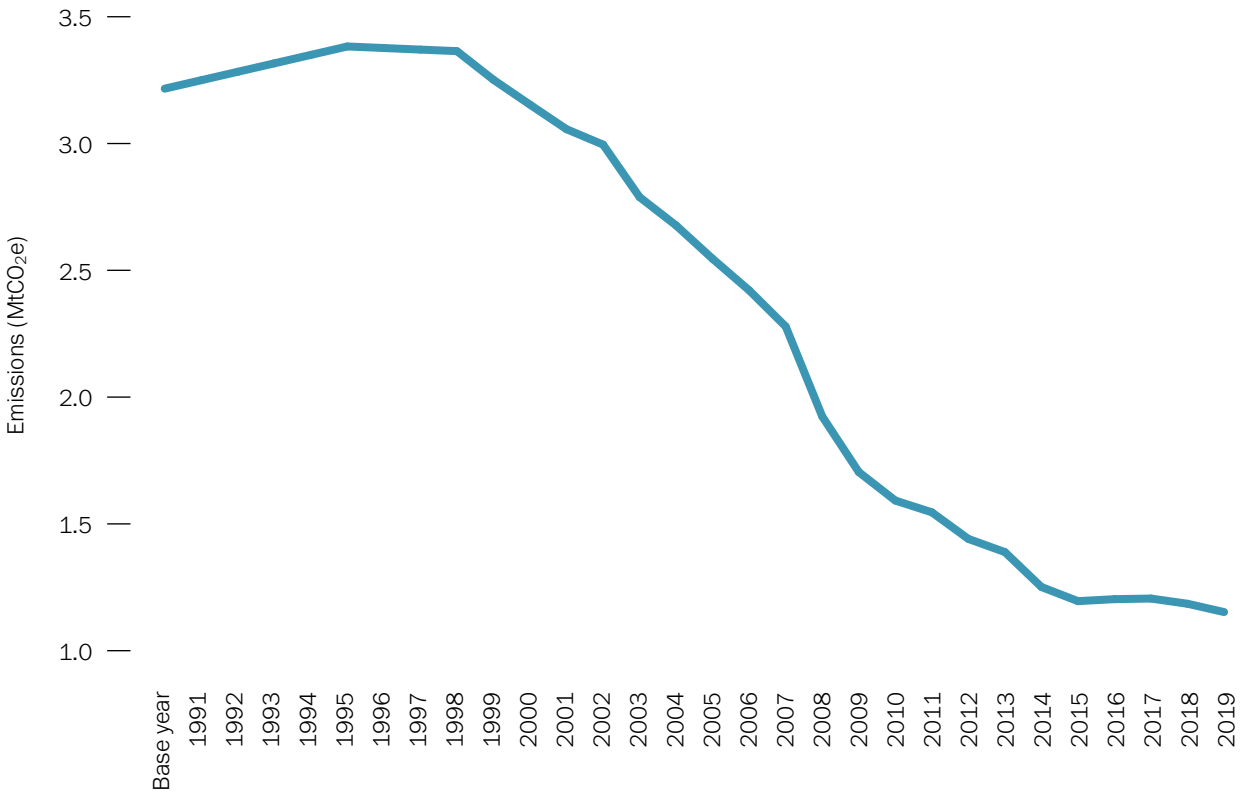
Source	% of total Welsh emissions
Landfill	2%
Domestic wastewater treatment	0.2%
Composting municipal waste	0.2%

Summary of progress to date

Total emissions from the waste sector in Wales have declined by 64% between the base year (1990) and 2019, driven largely by the reduction in the landfilling of biodegradable waste and also through progressive introduction of methane capture and oxidation systems within landfill management.

In 2019, waste sector emissions declined by 2.8% compared to 2018 largely driven by a reduction of emissions in the management of methane capture at landfill sites, while emissions derived from domestic wastewater treatment and composting municipal waste have increased by 6% and 1%, respectively, compared to 2018.

Figure 22: A graph to show 1990–2019 historic Welsh emissions for the waste sector



3. Ambition statements

Meeting Carbon Budget 2 and entering onto a pathway for delivering net zero emissions across Wales by 2050 will require action in this sector in three broad areas:

- **Landfill** – Reducing the greenhouse gas emissions from landfill sites.
- **Recycling** – To achieve 70% recycling across all major waste streams.
- **Behaviour change** – To promote recycling and further reduce waste.

These areas for mitigation align with the levers in our Wales 2050 calculator, which we have used to set the Wales 2050 pathway. These inform our ambition statement for the waste sector.

Waste sector ambition statement

Between now and 2050, we will build on our strengths as one of the world's highest recycling nations, to become a zero waste nation by 2050. That will mean that virtually no materials are buried or burned and we have effectively 100% re-use and recycling. By keeping resources in use the sector will support the wider transition to a circular more resource efficient and net zero carbon economy.

By encouraging behaviour change and improved waste management, we will continue to reduce the amount of waste that ends up in landfill sites, prioritising the reduction of biodegradable waste to as close to zero as possible by 2025.

By 2025, greenhouse gas emissions from landfill sites will reduce by 19%, compared to 2019.

4. Policies and proposals

Our focus in this chapter is on the direct emissions from the waste sector. The following policies and proposals set out how we will continue our action to reduce landfill and maximise recycling, alongside the actions covered elsewhere in the plan to prevent waste from arising in the first place as part of our wider circular economy strategy.

Landfill

Policy 73 – Reduce waste sent to landfill

For Carbon Budget 2, as part of our action to reduce landfill overall we will:

- halve the amount of avoidable food waste[92]; and,
- reduce the landfilling of biodegradable waste in Wales to zero by 2025.

We have been on a trajectory of reducing landfill in Wales and this will continue. We are now targeting wastes which contribute the most emissions, such as food. By significantly reducing food waste and increasing the recycling of any biodegradable waste generated (for example through anaerobic digestion), we can reduce the damaging methane emissions caused by burying it in landfill. Anaerobic digestion also has the added benefit of generating renewable energy, thus contributing to renewable energy generation targets and decarbonising energy supply.

These ambitious targets will be delivered by utilising the universal separate household food, paper/cardboard and garden waste collection already in place throughout Wales, increasing the separate collection of food, paper, cardboard and textile waste from non-domestic premises and driving more reuse, recycling, composting and anaerobic digestion of those biodegradable wastes.

92 Against a 2006 baseline

This work will be complemented by preventative action being taken to reduce waste and encourage more efficient use of resources as set out in the circular economy section of this Plan and other chapters.

FareShare Cymru

Food that is wasted can end up in landfill generating methane, an extremely damaging greenhouse gas. In addition to our work to collect food waste from households for anaerobic digestion, we have also been working to ensure that edible surplus food is redistributed to those in need through supporting FareShare Cymru.

Since 2011, FareShare Cymru, have redistributed the equivalent of almost 11 million meals to those in need and currently provide quality surplus food to around 180 community organisations and charities throughout the country.

They saved 819 tonnes of surplus food from waste in 2020, enough to provide almost 3 million meals – which was diverted to organisations, including homeless shelters, school breakfast clubs and community centres.

The pandemic has driven a 70% increase in membership and doubling of the amount of food being redistributed, and FareShare Cymru have increased their coverage across Wales to meet the increase in demand.

Supporting surplus food redistribution is not only supporting people in need across Wales but also delivering against other key goals, including our aim to halve food waste by 2025 and the major impact cutting food waste has on climate change emissions.

Proposal 37– Further increase CH_4 capture and utilisation in Welsh landfill sites by 2030

All operational landfills in Wales have been required to capture and utilise landfill gas since 1999. In Wales, this is implemented through the Environmental Permitting (England and Wales) Regulations 2016. These regulations mean that landfill sites need to control the gas generated on their sites and must collect, treat it and use it in a way that minimises environmental damage. This includes the requirement to flare gas which cannot be used to produce energy.

Emissions from these 'flares' or other combustion are captured and reported by NRW. We expect to see a decline in these emissions due to the decrease in biodegradable waste material being sent to landfill. Each site will have a peak methanic generation phase followed by a slow but steady reduction in gas production. Short term increases may be positive, for example where a site has improved its site infrastructure to increase landfill gas capture rates, however, the overall trend should be downwards.

As current methane capture systems are variable in their effectiveness, we will work with NRW within this budget period to improve the controls around the release of landfill gas from operational landfills. This will be achieved by reviewing the current approach to the regulation of landfill, with the focus on further improving the overall compliance and therefore emissions performance across the sector. The aim will be to capture a greater proportion of the methane.

In parallel, NRW will also work with operators to further improve the performance of closed landfills and build on the work they are already doing with the operators of the highest risk sites to improve the collection and treatment of landfill gas. There are just over 100 permitted landfills in Wales which no longer accept waste and these sites have a wide range of gas containment and control systems and permit controls.

This work will commence with NRW's development of a plan for landfill sites by 31 March 2022.

Recycling

Policy 74 – Further increase recycling

Our Beyond Recycling Strategy highlights we will strive to achieve the highest rates of recycling in the world. For Carbon Budget 2, this means we will achieve at least a 70% recycling rate for all major waste streams (household, industrial, commercial and construction).

We have already increased Wales' municipal waste recycling rate from less than 5% (1998-99) to just over 65% (2019-20) and the recycling rate for industrial and commercial waste increased by 9 percentage points, from 58% to 67%, between 2012 and 2018. This progress has been supported by robust recycling collection regimes around Wales with a consistent set of core items collected from every household like food, plastics, metals and paper.

Detailed action to deliver at least a 70% recycling rate within this budget period includes:

- working with the waste industry in Wales to further improve consistency in the range of waste materials separately collected for recycling;
- developing additional infrastructure to collect and recycle household materials not currently widely recycled (such as absorbent hygiene products, wood, plastic film, waste electrical and electronic equipment, cartons); and,
- reviewing our Collections Blueprint with a focus on capturing a greater range of high quality recyclable material (including, for example, cartons).

These actions will link with specific action in other emission sectors, such as the new recycling regulations for non-domestic premises, Extended Producer Responsibility (EPR) scheme for packaging and Deposit Return Scheme. Together with regional infrastructure action to install solar panels on closed landfills, upgrade to ultra-low emission collection fleets and depots, and improve materials processing we will deliver a holistic and place-based programme of action.

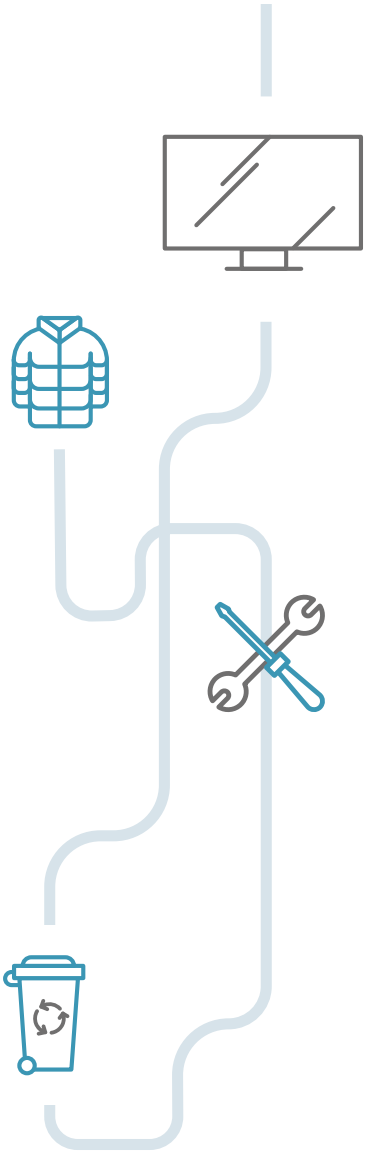
Behaviour change and demand reduction

The way people think about waste has been at the heart of the significant progress on recycling rates to date and Wales' journey to become a recycling nation. To deliver on the ambition of the Welsh Government to become a zero waste nation by 2050 we will require considerable further action. The way people behave will continue to be fundamental to our approach.

Policy 75 – Be Mighty Campaign

Recycling is part of our modern culture in Wales with every household having contributed to the collective effort that has seen Wales become a world leader.

In 2020, we launched the Be Mighty Campaign which asked everyone to make small but important changes in how they recycle with the aim of becoming number one in the world rankings. The campaign was co-developed and delivered in conjunction with local authorities as a coordinated national and local campaign, receiving significant traditional and social media coverage.



Case Study – Be Mighty campaign

In September 2020, the Welsh Government launched the 'Be Mighty. Recycle.' campaign to enhance positive behaviours and increase recycling rates by linking recycling to national pride and to build on the way recycling has become a part of who we are as a nation. The campaign focused on reducing the amount of recyclable waste being disposed of in the residual refuse bin, particularly food waste. Key aims of the campaign were to educate the audience and raise awareness of under-recycled items such as food, foil, and aerosols.

In the first year, the campaign resulted in 81 million impressions across TV, billboards, adverts on public transport, print, social media, radio and celebrity endorsements.

Importantly, the campaign was co-developed with local authorities. The national campaign bursts were supported with local implementation. This was a key feature of the campaign delivery helping to increase reach and impact.

45% of people reported that they recalled the campaign with 90% saying that they thought it stood out. Importantly, 59% of those who saw the campaign said they had recycled more in the past 6 months, compared to only 37% of people that hadn't seen the campaign. Wales' transformational progress on recycling has seen carbon emissions reduce, this campaign has been designed to continue and extend that progress through co-production, ensuring maximum impact.

In the first half of this carbon budget period we will work with local authorities to run a further round of the 'Be Mighty' campaign and build on the successful impact to date, including building in changes people can make for waste reduction and reuse. This work will be complementary to the broader public engagement approach detailed in Part 2.

5. Team Wales approach

We need everyone to play their part in decarbonising the waste sector. The diagram at the end of this chapter captures the collective action needed to decarbonise across the three broad areas of landfill, recycling and behaviour change, with the detail set out below. In addition the *Working Together for Net Zero* document accompanying *Net Zero Wales* sets out where our partners have committed to taking action through their pledges, alongside additional case studies to demonstrate the action already taking place across Wales.

Actions in every sector will impact on our resource use in Wales, from buildings to agriculture. These actions also have a significant secondary impact on emissions in the waste management sector. The integrated approach discussed in Part 2 and the introduction to Part 3 will be especially important for the waste sector.

The Ask of Others

Government cannot bring about the transition to a zero waste future alone. This is why we want to do all that we can to support individuals, communities, businesses, social enterprises and the public sector to drive change. Together we can make a huge collective difference by harnessing the energy of businesses who are already making great strides to provide resource efficient products and reduce waste; harnessing the power of public procurement to create reliable and effective markets for resource efficient products, supporting the many community initiatives across Wales; and those taking actions as individual citizens, role models, champions and resource efficiency entrepreneurs.

Individuals/households

People's involvement is fundamental to reducing emissions from waste. Although we have had a clear strategic aim of achieving zero waste for two decades, successful delivery has been down to a truly collective effort, with people and communities across Wales playing their part. It is only through the efforts of every Welsh citizen that we have achieved globally leading recycling rates.

To help us meet our targets, we ask people to:

- Keep separating all recyclables, including avoidable food waste, into the relevant recycling container.
- Reuse and recycle as much as possible.
- Buy only what you need, and use what has been bought (especially food). People can also help by avoiding unnecessary single use packaging, avoiding purchasing unnecessary short life disposable products, making products last longer, repairing them when needed and donating them for reuse when no longer used.
- Sharing economy in communities
  - FareShare Cymru – redistributing surplus food from the supply chain to communities in need prevents food waste going to landfill.

Public sector organisations

The public sector can play a vital role in waste management. Key actions for the sector include:

- Reducing its own waste (especially food waste).
- Increasing recycling and sending less to landfill.
- Purchasing reused and remanufactured items and products that have a high recycled content.
- Demonstrate the leadership needed in reducing emissions in its operations which impact on other sectors for instance, including reducing emissions from waste infrastructure, the roll out of ultra-low emission refuse vehicles and ensuring procurement decisions are made on principles which support sustainably and locally sourced materials.

This includes those actions within the Beyond Recycling Strategy, which will support the public sector to reduce emissions set out within the relevant chapter.

Welsh businesses and industry

The Environmental Services Association, the trade body for a large part of the waste sector, published in June 2021 'A net-zero greenhouse gas emissions strategy for the UK recycling and waste sector'. This document identifies "decarbonising non-recyclable waste treatment by removing organics from landfill by 2030" as a key priority. It also states that 'with the right regulatory and policy framework in place', the waste sector can meet a target to 'increase capture of methane emissions from landfill to 85% by 2030.'

> ***"We pledge to minimise the single use plastic used across the company, including single use PPE items & sourcing reusable alternatives from other independent green businesses local to us."***
>
> **Pledge – Litegreen Ltd**

Fundamentally, reducing waste can improve productivity and reduce costs to businesses and industry. Increasing recycling also means more of those materials being available to produce new goods and products more sustainably, which in turn can shorten and improve the resilience of supply chains.

We encourage businesses to:

- Reduce their waste.
- Increase recycling.
- Use more sustainable/recycled materials in manufacture and construction.

Case Studies

- **Capital Valley Plastics** – manufacture recycled damp proof membrane and damp proof course from recycled film which would otherwise go to waste. Heathpak – supported to double their production of products with 80-100% recycled content and introduce an innovative plant-based liner for their solid board packaging, replacing the current plastic-based liner.
- **Sarpak** – will incorporate 30% recycled content into a high-quality, three-layer film previously manufactured from virgin plastics. The central layer will be made from recycled plastics, enabling Sarpak to reduce their environmental footprint without compromising the quality or recyclability of their product.

Ask from the UK Government

Working jointly with the UK Government and other devolved administrations to bring about the wider changes needed is vital to the delivery of emissions reductions within the sector and more widely. We call on UK Government to:

- End the use of landfill as a waste management option so the 18% of the landfilled waste that is imported into Wales is reduced as soon as possible and no biodegradable waste is sent from outside of Wales to landfill here.
- Work jointly and share information on research projects looking at landfill aftercare, including the planting of trees on old landfill sites as a means of carbon sequestration.
- Collaborate with Wales on wider measures for extended producer responsibility for packaging, and potentially for other product waste streams such as mattresses, furniture and textiles.

We are also working with other administrations on the application of new powers that are proposed for environmental product labelling and standards currently included in the UK Environment Bill. For example this could potentially require labelling for embedded carbon of products, and could be used to set embedded carbon standards or limits for key product types, and/or packaging.

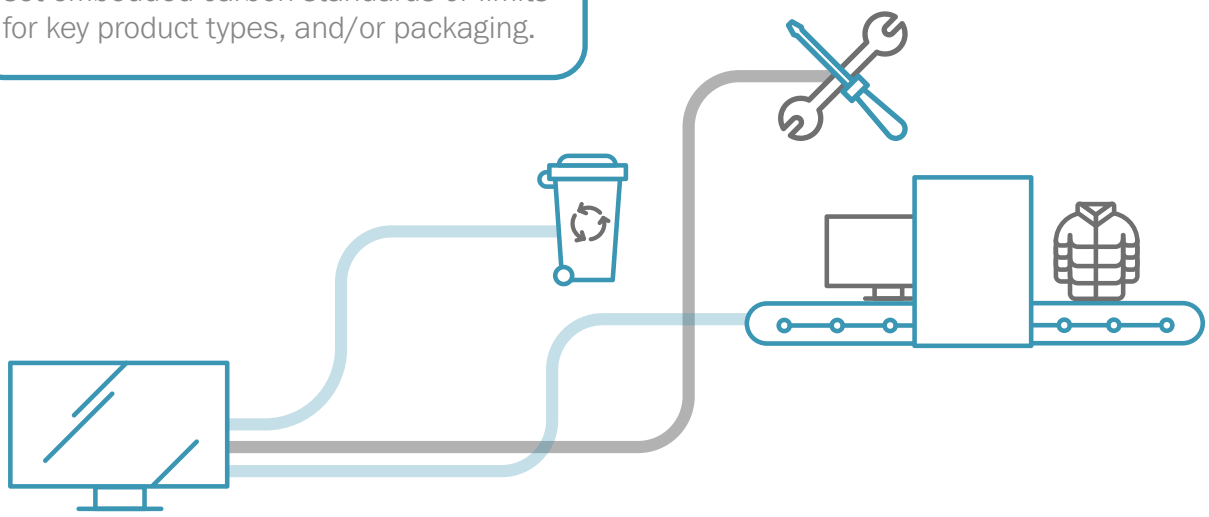
International engagement

Many of the products we consume in Wales and which may end being sent to energy from waste and/or landfill will have been manufactured in, and imported from, the EU. Keeping track of EU policy developments being implemented through their circular economy package and working with the UK Government to make representations where necessary will continue to be important. We will also work with the UK Government to improve the coverage of resource efficiency and a circular economy so that they not just mentioned in international trade deals but they actively support transition and the delivery of the UN commitments.

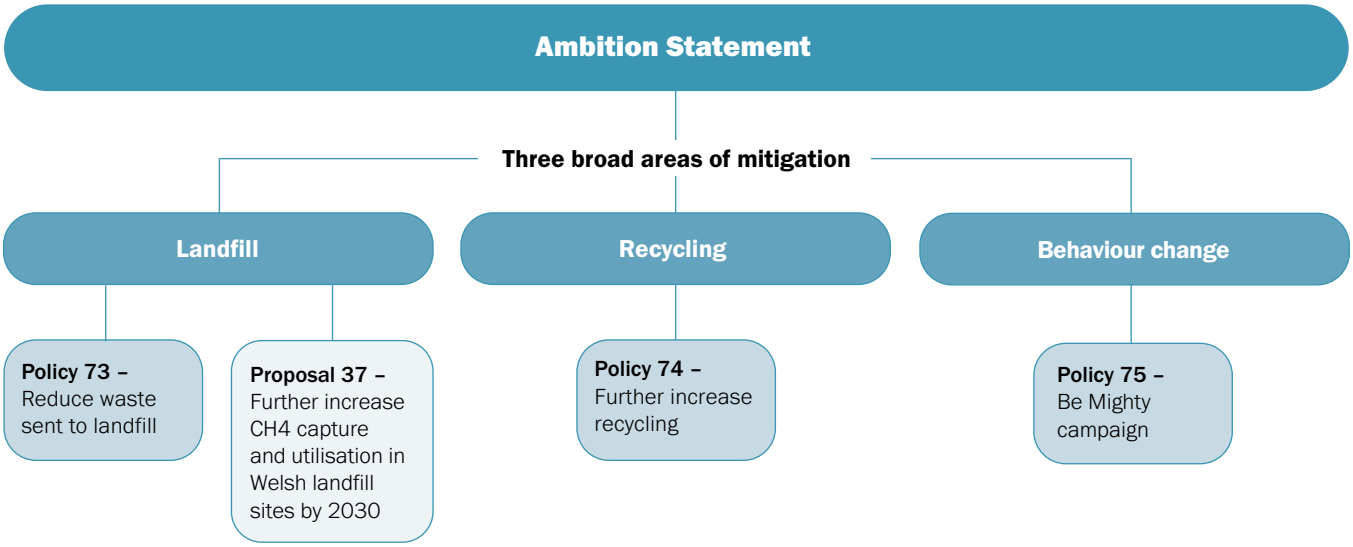
In doing so, we will also make sure Wales complies with, and works towards the UN Sustainable Development Goals and associated targets – especially Goal 12 on Sustainable Consumption and Production.

Case Study

Wales was one of the six partner regions in the Interreg Europe funded Circular Economy for SMEs (CESME) project. This included the sharing of best practice on resource efficiency, and agreeing common barriers and solutions to a circular economy.
https://www.interregeurope.eu/cesme/



Waste Management



Team Wales approach – The ask of others	
1. Our Ask of the Welsh Public *(Individuals & Households)*	We ask the public to continue separating recyclables, reuse and recycle where possible and only buy what they need in order to reduce waste. We also would encouage a sharing economy within communities to redistribute surplus food from the supply chain to communities in need, thus preventing food waste going to landfill.
2. Our Ask of the Public Sector	We want the Public Sector organisations to demonstrate leadership in reducing overall business emissions and leading by example by reducing its own waste by increasing recycling and purchasing reused and remanufactured products reducing waste being sent to landfill.
3. Our Ask of Welsh Business & Industry	We encourage Welsh Businesses to reduce their waste, increase recycling and use more sustainable / recycled materials in manufacture and construction.
4. Our Ask of UK Gov *(Call for UK action)*	**We call on UK Government to:** • End the use of landfill as a waste management option so the 18% of the landfilled waste that is imported into Wales is reduced as soon as possible and no biodegradable waste is sent from outside of Wales to landfill here. • Work jointly and share information on research projects looking at landfill aftercare, including the planting of trees on old landfill sites as a means of carbon sequestration. • Collaborate with Wales on wider measures for extended producer responsibility for packaging, and potentially for other product waste streams such as mattresses, furniture and textiles.
5. International Engagement	**Commitment:** The Welsh Government, along with the UK Government will continue to review EU Policy developments regarding products imported and consumed in Wales; and will continue to improve the coverage of resource efficiency and a circular economy ensuring Wales complies with the 'Sustainable Consumption and Production' UN Sustainable Development Goal.

Public sector

1. Introduction

Scope

The previous emission sector chapters focus mainly on the emissions within their areas. However, the public sector has a much greater role, in not only removing carbon from its own estate but within their span of leadership influence and operations. The importance of the public sector is seen across the other emissions sector chapters to help drive change. This chapter is focussed on the wider role.

Vision

Net Zero Wales – Public Sector by 2030 – A Fairer, Greener Wales

Our ambition is for the Welsh public sector to be collectively net zero by 2030, radically reducing emissions from over 780 organisations. These organisations deliver vital public services including health and social care, protecting people and the environment, education, culture and the arts – they support and shape communities and have a shared focus on improving the economic, social, environmental and cultural wellbeing of everyone in Wales.

NHS Cymru 7 Health Boards 3 Health Trusts	**Welsh Government**	**Senedd Cymru (TBC)**
Local Authorities: 22 **Community and Town Councils: 730**	**National Parks Authorities**	**Fire and Rescue Authorities**
Others – Culture, sport and education: **5**	**Universities (invited):** **8**	**Natural Resources Wales**

The size and reach of the public sector means it has a critical leadership role to play in driving and embedding net zero across all that we do and in bringing the communities of Wales with us. Significant work is already underway in parts of the public sector in Wales but there is still a lot more to do in order to realise the net zero ambition by 2030. Public sector organisations must lead the way towards a net zero future as set out below:

We will leverage our £7bn spending power and buy differently, **working with our supply chain partners** to ensure that social and environmental value is built into how we buy. We will look to our **supply chains to be fully transparent about their emissions and ambitious in their plans to drive reductions**. We will expect the products we buy and use to be fully recyclable, multi-use or able to be re-purposed as part of a more circular approach to waste. We will also reduce the level of goods and services we consume, removing waste where ever possible.

We will be more efficient in how we use **public sector buildings and locations**, making greater use of co-location to improve access and provide more joined-up services as well as using modern and efficient, cloud-based, digital infrastructure to reduce our overall carbon footprint. Where we undertake refurbishment or need new buildings these will meet the highest levels of sustainability by default.

We will **design and deliver all our services** around the users of those services focusing on the lowest carbon options. Digital solutions will aim to make things as straight-forward as possible and reduce the need for unnecessary travel. We will continue to recognise that non-digital services remain vital to inclusion and will deliver them in a net zero way.

We will draw on the **best practice in the transport sector promoting active travel** and ensuring our services are accessible for all by active and public transport. We will enable a **rapid shift toward zero emission technologies in vehicles** across our fleets – from ambulances to waste vehicles to the cars used by our workforce.

We will draw on the expertise within the public sector to **ensure land across our estate is valued and protected as an asset to** support a reduction in carbon emissions, increase carbon sequestration and improve biodiversity. We will make the places where we live and work greener in every sense for the benefit of our communities, our workforce and to more than offset any emissions we cannot reduce by other means.

Delivery of this vision by 2030 requires a step-change and action at all levels. Public sector organisations will work together across traditional boundaries creating ambitious, joined-up plans that are more than the sum of the individual parts and which demonstrate a one Wales public sector approach.

We also need the circa 311,000[93] people who work for the public sector and the communities they support to understand the economic, health and wellbeing benefits of faster decarbonisation, what they can do to help and how they can hold us to account for delivery.

93 Public sector employment, UK – Office for National Statistics (ons.gov.uk) (https://statswales.gov.wales/Catalogue/Business-Economy-and-Labour-Market/People-and-Work/Employment/Persons-Employed/publicprivatesectoremployment-by-welshlocalauthority-status)

2. Emissions

Where public sector emissions come from

In terms of the greenhouse gas inventory the public sector covers emissions from public sector buildings[94]. However as already highlighted, it has a wider role. The scope and influence of the public sector goes beyond its immediate emissions. Based on the evidence available we believe these emissions are broadly split across procurement (60%), buildings (20%) and mobility and transport (20%).

Emissions reduction – public sector progress

Although we have data in terms of direct emissions from the buildings[95], we currently do not have data on emissions from the wider scope of the public sector. However a growing number of public sector organisations have declared a climate emergency and are reporting on their carbon footprint individually or as sectors. As the biggest emitter within the public sector (around 1.00 $MtCO_2e$ in 2018-19) the NHS has been a first mover in tracking and reporting progress through its NHS Wales Carbon Footprint Report 2018-19 (https://gov.wales/written-statement-nhs-wales-carbon-footprint-report-2018-19) and compared to 2016-17 has shown a small reduction in its 2018-19 footprint of 4.8%.

Faster progress is needed to build capacity in the public sector to baseline, monitor and report progress towards carbon neutrality and our plans here are covered in the **Toolkits to Support the Change** in the below section.

3. Ambition statement

Our ambition is for the public sector to be collectively net zero by 2030[96].

4. Policies and proposals

The below section provides an overview of the support tools available, best practice and case studies and reiterates the mandated actions the public sector need to be leveraging to drive real progress.

Toolkits to support the change

The Welsh Government has worked with partners across the public sector to co-create a toolkit of support, which includes A route map for decarbonisation across the Welsh public sector (https://gov.wales/sites/default/files/publications/2021-07/a-route-map-for-decarbonisation-across-the-welsh-public-sector.pdf) and Welsh public sector net zero carbon reporting guide (https://gov.wales/sites/default/files/publications/2021-05/welsh-public-sector-net-zero-reporting-guide_1.pdf).

94 In terms of the greenhouse gas inventory the Public sector covers emissions from public sector buildings (heating and cooking in public sector buildings). At 0.32 $MtCO_2e$, the Public sector accounted for 0.82% of Welsh emissions in 2019. Practically all public sector emissions (99.7%) are emissions of carbon dioxide.

95 Total emissions from the Public sector in Wales have declined by 58% between the base year (1990) and 2019. Overall, emissions from public sector buildings have declined by 3% between 2018 and 2019.

96 This ambition statement covers the wider scope of emissions, which are being looked at as part of the chapter. For our legislative pathway, assumptions around public sector buildings have been built in to the pathway. See Annex 4 x

Published in August 2021, *the Route map for decarbonisation* provides a strategic overview of the priority areas for action and milestones needed for the Welsh public sector to collectively reach net zero by 2030. The framework is intended to support public sector organisations in the development of their own strategic plans setting out a three phased approach –
1) Moving up a gear (2020–2022)
2) Well on our Way (2022–2026) and
3) Achieving our Goal (2026–2030).

Whilst most organisations have already started to 'move up a gear' we now need all public sector bodies to be 'well on their way' with clear actions to achieve net zero and be preparing for the final phase 'achieving our goal' from 2026.

The Routemap: a strategic framework for change

	Society	Individual	System governance	Use of resources	Models of service delivery	Technology
Achieving our goal 2026–2030	**We embed** value over cost. By doing so, society understands, accepts and expects that sustainability and climate action is integral to public services.	**Staff and citizens demand** zero tolerance of unsustainable behaviour as it is socially unacceptable.	**Self regulate** and feedback processes across the public sector. Sustainability is part of life.	**Value** all resources including people's time and the natural environment. Account and profile all resources for a no waste approach.	**Tailor** citizen-centred, low carbon services. The public sector, society and the individual work together to reduce inequalities & improve well-being.	**Require and expect** low carbon technologies to be incorporated in all public sector services and products.
Well on our way 2022–2026	**We integrate** action on climate change into our public facing engagement. We show how we appreciate the value of low carbon products, services and places.	**Staff and citizens expect** to be able to make choices based on sustainability and well-being criteria when considering services and products.	**Account** for climate change future impacts in all decision making processes. Life cycle costing is the norm in the public sector.	**Model** business decisions so entire resource impact is accounted for. All resources need to include full life cycle carbon costings.	**Collaborate** with cross sector partners to prevent disadvantage, promote well-being and develop sustainable joint service plans.	**Enable and support** technology to allow the empowerment, equality and well-being of individuals.
Moving up a gear 2021–2022	**We engage** with the climate change debate. The public sector explains its case for taking sustainability seriously and considers how it can impact on the wider society.	**Staff and citizens understand** what you can do. You know you should act. You know you can make a difference.	**Agree** on responsibilities, mechanisms and measures including legislation, regulation and public reporting of progress.	**Research** how to use all types of resources better to enhance health and minimise waste. Identify, prioritise and address gaps in knowledge.	**Explore** sustainable models. Increase investment to prevent disadvantage and improve well-being. Optimise benefit from nature.	**Adopt and invest** in sustainable technologies. Reduce the risk of investment in new technology. Welcome innovation.
	Behaviours		**Standards**		**Innovation**	

Complementing the route map, the *Welsh Public Sector Net Zero Reporting Guide* details the principles and priorities for the Welsh public sector reporting approach. The guide provides a set of instructions to support the public sector to consistently **estimate baseline emissions, identify priority sources and to monitor progress** towards meeting the collective ambition of a net zero public sector by 2030.

By following the guide public sector organisations will be able to identify and measure the emissions from their activities including the supply chain and take targeted measures to tackle those areas of greatest impact or importance. It also provides a mechanism for organisations to identify and measure the carbon absorbed by the land they manage. Reporting by sector provides opportunities for collaborative actions, working across organisational boundaries and within regions on a framework of actions such as improved procurement, local energy supply, more efficient building use and improved land use.

Where organisations have already developed their own methodology for baselining emissions and tracking progress the toolkit should be used to ensure consistency with the wider public sector approach.

We know that local authorities, Health Boards, NHS Trusts and many other public sector bodies have already used these toolkits to develop their baselines, plans and delivery commitments (see Case Studies below and in **Working Together to Reach Net Zero**).

Policy 76 – All public sector organisations should use the Routemap and Reporting Guide to develop and publish plans by March 2023 to achieve a collective net zero public sector by 2030

Policy 77 – The Welsh Government's plan to achieve net zero as an organisation by 2030 will be published in spring 2022

Given the urgency of the climate emergency, all public sector organisations should now use these toolkits to:

- Understand their emissions baseline;
- Develop robust evidence-based strategies and plans setting out their route-map to net zero and publish these plans by March 2023;
- Undertake regular monitoring and evaluation to spot what works, stop what doesn't and share best practice; and
- Report against plans annually in line with the requirements set out in the reporting guide.

Case Study – Action Plans: Welsh Government Energy Service (WGES)

WGES provides a one-stop shop for energy projects across public and community sectors, delivered by a consortium of the Carbon Trust and Energy Saving Trust with support from local partnerships. Between July 2018 and March, the Energy Service supported community enterprises and public bodies to secure investment of £102m for energy efficiency, renewable energy and ultra-low emission vehicles, helping to accelerate carbon reduction projects.

These projects are expected to save 432,000 tCO_2e over their lifetime, the same amount of CO_2 as 800 km^2 of trees absorb in a year, an area larger than Ynys Môn. These energy projects will also generate £212m of local income and savings and add 32.6MW of new renewable energy capacity in Wales (enough to power 9,400 homes).

The Energy Service is developing further plans for 2022 to support the delivery of a carbon neutral Welsh public sector. The plans aim to:

- Stimulate regional change and investment in line with Wales' energy decarbonisation ambitions and regional energy strategies;
- Establish cross-sectoral partnerships and projects across the energy system (power , heat and transport);
- Continue to identify, develop and support energy efficiency and renewable energy projects, working collaboratively with public bodies and community enterprises;
- Increase the amount of locally owned renewable energy in Wales; Support the public sector to transition to low carbon heating in buildings;
- Support the roll out of electric vehicle charging infrastructure and ultra-low emission vehicles; and,
- Share news and case studies of energy projects via social media.

Welsh Government Energy Service Annual report 2020-21[97]

Policy 78 – The Welsh Government to include Net Zero Wales commitments in our remit letters and sponsor arrangements with public bodies in Wales

Whilst the Welsh Government is tackling its own emissions for example through improvements in its estate, staff mobility and the services we deliver, we are also including firm **Net Zero Wales commitments** in our remit letters and sponsor arrangements with a range of public bodies in Wales. This highlights to those charged with spending public money and delivering vital public services that the public sector is committed to the journey to 2030. Welsh Ministers have the welcomed declarations from public bodies, who have publically announced their own net zero ambitions in-line with the routemap for a net zero Wales public sector by 2030.

The Welsh Government will accelerate the use of all levers at its disposal, including through arm's length bodies and Welsh Government sponsored bodies, to increase our ambition and pace as we enter the *'well on our way'* phase of the public sector routemap.

97 https://gov.wales/sites/default/files/publications/2021-07/energy-service-annual-report-2020-2021_2.pdf

For example, through the Energy Service and Wales Funding Programme, the Welsh Government provides free practical support (technical and financial) to the public sector to implement projects which are already impacting positively and reducing our carbon emissions from the sector.

Proposal 38 – UK Government organisations who have a significant presence in Wales to develop and publish plans setting out how they will support Wales' ambition for a net zero public sector by 2030

The UK Government has a presence in Wales and, whilst outside of the scope of the net zero ambition in Wales, we will look to our UK public sector partners to play their part in driving down emissions that occur in Wales. The headquarters of the Driver Vehicle Licensing Agency, Companies House, the Office of National Statistics (ONS), HMRC, DWP and other UK Government Departments and agencies are all based in Wales – buildings, procurement and transport emissions are likely to be key emission areas and should be priorities for reduction strategies. Welsh Government officials will work with the UK Government organisations who have a significant presence in Wales on actions to support Wales' ambition for a net zero public sector by 2030, sharing best practice and collaborating to achieve our common ambition for the benefit of the people of Wales.

Priority areas for action

Given the diverse nature of the organisations within the public sector this chapter focuses on the highest emissions areas (sustainable procurement, mobility and transport, net zero buildings and land use) together with the actions of the largest emitting organisations (NHS Wales and local government).

Sustainable procurement

Research undertaken within the Welsh public sector has identified that the supply chains supporting the Welsh public sector account for circa 60% of their carbon emissions. With £7bn spent annually by the public sector there is significant scope to leverage our spending power to consider alternatives to purchasing and where necessary to buy differently factoring in net zero Wales.

The responsibility for this transformation lies with the public sector budget holders at the earliest stage of decision making and then transmitted through the procurement process and contract management. We want the public sector to procure from businesses that embrace net zero emissions and in doing so support low carbon suppliers as part of our wider transition to a net zero society.

Policy 79 – Make Carbon Reduction Plans a mandatory part of tenders for Welsh Government procurement contracts over £5m from April 2022 and prioritise products which are fully recyclable, multi-use or able to be re-purposed as part of a more circular approach to waste

Published in March 2021, the Wales Procurement Policy Statement (https://gov.wales/procurement-policy-statement-html) sets out 10 principles for procuring well-being for Wales. While the statement in its entirety supports decarbonisation, principle 6 specifically states:

> *"We will act to prevent climate change by prioritising carbon reduction and zero emissions through more responsible and sustainable procurement to deliver our ambition for a net zero public sector Wales by 2030"*

Pledge – Welsh Government

By April 2022 the Welsh Government will issue a new Welsh Procurement Policy Note to make Carbon Reduction Plans a mandatory part of tenders for procurement contracts over £5m. We will support carbon reduction for lower value contracts by developing procurement specifications which place an emphasis on carbon reduction where possible and work with local SME's to support their ability to tender for such contracts. We will suggest practical strategies to plan for or build in ways to drive decarbonisation actions across the wider public sector. The proposed Social Partnership and Public Procurement Bill will also place a duty on public bodies to undertake sustainable procurement which is likely to include reporting on carbon reduction. We will also seek to include similar commitments in grants and other funding awards made by Welsh Government.

While public sector bodies have most control over their scope 1 and 2 emissions (linked to their own decisions on the management of their estates and operations), scope 3, accounting for around 60% of any organisations carbon footprint presents the biggest opportunity to make significant emissions reductions. Generated by the supply chain activities when meeting the demand for goods, services or works, scope 3 emissions can be effectively addressed by only entering into contracts with businesses focused on carbon reduction in their operations, production processes and logistics.

Welsh Government is supporting the public sector action to drive decarbonisation through procurement expenditure analysis tools and guidance for all public bodies to help them prioritise actions to address carbon emissions. These tools include the Decarbonisation Dashboard, made available in 2020, to help those organisations who needed it to identify their highest emissions categories of expenditure and establish an organisational emissions baseline. Following the Decarbonisation Dashboard, a new forward looking Wales Procurement Policy Note is being developed which will suggest practical strategies to plan for/build in ways to drive decarb actions which will be available in 2021. WRAP Cymru, funded by the Welsh Government, has also published clear guidance (https://wrapcymru.org.uk/resources/guide/public-sector-guidance-procurement-sustainable-products) tailored to the public sector on sustainable procurement.

Net zero buildings

The public sector's built assets are considerable and diverse including schools, hospitals, health centres, historic buildings, offices, art centres, business and industrial facilities, leisure centres, mass food production facilities and training sites.

Across the public sector there is activity underway to reduce the carbon footprint of buildings – from NHS commitments to develop and build low carbon buildings to net zero standard to Welsh university plans to rationalise their estate.

In 2020–21 the Energy Service supported the investment of £29 million in insulation, control systems, lighting, ventilation, low carbon heating, building integrated renewables and roof mounted solar projects within the public sector estate. And in one example, Blaenau Gwent County Borough Council, invested £4 million from Wales Funding Programme for lighting, heating, controls and building integrated renewables across 20 properties saving 26,500 tCO_2e and reducing the council's energy bills by £9 million over the project's lifetime.

Proposal 39 – All future public sector properties being built or undergoing major refurbishment achieve a net zero standard by 2030

Progress has been made, but more needs to be done to share best practice examples of what works and all public organisations need clear plans for building decarbonisation at pace. Investment decisions on new buildings and the refurbishment of others must from now on be consistent with net zero approach if the public sector is to achieve the 2030 ambition.

Whilst there is a need to consider, for example, building fabric, heat generation and distribution, enable heat pumps and shift away from gas combined heat and power, we also need to be more efficient in how we use public sector buildings and locations. The unintended benefits of the Covid pandemic have included our ability to operate digitally, creating an opportunity to increasingly make best use of co-locating organisations and services to improve access and provide more joined-up and better quality of services whilst reducing our overall carbon footprint.

Local authorities also have a critical role, as organisations responsible for planning policy and permissions as well as social housing, to ensure new homes are built to the highest standards and lowest carbon and, importantly, that they help reduce carbon in the existing housing stock. Improvements to existing housing stock should achieve EPC A (SAP92 or greater) through adopting a fabric first approach and use non fossil fuel fired boilers to provide domestic hot water and space heating.

The residential buildings chapter recognises that when doing so it is important to lift households out of fuel poverty focusing on changing the building fabric (roof, walls, windows doors etc.) and behaviours to save people money as well as saving the planet.

Case Study – Buildings: Welsh Government Administrative Office Estate

Efforts to decarbonise Welsh Government's administrative office estate continue to deliver very positive results with substantial reductions in carbon emissions and energy used over the last 10 years. As at 1 April 2021, a 73% reduction in carbon emissions had been achieved giving a revised total carbon footprint for the estate of 3,461 tCO_2e. This equates to an overall reduction in total estate emissions by a substantial 9,101 tCO_2e since 2010-11. This momentum is being maintained and further reductions in emissions are anticipated by the end of 2021–22

While a successful estate rationalisation programme has been a contributor to these carbon reduction achievements, carbon savings are primarily delivered through a proactive approach to sustainable building management. Principal activities have included a robust system of collecting, analysing and acting on energy/carbon data; adopting a sustainable approach to the design of all building refurbishment projects, incorporating energy efficient measures and renewable technologies in our improvement schemes; and further rationalisation of the estate. Measures include more efficient LED lighting and building controls; implementation of an updated heating/cooling temperature set point policy across the estate designed to deliver energy, emissions and cost savings; and installation of renewables including biomass and solar panels.

Action to tackle the climate emergency remains a central plank in the development of Welsh Government's long-term strategy for its future ways of working and future of its office estate post Covid including fully exploring the potential environmental benefits of the shift to remote working.

Since 2015, Welsh Government has supported the decarbonisation of public and private sector buildings through the Smart Living initiative, which facilitates development of innovative solutions for place-based decarbonisation issues.

Working with local authorities and other key stakeholders, the Smart Living scheme is helping define and clarify potential opportunities for decarbonisation by drawing in key expertise at critical points in the concept and design stage and ensuring whole system thinking is applied.

Case Study – Buildings: Smart Living: WBRID

The Whole System Business Research Innovation for Decarbonisation (WBRID) scheme, is in its Phase 2 demonstrator phase, applying the tested principles of Small Business Research Initiative schemes. The WBRID Challenges will run until the late spring of 2022. Benefits include reduced carbon emissions, energy savings and business economic support with the testing of new technology, products, systems and processes. Smart Living is supporting the Blaenau Gwent County Borough Council's WBRID challenge for developing a Smart Industrial and Commercial Energy Platform Model Solutions to achieve net zero outcomes. Working with two suppliers, Blaenau Gwent will focus on whole system development of a publicly owned demonstrator business park to maximise effective use of energy efficiency, generation, use, storage and distribution.

StorTera are an Edinburgh based energy storage solution provider working to revolutionise the energy storage industry. BankEnergi is a consortium consisting of Consortio, Carbon Track, Wales and West Utilities and BankEnergi. The two companies will be demonstrating their solutions on council owned business parks, which include creating an energy trading platform utilising existing renewable energy generation and installing new equipment including battery storage, solar PV, heat pump and Artificial Intelligence (AI) controls. This will optimise performance and energy utilisation with a view to decarbonising business parks.

Other WBRID Challenges include:

- Bridgend Local Energy Market Demonstration Projects - Identify how projects could be developed to test a local energy market (LEM) in Bridgend and understand how the LEM could operate within current market rules and where derogations could be sought to enable the LEM to operate to its fullest extent.
- Rhondda Cynon Taf - Decarbonising Assets and Developing Innovative Multi Vector Energy Model Solutions to achieve net zero - Develop a net zero multi-vector heat, storage and electricity micro-grid solution which will serve as part of a wider energy mix in an initial proposed 'zone' of a group of designated buildings.
- Gwynedd and North Wales Economic Ambition Board - Developing a Net Zero Farm Innovation Competition. Developing innovative technology, systems and/or process solutions that reduce greenhouse gas emissions within an agricultural setting in line with Wales' Innovation in Agriculture agenda.

Mobility and Transport

Reducing and removing emissions from public sector transport and its fleet has a significant role to play in helping Wales reach net zero whilst also driving wider benefits across health, air quality, accessibility and the economy.

The Welsh public sector fleet currently comprises of around 64,200 cars, vans, light, heavy and specialised commercial vehicles with only 0.3% already zero emission vehicles. Most transport emissions (99%) are emissions of carbon dioxide. The public sector must stop investing in internal combustion engine vehicles which use high carbon fuels and quickly move to zero/ultra low emission vehicles

Policy 80 – All new public sector cars and light goods vehicles should be zero/ultra-low emission by 2025 and heavy goods by 2030

If the public sector is to meet the ambition of net zero by 2030 the rapid and early decarbonisation and management of its fleet will be a key component. There is also an important role to influence and enable wider emissions reductions across society. For example, local authorities will be essential to enable delivery of almost all elements of the transport chapter within this plan, and will do much of the work to manage allocation of investment at a local level. As set out in Llwybr Newydd, our vision for an accessible, sustainable and efficient transport system, pubic bodies need to plan ahead for better physical and digitalconnectivity, more local services, more home and remote working and more active travel, to reduce the need for people and their services to use cars on a daily basis.

WGES has been working extensively with the public sector to develop the evidence base to transition the fleet to ultra-low emission vehicles and to reduce the demand, in the form of public sector fleet reviews. To date, the Welsh Government has investment £1.1m in supporting the public sector to purchase electric vehicles and has awarded a £6.6m grant to local authorities to support the rollout of electric vehicle charging infrastructure across their estate in 2021-22.

Data, management and rationalisation of the fleet in accordance with sustainable transport hierarchy is an important first step. Reducing and rationalising the fleet, as well as supporting the transition to zero emission vehicles will provide a balanced and sustainable approach to fleet management.

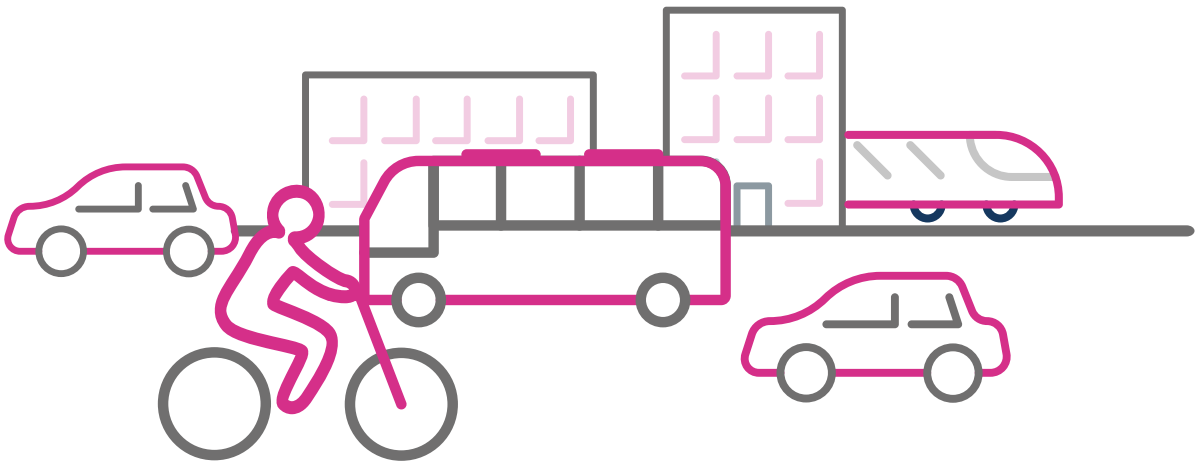
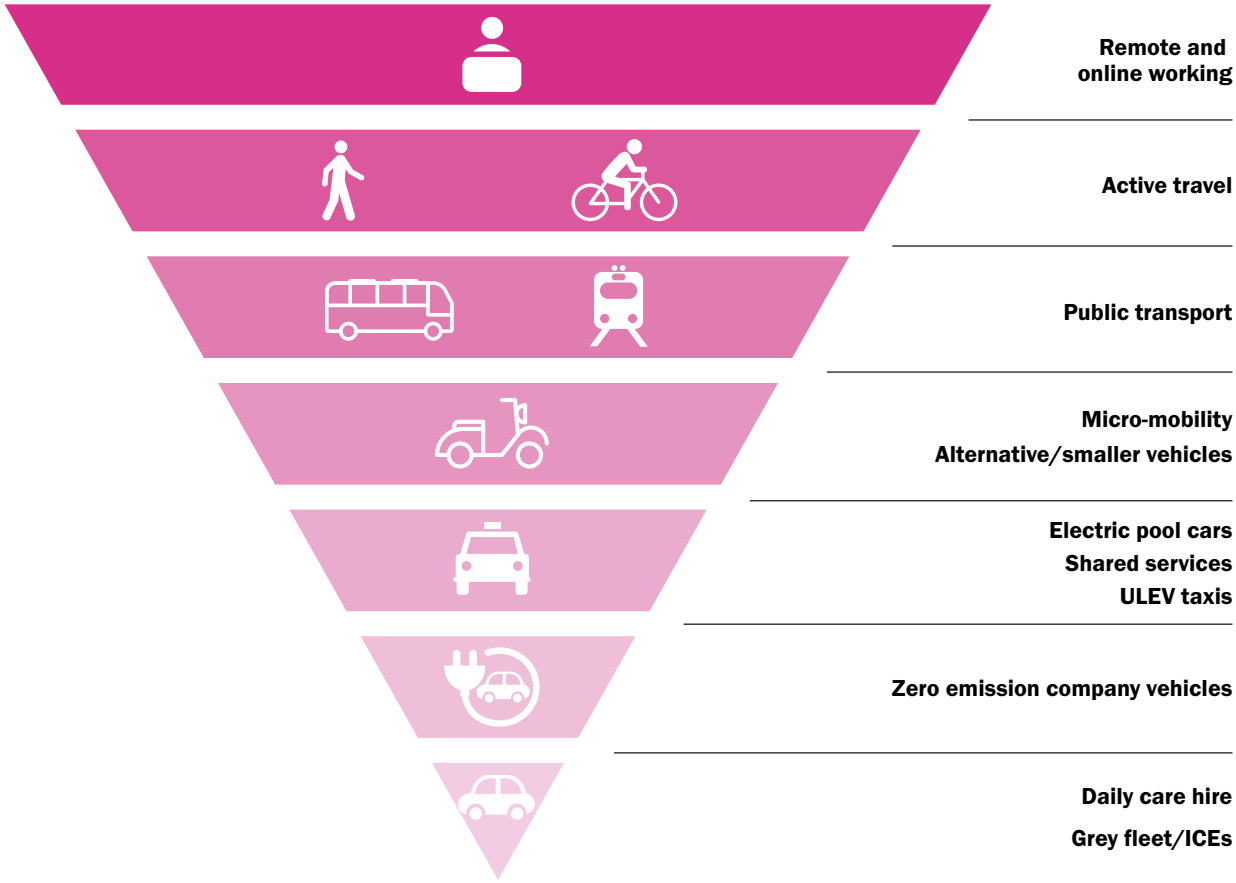


Figure 23: Application of a sustainable travel hierarchy when seeking to reduce and rationalise a public sector fleet



Public sector bodies will need to accelerate transformation to a zero emission fleet, building on fleet reviews completed in 2021 to develop business plans through 2022 setting out how they will decarbonise their fleet. Transition plans will enable public sector bodies to define their requirements, set milestones to align with net zero 2030 and bid for financial support from existing Welsh Government programmes.

To meet the policy goal of **all new public sector cars and light goods vehicles being zero/ ultra-low emission by 2025 and heavy goods by 2030**, transition plans will need to address:

- fleet sharing and fleet reduction;
- charging infrastructure deployment to support shift to ultra-low emission vehicles (ULEV);
- ULEV vehicles only at replacement points;
- mandating only ULEV when hiring or leasing additional vehicles;
- a reduced grey fleet use through home working, public transport or active travel alternatives; and,
- the carbon footprint of buses, taxis and private hire vehicles.

Case Study – Mobility and Transport: Welsh Government Green Car Scheme

The Welsh Government launched a Green Car Scheme for staff in June 2021. The scheme allows staff to lease a brand new ultra-low carbon emission car emitting 50g/km CO_2 or less from our provider, Tusker, and pay for it through a salary sacrifice, direct from their pay before tax is applied. In return for offsetting part of their salary, staff can get a brand new fully maintained and insured car.

The Green Car Scheme was negotiated with our three recognised trade unions and operates in a similar way to other salary sacrifice arrangements we have in place such as the Cycle to Work and Childcare Voucher schemes. The scheme has been delivered as part of the Commercial Procurement Directorate's Managed Service for Employee Benefit Schemes Framework.

As part of our pay and reward provision the organisation is committed to providing a growing benefits package to staff, maximising disposable income and improving staff morale. Through the Green Car Scheme we have been able to support staff wishing to respond to the climate emergency, as well as demonstrating the Welsh Government's commitment to tackling climate change.

Land use

Wales has a spectacular natural location and landscape and it is critical that not only is our natural environment protected as an asset for everyone but that we expand the natural world into our public spaces. We want our communities and community spaces to be as green as possible in every sense in order to realise the wellbeing benefits. Public bodies should not rely on the potential to offset the emissions that we can't reduce by other means, through land use when shaping their actions to achieve net zero.

Policy 81 – All public sector organisations should understand the sequestration potential of land in their ownership by March 2023 and commit to taking action to realise this potential by March 2030

Proposals should include increasing tree cover, planting new woodland, improved woodland management and increasing carbon stores in soils and biomass.

Our public bodies also have an opportunity to use their assets to support the increased supply of renewable energy through more localised, flexible and smarter low carbon renewables based system. In Flintshire the Energy Service supported the County Council to turn an old landfill and two brownfield sites into solar farms. Installing 9,000 solar panels, these generate 3.5MWh of electricity annually, enough to power 900 Welsh homes. In 2020-21 the Energy Service has helped support the creation of 13.6MW of new renewable electricity projects, securing investment of £13 million and saving 57,000 tCO_2e over their lifetime. However, a lot more can still be done.

As set out in the Electricity and Heat Chapter, our PfG commits to expand renewable energy generation by public bodies and community groups in Wales by over 100 MW between 2021 and 2026. This will put us on the path to meet our longer term target of 1 GW of renewable energy generation capacity to be locally owned by 2030.

As part of our consultation on meeting Wales' electricity demand from renewable generation we will also review our target for local ownership.

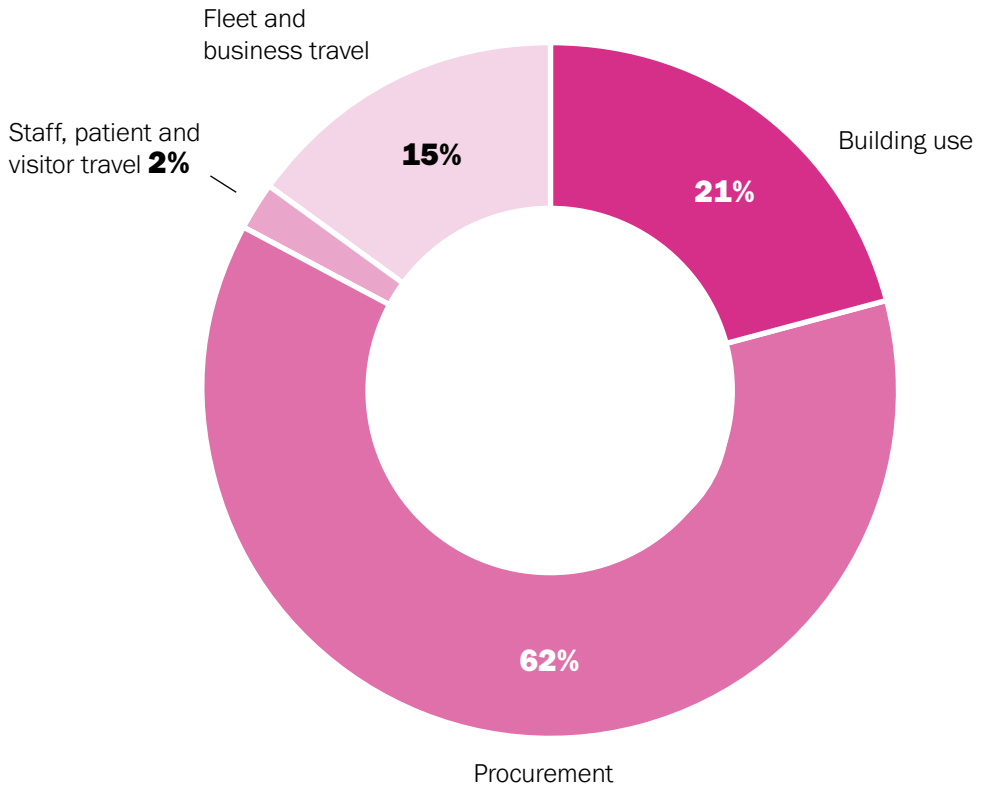
As part of decarbonisation planning all public sector organisations need to understand the sequestration potential of land in their ownership and commit to taking action to realise this potential by March 2030.

How the sector is showing leadership

Health and Social Care

Wales' health and social care community recognises there is a significant opportunity for health and social care systems to lead the way on reducing carbon emissions from the public sector. Action is needed not only because NHS Wales is the biggest public sector emitter (with a carbon footprint (https://gov.wales/sites/default/files/publications/2020-09/nhswales-carbon-footprint-2018-19.pdf) of around 1.00 $MtCO_2e$ in 2018–19 which represents approximately 2.6% of Wales' total greenhouse gas emissions) but also because the health and social care systems are at the forefront of responding to the impact of the climate emergency on health outcomes. Air pollution is linked to increased rates of cardiac arrest, stroke, heart disease, lung cancer, obesity, cardiovascular issues, asthma and dementia. Conversely we know that reducing emissions and increasing green spaces have significant health and wellbeing benefits.

Figure 24: NHS Wales Carbon Footprint by Category 2018-19



Policy 82 – NHS Wales is committed to the collective net zero ambition by 2030 delivering through the NHS Decarbonisation Strategic Delivery Plan

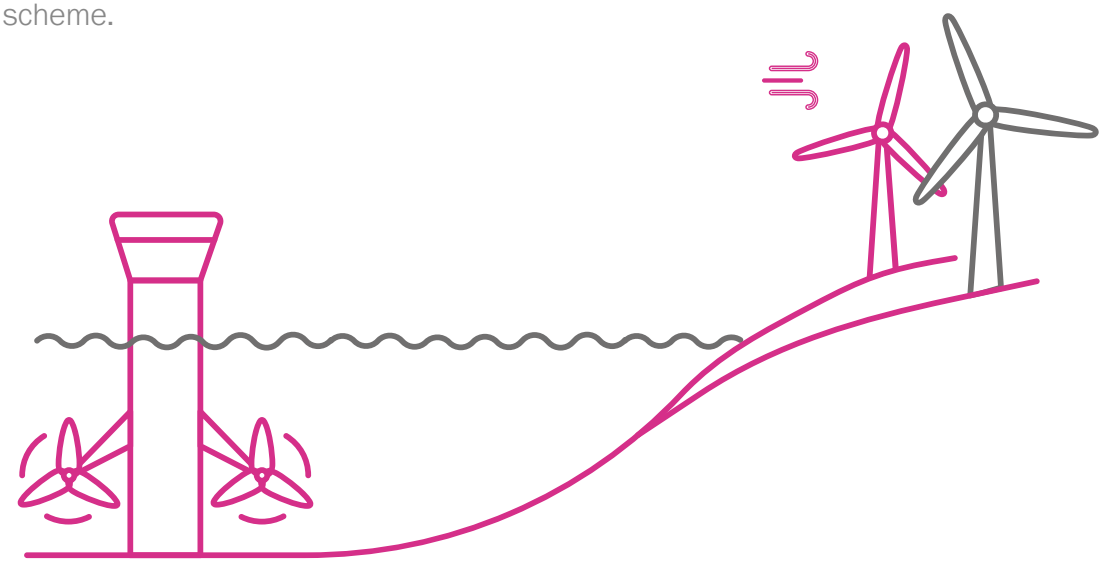
Policy 83 – A joint NHS Wales and LG Social Care Decarbonisation Plan should be created to support the achievement of a collective net zero by 2030

In response to this challenge in March 2021 the NHS Wales Decarbonisation Strategic Delivery Plan (https://gov.wales/sites/default/files/publications/2021-03/nhs-wales-decarbonisation-strategic-delivery-plan.pdf#:~:text=NHS%20Wales%20Decarbonisation%20Strategic%20Delivery%20Plan%205%20This,reducing%20our%20impact%20on%20the%20Global%20Health%20Emergency.) was published.

The plan sets out 46 commitments for delivery by 2025 across NHS Wales' highest emissions areas including procurement, buildings, land use, mobility and transport; 30 of these commitments are due for delivery by 2023. It is a clear and ambitious mandate for action but only the start. In 2022 the Welsh Government and local government in collaboration with the social care sector will publish a strategic delivery plan for Social Care Decarbonisation. Further activity is also underway to strengthen Wales' approach to sustainable healthcare and to support decarbonisation in wider Primary Care.

The plans build on the progress that has already been made including:

- **Swansea Bay Solar Farm at Morriston Hospital** – Funding has been provided for a 4 megawatt solar farm with 10,000 panels on 14 hectares of land. It is believed to be the first hospital in the UK to develop its own full scale solar farm. Once operational in autumn 2021 it will significantly reduce carbon emissions and at peak production could meet the electricity demand for the entire hospital. Guidance has been issued on solar developments to all other NHS Wales organisations as a consequence of the scheme.
- **Electric vehicle charging points** – EV charging points have been introduced across the NHS estate and will be considered for all future projects.
- **Virtual consultations** – While Covid brought significant challenges it also brought unintended benefits that have supported the decarbonisation agenda. The move to more virtual consultations and outpatient contact has meant a reduction of over 520,000 miles travelled and over 150,000 tCO_2e emissions whilst also maintaining high levels of patient satisfaction (based on TEC Cymru Research of 35,000 patients and professionals). NHS Wales plans for the future will embrace this change and retain the benefits that new ways of working have delivered.



Health and social care key commitments for 2021–2025:

Commitment – By 2023 in collaboration with the social care sector develop and publish a joint Welsh Government and Local Government Social Care Decarbonisation Strategic Delivery Plan.

Strategic Planning

Commitment – By 2023 'Decarbonisation Action Plans' will be developed by Health Boards, Trusts, and NWSSP Procurement – these will be regularly updated and committed to within Integrated Medium-Term Plans on a 2-yearly basis

Buildings

Commitment – Develop and build low carbon buildings to net zero standard – engage and collaborate with NHS partners across the UK on the emerging net zero building standard for hospitals, and adopt a net zero building accreditation approach which will be defined by 2022.

Commitment – Progress a transformational energy and water efficiency retrofit programme across the estate – every building with a long-term future will have undergone a multi-technology energy-efficient upgrade by 2030.

Procurement

Commitment – By 2025 NHS Wales Shared Services Partnership will:

- Transition to a market-based approach for supply chain emissions accounting.
- Expand its current Sustainable Procurement Code of Practice to include a framework for assessing the sustainability credentials of suppliers.
- Embed NHS Wales' decarbonisation ambitions in procurement procedures by mandating suppliers to decarbonise.

Mobility and Transport

Commitment – All new cars and light goods fleet vehicles procured across NHS Wales after April 2022 will be battery-electric wherever practically possible. In justifiable instances where this is not suitable, ultra-low emission vehicles should be procured.

Commitment – The Welsh Ambulance Service NHS Trust will aim for all rapid response vehicles procured after 2022 to be at least plug-in hybrid EV, or fully battery-electric in appropriate locations.

Commitment – The Welsh Ambulance Service NHS Trust will continue to develop their electric vehicle charging infrastructure network plan for the existing NHS Wales estate to facilitate the roll-out of electric vehicles

Commitment – All new medium and large freight vehicles procured across NHS Wales after April 2025 will meet the future modern standard of ultra-low emission vehicles in their class.

Land Use

Commitment – By 2025:

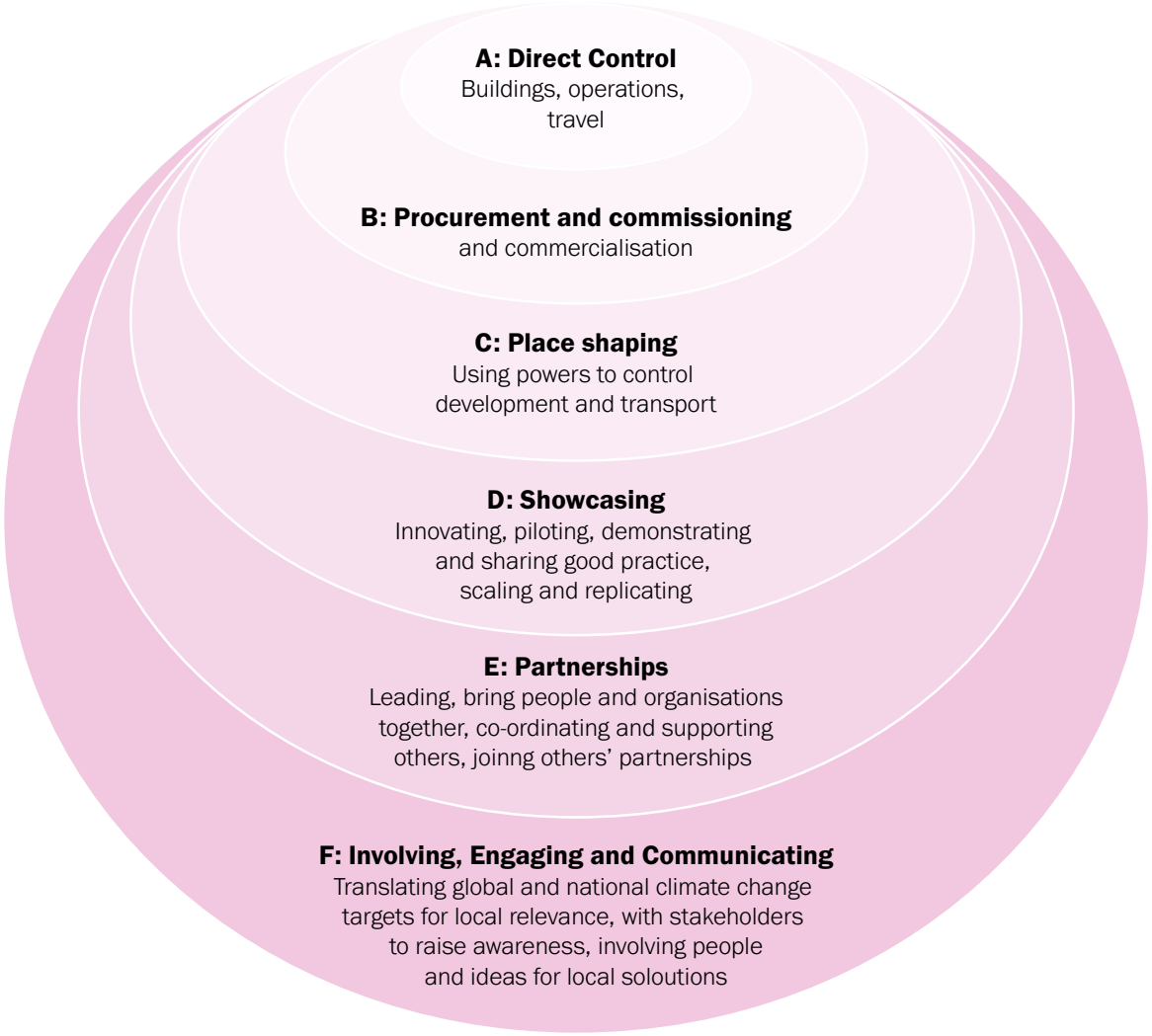
- All-Wales strategic estate planning will have carbon efficiency as a core principle.
- NWSSP and Welsh Government will advise Health Boards and Trusts on an appraisal approach for allocating land for uses such as renewable energy generation, greenhouse gas removal and afforestation – NHS Wales organisations will maintain green space and utilise land for decarbonisation, including collaborating with neighbouring land owners.
- Large-scale renewable energy generation opportunities with private wire connections to NHS Wales sites will be progressed where viable.

Local Government

Encompassing 22 local authorities and 730 community and town councils, local government is uniquely placed to both lead by example and also increase public awareness of the scale and pace of change needed to meet the ambitious target of becoming net zero by 2030.

Over half of local authorities in Wales have declared a climate emergency and all have active decarbonisation plans in place – publicly recognising the need for local and national action to achieve the public sector ambition. Many have also committed to be net zero organisations by 2030. Local authorities are responsible for 2-5% of local emissions but potentially influence around a third of an area's emissions through place-shaping and leadership[98].

Figure 25: How local authorities control and influence emissions



Source: CCC Local Authorities and the Sixth Carbon Budget

98 Source: Climate Change Committee Local Authorities and the Sixth Carbon Budget Dec 2020 (www.theccc.org.uk/publication/local-authorities-and-the-sixth-carbon-budget/)

Councils such as Denbighshire are taking active steps to embed the emergency into decision-making at all levels (See Case study in Working Together to Reach Net Zero).

We also pledge to ensure that our existing homes have a pathway to Carbon Zero and that all new developments achieve Carbon Zero. We will be working collaboratively with our partners, people and residents to change behaviours towards environmental issues.

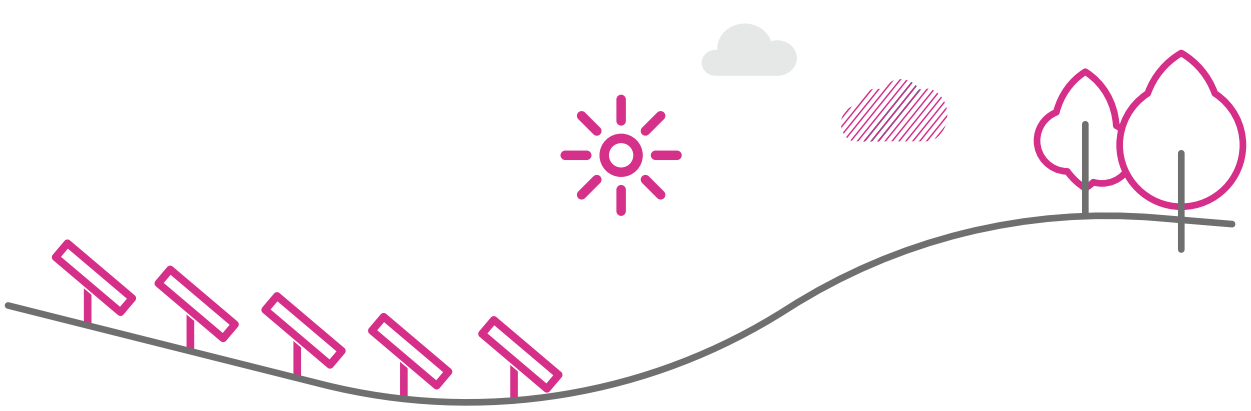
Pledge – Denbighshire County Council

Policy 84 – The Local Government Decarbonisation Strategy Panel and WLGA will support the commitments made by local government organisations to meet the collective net zero ambition by 2030

Local government is making best use of the strong regional, national and local structures already in place to facilitate and support excellent communication, sharing of good practice and lessons learnt and to challenge and to raise and support the ambition across Wales.

Further leadership is being provided by the Partnership Council for Wales who are helping drive a Team Wales Approach to Tackle Climate Change (https://gov.wales/team-wales-approach-tackle-climate-change) including through the establishment of the Local Government Decarbonisation Strategy Panel. The Partnership Council is a statutory vehicle for promoting joint working and co-operation between the Welsh Government and local government providing political accountability and leadership, attended by Welsh Ministers and all leaders of local government.

The Local Government Decarbonisation Strategy Panel, made up of local authority Chief Executives, National Parks, Natural Resources Wales, Unions, the Centre for Climate Change and Social Transformations (CAST), Welsh Government and Welsh Local Government Association, **has co-developed a set of ambitious local authority commitments, contributing to the net zero public sector ambition by 2030** (see table below), as well as a wider programme of supporting actions and communications.



Local authority key commitments for 2021–2025

Local government strategic commitments

Commitment – Strong structures in place for strategic planning and communication and a two year programme of support through the WLGA funded by WG.

Commitment – All local authorities have live decarbonisation action plans in place, which will be reviewed regularly with lessons and best practice shared through the WLGA support programme, the first review by end of 2021.

Commitment – from 2021 onwards emissions will be monitored annually, using baseline data. Annual reviews will report progress and drive improvements.

Buildings

Commitment – Develop and deliver a strategic plan for the **local authority estate** decarbonising existing (retained) buildings including retained council housing, moving to renewable energy sources for electricity and heating, and ensuring any new build is to net zero standards (in construction and operation).

Commitment – Ystadau Cymru as strategic lead for the public sector will work with LA estate managers to identify and shape what the estate will look like longer term (following recovery from the pandemic) ensuring decarbonisation is at the forefront of this agenda, and help drive the next three commitments:

- Develop a strategic plan for **decarbonising buildings** by the end of 2023;
- All public buildings are supplied with **low carbon heat** by 2030 and generate their own electricity where feasible;
- All **new** [new build and new acquisitions, e.g. hubs and lease arrangements] public sector buildings are **built to net zero standard**, including supply chain impacts as soon as practicable/dates to be confirmed as part of strategic plan. (Net zero build and net zero operation).

Procurement

Around 60% of a council's carbon emissions are from procuring supplies and services. There are significant opportunities for councils and other public sector bodies to collaborate on specifications to minimise the carbon impact of goods and services procured (e.g. setting contractual expectations in respect of reusable packaging, delivery of goods by electric vehicles, elimination of single use plastics, waste recycling targets for each business).

Commitment – Develop a good understanding by end of 2022 of all procured goods and services and its emissions profile.

Commitment – Set out carbon reduction specifications in all new or reviewed contracts to accelerate the decarbonisation agenda.

Commitment – Focus on a number of prioritised scale/impact contracts and share the learning regarding decarbonisation across all LAs by end of 2022 to develop a robust decarbonisation reduction approach to be applied to all contracts by 2023.

Commitment – Work with the 21st Century schools programme to establish and address cost differential and barriers to building net zero/carbon positive schools.

Commitment – Plan ahead for a coordinated programme of boiler replacement in council-owned properties.

Commitment – Work with colleges to develop a 'pipeline' of skilled workers, through apprenticeships and training, to support local authority retrofit work.

Mobility and Transport

Commitment – Accelerate transformation towards a zero emission fleet. Building on local authority fleet reviews completed in 2021, develop business plans through 2022 setting out how local authorities will decarbonise their fleet, including:

- Accelerate the roll-out of EV charging infrastructure.
- All new cars and light goods vehicles being net zero/ultra-low emission by 2025.
- Reduce the carbon footprint of buses, taxis and private hire vehicles to zero by 2030.

Commitment – Grey Fleet review completed by end of 2022 to identify how to support staff and service delivery to reduce travel requirements where possible and transition to low/zero emission transport.

Commitment – Support remote working by staff where possible and appropriate, at home or in 'hubs', and encourage travel to work via active travel and public transport to reduce car journeys.

Land Use

Commitment – In collaboration with NRW/WLGA/WG map out local authority land holdings by April 2022 to identify types of land and their sequestration potential to develop plans to maximise carbon benefits, renewable energy and to identify potential flood management measures.

Commitment – Carbon sequestration seen by leaders as a valid core purpose for use of public land and opportunities actively pursued by local authorities on their own land, including habitat restoration, tree planting etc as appropriate.

Commitment – Develop a specific five-year training and apprenticeship programme on peatland restoration to support the supply chain (which could tie into proposals for a National Nature Service).

Part 4 – Monitoring and reporting

Introduction

This section describes:

- how we will achieve our overall emission reductions, including how we are accounting for the policies in the plan;
- how we are counting the cost of carbon and money;
- how we have developed this Plan, guided by the sustainable development principle within the WFG Act; and
- how we will monitor the delivery of this Plan.

How we will achieve our overall emission reductions?

Under the Environment (Wales) Act 2016, Welsh Ministers must prepare and publish a plan (report) for each budgetary period, setting out their policies and proposals for meeting the carbon budget. This Plan sets out how we will meet Carbon Budget 2 (37% average reduction against our baseline) from 2021 – 2025. The policies and proposals are set out in Parts 2 and 3 of this Plan.

Part 2 primarily sets out the cross cutting and facilitative policies and proposals to decarbonise.

Part 3 of the plan includes ambition statements for each emission sector and provides the Policy Framework that will deliver these reductions. Delivery is underpinned by Welsh Government Policies and Proposals that have a more direct effect on emission reduction than those in Part 2, as well as the UK and wider societal contributions which will be required to deliver our targets.

While we recognise the need to take a systems view which considers the dependencies and links across a net zero Wales, we need to organise this plan in a way which groups related actions and aligns with our statutory accounting approach that considers emissions in line with international reporting practices. The emission sector chapters are therefore split into the following sectors: Electricity and Heat Generation, Transport, Residential Buildings, Industry and Business, Land Use, Agriculture, Waste and Public Sector.

Meeting the targets and budgets

In *Prosperity for All: A low carbon Wales*, we adopted the CCC's recommendations on the contributions different sectors should make towards meeting Carbon Budget 1.

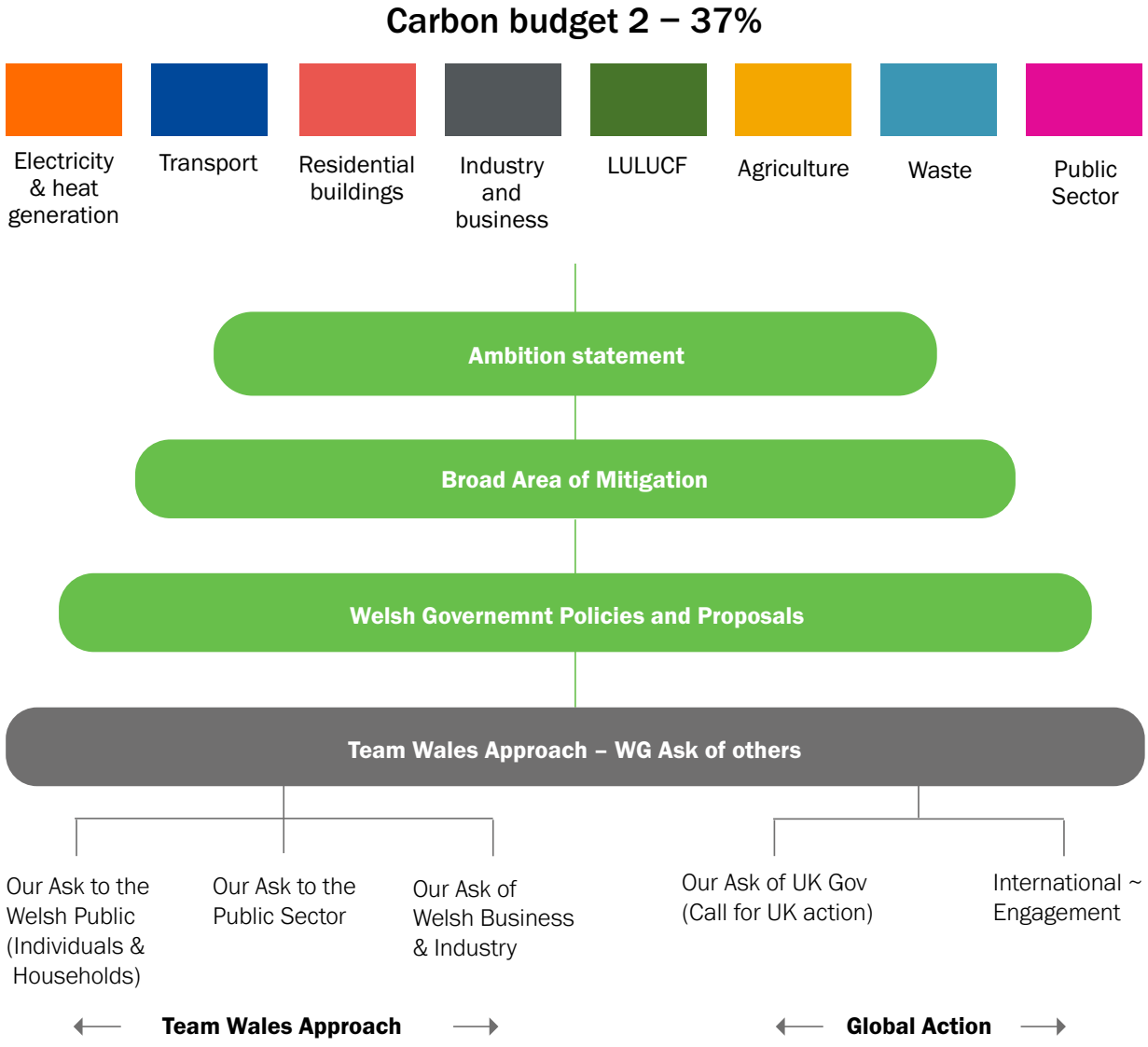
For Carbon Budget 2 and as we set out in Part 2, although we have accepted the advice of the CCC about **what** our long term 2050 pathway targets need to be, it is up to Welsh Ministers working in partnership with the Welsh people to agree how we get there. Since the last plan we have been further developing both our evidence base and our Wales 2050 emissions calculator.

The Wales 2050 calculator is a scenario based emissions projection model with a 2050 time horizon, covering all emissions sectors. Since Carbon Budget 2 is for Wales and not just Welsh Government, it is important we have a tool to measure emissions at the national level and which takes account of national action. The model allows the user to explore different pathways to decarbonisation and generates quantified emission outputs, based on the user choices made.

The **Ambition Statements** are constructed from a number of **broad mitigation measures** aligned to levers in the Wales 2050 calculator. Each lever in the model has a range of possible ambition levels ranging from business as usual to the maximum technical potential.

We have modelled a scenario, which reflects the contents of this plan, with an ambition level identified for each lever within the model. The outputs show we will collectively meet Carbon Budget 2, based on collating the specified ambition statements across the emission sectors. The output of this calculation is contained in Part 1.

How we meet our targets



The statements mainly relate to the existing budget (2021 – 2025) in recognition that new evidence and research will become available in future years. Any Ambition Statement dated outside the timeframe of this plan reflects our current understanding of what changes will occur in the future, but is subject to greater uncertainty and may change.

Delivery of each Ambition Statement is underpinned by a combination of policies and proposals from Welsh Government and others, which usually involves the increase of particular activities (e.g. active travel), or the decrease others (e.g. reduce energy demand). A policy is a committed course of action, whilst a proposal is a suggested course of action or exploratory action, the details of which might change as this course of action is explored further. Many proposals will be developed into detailed policies to deliver future carbon budgets.

This plan is a snapshot in time and as we go through Carbon Budget 2 we expect existing policies and proposals to be updated to increase their impact and new ones will emerge as our understanding of the evidence improves.

How we are counting the cost of carbon and money?

Carbon impacts

Understanding the amount of carbon we produce, both directly and indirectly, can help everyone in their decision making. Currently there are hundreds of different carbon models, focussed on different sectors, time periods and scope. Whilst there are some established techniques in specific sectors, we intend to continue refining the methods used and supporting the development of skills to apply those methods consistently across sectors so that the carbon impact of policies can be even more sophisticated in future.

The interconnected nature of the net zero system means this is further complicated by the direct and indirect consequences of policy action and by the implications in the wider system, which can be difficult to robustly model.

Over Carbon Budget 2, working with Wales Centre for Public Policy, we aim to improve our understanding of how to effectively count the carbon impact of decisions and how multiple decisions interact to impact our overall targets. This will help increase awareness across sectors and society to enable better decisions to be made by everyone. We have already started some of this work, and have included the early outputs in the Transport chapter as an exemplar to show how our understanding and approach is evolving.

Financial costings explained

Our emission reduction targets are set at a Wales level and as such, this is an All Wales plan, recognising that actions will need to be taken by everyone. This means that the costs and benefits will also be shared across society. While Part 2 outlines how the Welsh Government is supporting actions through enabling mechanisms, such as the way we use our finances and investments in the future, this section explores what the costs of the low-carbon transition in Wales more generally might be.

There are a wide range of costs and benefits arising from a low-carbon transition. For example, the additional capital investment required to purchase and install new low carbon technology and infrastructure needs to be considered alongside the associated operating costs or savings that occur through operating that technology. These monetary costs and benefits vary significantly between different sectors in Wales. There are also co-impacts, which are often positive, including on air quality, health, the environment and biodiversity.

Although the monetary costs associated with Wales transitioning to net zero by 2050 are not fully known yet, an indicative cost estimate has been provided in the Regulatory Impact Assessment for net zero[99]. In this Regulatory Impact Assessment, we estimate that the additional cost of meeting net zero compared to a scenario with no further climate action will lead to additional present value resource costs of between £10bn and £16bn in total over the period to 2050. Additional resource costs are the monetary costs (and savings) required to provide the same goods and services in a low or zero carbon way. However, there may also be significant societal co-impacts associated with transitioning to net zero which have not been quantified in our analysis, such as health and natural capital.

There is a great deal of uncertainty inherent in estimating future costs associated with long–term emission targets which increases over time. The uncertainty comes from questions about the cost and development of future low-carbon technologies, the future actions of government, business, other social groups and individuals. For example, the actions of consumers in Wales and the UK more widely will have a major effect on the future cost of meeting our emissions targets – if consumers develop low-carbon behavioural habits[100], the future costs will likely be much lower. Irrespective of this uncertainty, we are looking to continually boost our evidence base and improve our understanding of the costs associated with reaching net zero, to help us facilitate the least-cost low-carbon transition.

Investment and operating costs

The latest estimates by the CCC indicates that that capital investment associated with delivering net zero in Wales may need to increase by around 0.5% (or £360 million) of GDP (total economic output) in 2022, reaching 1.7% of GDP (£1.4 billion) in 2025, peaking at 3.8% of GDP (£3.6 billion) in 2034, before falling to a more-or-less steady state figure of just under 2% of GDP (£2.3 billion) in 2050[101]. As mentioned above, due to the uncertainty of estimating future costs, these figures should be seen as illustrative of a potential order of magnitude rather than an accurate forecast. In the long-term, the CCC also project significant savings in fuel costs in a variety of areas, which may offset a large proportion of the additional investment costs.

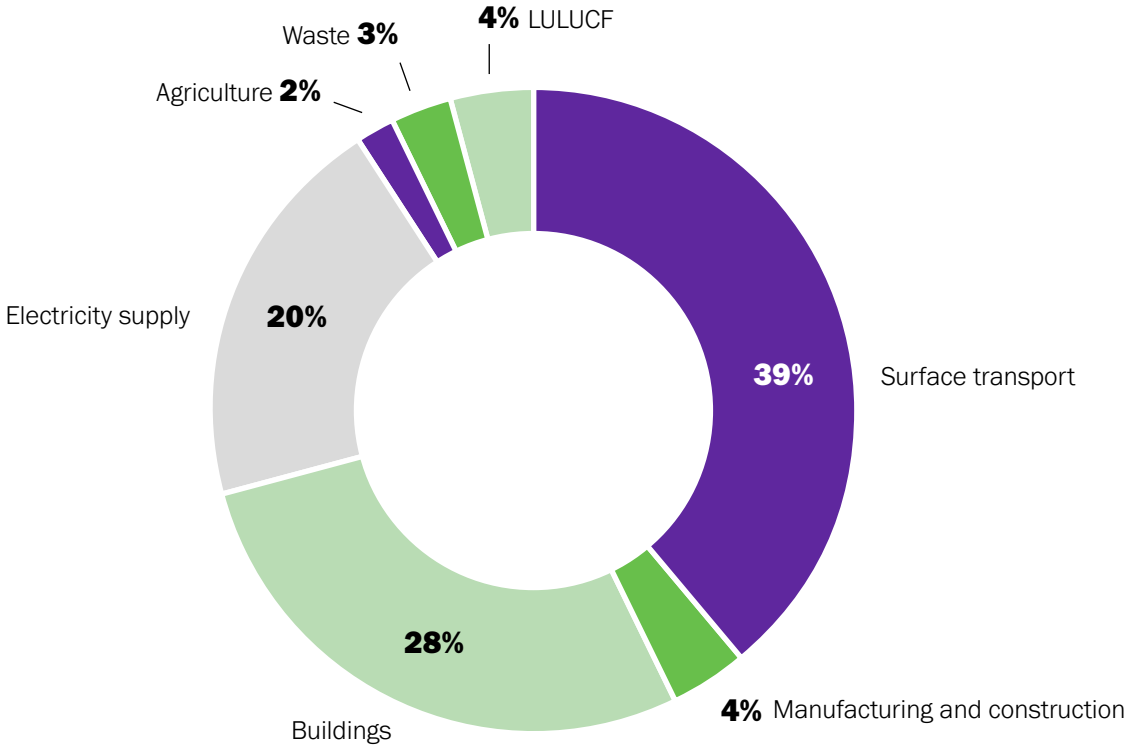
In the short term over Carbon Budget 2 (2021–2025), the CCC indicate that additional capital investment associated with the low-carbon transition in Wales will need to increase steadily over this period. According to the CCC's recommended pathway (the Balanced Pathway), over this 5 year period, the total additional

99 https://senedd.wales/media/fpvlq1yq/sub-ld14108-em-e.pdf
100 Low-carbon behaviour includes actions such as active travel and reducing food waste.
101 These figures are based on the CCC's recommended pathway, the Balanced Pathway. Total investment varies in the other scenarios

investment cost is estimated to be approximately £4.2 billion, compared to a baseline of no further climate action.

Figure 20 shows an illustrative approximation of the distribution of additional capital investment costs over Carbon Budget 2 across the key sectors in Wales, according to the CCC's Balanced Pathway. It suggests that almost 40% of the total additional capital investment over this period is expected to be in the surface transport sector. The majority of these costs will likely be private sector investment in zero-emission vehicles. Just under 30% of total additional investment is expected to be in buildings, with the majority of this investment going into improving energy efficiency via retrofitting and installing low carbon heat in existing residential homes and non-residential buildings. Finally, roughly 20% of the total additional investment is expected to be in electricity supply, installing low-carbon generation (mostly in variable renewables such as wind and solar PV).

Figure 26: Additional capital investment costs over Carbon Budget 2 (% of total (£4.2 billion))



The level of investment costs in the short-term is largely dependent upon the technological maturity and cost of low-carbon alternatives. For example, the CCC expect high levels of investment in zero-emission cars in the short-term since the technology has largely reached maturity, and they assume zero-emission cars will reach price parity with conventional vehicles in the 2020s. In the power sector, dramatic falls in the price of renewable energy has made it increasingly cost-competitive with gas, resulting in significant capital investments in the short-term.

In the medium and long-term, costs across sectors will continue to change following technological development and cost reductions in low-carbon goods, but also importantly, following changes in regulation, tax, and the carbon price and emissions cap (when included in the UK ETS). For example, as low-carbon hydrogen and electrification technologies in industrial processes are ready for the market, an appropriate carbon price alongside the emissions cap is expected to incentivise widespread roll out of these technologies in industry in the 2030s. In addition, future regulation of residential heating, removal of price distortions, as well as price reductions of low carbon heating technology such as electric heat pumps is expected to drive significant uptake and investment in the 2030s and 2040s. In all cases we need to make sure the cost of transitioning to a cleaner future is not met by the least well off in society.

For technologies which have not yet reached maturity, small marginal changes in future low-carbon technology prices can shift the optimal technology mix significantly, for example with low-carbon heating technologies. This means, in line with our intent to innovate, to test and to learn, investments need to make sense across a wide range of possible paths to facilitate the least-cost low-carbon transition.

The Welsh Government's programme of capital investments prioritises maximising wellbeing benefits and value for money in terms of delivering carbon reductions. It will also aim to ensure appropriate corrective measures are in place so that the costs will not fall on those least able to bear them.

Using sustainable ways of working to develop our plans

The challenge of climate change requires us to work differently, which can help in delivering better decisions and outcomes for all. Climate change is an immediate threat that is getting worse. The new PfG, published in June 2021 sets out our ambitious and radical commitments over the next five years in order to tackle the climate and nature emergencies, putting these challenges at the heart of the new Government. This step change will require all of us to think and work differently to not only improve the future of our planet but improve the lives of people across Wales.

The PfG sets out the 10 well-being objectives that the government will use to maximise its contribution to Wales' seven long-term well-being goals and the steps we will take to deliver them over this government term (2021 – 2025).

The ten well-being objectives are:

- Provide effective, high quality and sustainable healthcare.
- Continue our long-term programme of education reform, and ensure educational inequalities narrow and standards rise.
- Protect, re-build and develop our services for vulnerable people.
- Celebrate diversity and move to eliminate inequality in all of its forms.
- Build an economy based on the principles of fair work, sustainability and the industries and services of the future.
- Push towards a million Welsh speakers, and enable our tourism, sports and arts industries to thrive.
- Build a stronger, greener economy as we make maximum progress towards decarbonisation.
- Make our cities, towns and villages even better places in which to live and work.
- Embed our response to the climate and nature emergency in everything we do.
- Lead Wales in a national civic conversation about our constitutional future, and give our country the strongest possible presence on the world stage.

The five Ways of Working under the sustainable development principle have helped guide and shape the collective action needed to meet Carbon Budget 2 as set out in this plan.

This is just the start of a longer term involvement and collaboration as outlined in Parts 2 and Part 5.

How we developed the plan using the 'Ways of Working'

This Plan contains commitments from across Government and wider stakeholders. Recognising policy action on climate change is constantly evolving and developing, in July 2020 (with an update in March 2021) we published an updated Engagement Plan[102] highlighting how we would involve and collaborate with stakeholders throughout the process, rather than engaging on a near-finished product at the end.

Taking an example from a single sector, the development of the Agriculture Bill demonstrates how policy development does not just take place when we are developing our statutory emissions reduction plans, but continually. Our Transport Strategy had its own, bespoke engagement programme. Each major policy has its own engagement process and so this section considers the process at a more strategic level.

102 https://gov.wales/sites/default/files/publications/2021-03/engagement-approach-for-low-carbon-delivery-plan-2.pdf

The building blocks of Net Zero Wales engagement (Carbon Budget 2)		
Engaging with Sector/ Industry Groups	Informing stakeholders and public via Communications	Developing the Wales 2050 calculator
Proving evidence and attending the Climate Change Committee events	Attending Online Sector/ Industry Events	
Collaborating on behaviour Change	Collaborating via Climate Justice events and work	Collaborating with Young People
Pledge Campaign		
Welsh Government and UK Government Consultations on individual Policy		
Annual Conferences	International/COP	
Regular meetings with key stakeholders		

The collective action set out in this Plan provides better outcomes for the planet and people, both present and future generations. A number of examples of how the Wellbeing of Future Generations Act's ways of working have guided and shaped this plan are set out below.

The Environment Act establishes a clear long term pathway for Wales to reduce emissions to net zero in 2050. Whilst this Plan focuses on the short term (Carbon Budget 2 2021 – 2025), it also lays the foundations for **long term** action. A pivotal part of this plan is to include actions, such as evidence and research, to set the foundations for developing emission reduction policies of the future. They will be progressed over Carbon Budget 2 and then implemented in future carbon budgets.

It is crucial that we understand the impact of our policies to **prevent** undesirable consequences. It is also important to understand the impact of global decarbonisation on society in Wales. We have ensured that the concept of a 'Just Transition' is embedded across all aspects of this plan. We will also continue to work collaboratively with our key stakeholders and build our evidence base to ensure we understand the distributional impacts of decarbonisation action both in Wales and globally.

The integration of climate change within policies across government ensures that we maximise our contribution towards the seven well-being goals. In developing this plan we have continued to identify and realise where multiple benefits can be achieved in developing both existing and proposed future action. Understanding the climate impact of policy is now a key consideration of our policy development process. Since *Prosperity for All: A Low Carbon Wales*, the integration of our response to climate change has been strengthened by cross-Government policies such as *Future Wales, Llwybr Newydd* and *Beyond Recycling*. It is also a crucial factor in determining investment decisions, such as the forthcoming budget.

Since 2019 we have continued to strengthen our **collaboration** with partners to develop the policies and proposals within this Plan. We have worked with stakeholders to develop a Team Wales Approach because Government action is just one component of our response to the challenge of net zero, alongside concerted action across the public sector, across our economy and throughout our communities. This has included our Pledge Campaign which was launched in 2019 and which has seen over 100 organisations and individuals across Wales committing to play their part. The Covid pandemic did not deter our approach either. Our engagement plan published in July 2020 provided stakeholders with information on how they could collaborate to shape the opportunities and actions in this Plan. The success of this approach will see a new engagement plan developed on the delivery of Net Zero Wales in 2022 (Policy 15).

We have continued to strengthen **involvement** of the people of Wales in the response to tackling climate change. For instance, Wales Climate Week 2020 broadened our reach, with 2,270 people signed up to the platform website and over 80 speakers taking part across 20 events. We will continue this approach over Carbon Budget 2 starting with COP Cymru (see Part 5) but we need to reach even further. All of Wales has a part to play in reaching net zero emissions. Therefore in 2022 we will be consulting on how we can involve society on the changes individuals and communities can make to help Wales meet net zero and ensure no one and no place is left behind (Policy 16).

Using the Sustainability Appraisal to maximise our contribution to the well-being goals

We recognise the importance of understanding and demonstrating how our collective action is contributing to the achievement of the well-being goals, and our specific well-being objectives for this government term. Therefore we have commissioned an independent Sustainability Appraisal (SA) of the plan.

A Sustainability Appraisal is a systematic process that aims to promote sustainable development by assessing the extent to which an emerging plan or project will help to achieve relevant objectives. It identifies, describes and evaluates the economic, social, environmental and cultural sustainability effects of the policies and proposals in the plan.

As part of the SA process, a set of objectives and guide questions were developed to reflect the Welsh Government's well-being goals and

objectives. Key messages contained within other plans and programmes and the economic, social, environmental and cultural issues, which may affect (or be affected by) the plan were identified as part of the preparation of a SA Scoping Report in spring 2021.

Instead of following the traditional SA process, given the breadth of our approach, we wanted to ensure that our wider well-being requirements were taken into account. Our SA therefore includes the principles and approach of the traditional SA and Strategic Environment Assessment (SEA) process, whilst incorporating our wider objectives such as the WFG Act, Welsh Government's well-being objectives and requirements for impact assessments.

Policies and proposals in each major emissions sector have been appraised in order to determine the cumulative effects of each policy area/topic. In addition, a cumulative effects assessment has been undertaken in order to clearly identify areas where policies work together.

The policies and proposals have been appraised using the SA Framework and the qualitative scoring system in SA scoring system.

Score	Description	Symbol
Significant Positive Effect	The proposed option/policy contributes significantly to the achievement of the objective and/or enables resolution of existing issues.	++
Minor Positive Effect	The proposed option/policy contributes to the achievement of the objective but not significantly.	+
Neutral	The proposed option/policy does not have any effect on the achievement of the objective	0
Minor Negative Effect	The proposed option/policy detracts from the achievement of the objective but not significantly.	-
Significant Negative Effect	The proposed option/policy detracts significantly from the achievement of the objective.	--
No Relationship	There is no clear relationship between the proposed option/policy and the achievement of the objective or the relationship is negligible.	~
Uncertain	The proposed option/policy has an uncertain relationship to the objective or the relationship is dependent on the way in which the aspect is managed. In addition, insufficient information may be available to enable an appraisal to be made.	?

Table 9: Summary appraisal of cumulative effects

Principal wellbeing goal	A prosperous Wales	A prosperous Wales	A resilient Wales	A healthier Wales	A Wales of cohesive communities	A resilient Wales	A more equal Wales	A Wales of vibrant culture and thriving Welsh language	A Wales of cohesive communities	A globally responsible Wales
SA Objective	1. To achieve a strong and sustainable net zero economy	2. To provide sustainable employment opportunities that help tackle inequality and deliver a just transition	3. To address climate change	4. To improve the physical and mental health and well-being of everyone	5. To improve social cohesion and equality	6. To improve natural and built environments	7. To encourage learning for life and help to equip everyone with the skills required for a changing world	8. To help build resilient communities, culture and language	9. To help delivery of modern, connected, and resilient infrastructure	10. To ensure Wales is a globally responsible nation
Setting the conditions	++/-	++/-	++	++	++	++	++/?	+	++	++
Electricity and heat generation	++	++/-	++	+	+/-	+/-	+	+	+	+
Transport	+/-	+/-	++/?	++	+/-	+/-/?	0/?	+/?	++/-/?	0/?
Residential buildings	++/?	+	++/?	++/+	++/-/?	++	+	+	++/?	+
Industry and business	++	++/-	++/?	+	+	+	+	+	+	++
Agriculture	++	+	+/-	+	+	++	++	+	~	0
Land Use, Land Use Change and Forestry (LULUCF)	++	+	++	++/?	++/?	++	+/?	++	~	+/-
Waste management	+	+/?	++	++	+	++	~	+	+	+
Public sector	++	++	++	+	++	+	++	+	++	+
CUMULATIVE	++	++/-	++	++	++/-	++/-	+	+	++	+

An additional compatibility assessment has been made to demonstrate compatibility or identify tensions between the emission sector chapters set out in Part 3, which sectors should consider when implementing or developing future policies. A matrix has been used to record the findings of the appraisal, as shown below.

Table 10: Sector level compatibility appraisal

Electricity & heat generation		+	+	+/-	+/-	+	+/-	+
Transport	+		+/-	+	+/-	+	+	+
Residential buildings	+	+/-		+	+	+	+	+
Industry & business	+/-	+	+		+	+	+/-	+
Agriculture	+/-	+/-	+	+		+	+	+
LULUCF	+	+	+	+	+		+	+
Waste management	+/-	+	+	+/-	+	+		+/-
Public sector	+	+	+	+	+	+	+/-	
Emissions sector	Electricity & heat generation	Transport	Residential buildings	Industry & business	Agriculture	LULUCF	Waste management	Public sector

Key

+	Compatible	0	Neutral	?	Uncertain	-	Incompatible

Overall, the assessment found largely positive effects in relation to the ten SA objectives and therefore it is considered that Net Zero Wales supports achievement of the seven well-being goals. Significant positive effects have been identified for economy and employment, for addressing climate change, improving the environment, improving social cohesion and health, and in delivering resilient infrastructure with positive effects for lifelong learning, Welsh language and culture, and in supporting Wales's global role in the world.

However, some possible minor negative effects were also found for employment, social cohesion and environment reflecting potential impacts on jobs, the potential impacts on the poorest in terms of housing, power and transportation costs, and the potential for rural areas to be left behind in the decarbonisation of transportation. Minor negative effects also relate to the impacts of new infrastructure on the natural and built environment.

We will take the findings from the SA in to account in the development of the next phase of the programme, which starts in January 2022.

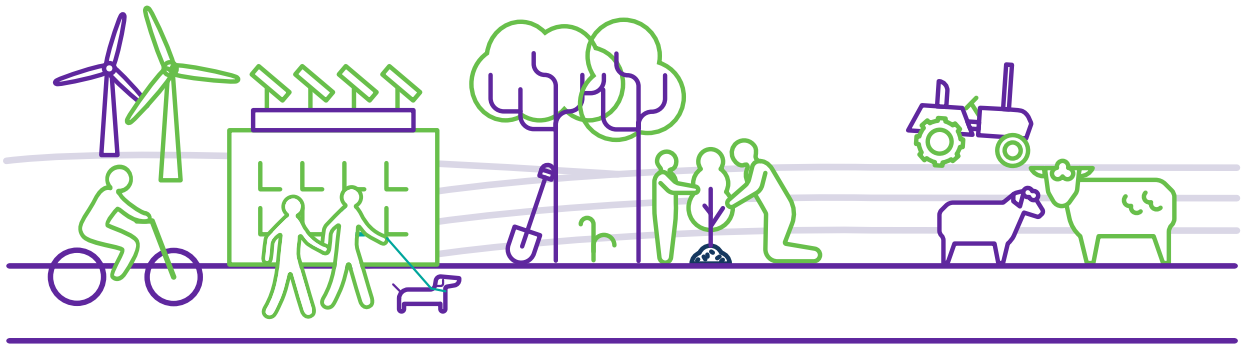
How we will monitor delivery of the Plan

This plan sets out our action over Carbon Budget 2. It is vital that we track and drive its implementation to ensure we make progress towards our targets and budgets in a fair and just way. To track our progress we have developed a comprehensive system to monitor delivery including:

- **Legislation** – requiring us to produce an assessment against our targets and budgets every 5 years. The next report is due in 2022.
- **Indicators** – tracking general progress towards our targets and budgets on an annual basis. We will publish our Wellbeing of Wales report annually.
- **A monitoring and reporting system**, which looks more in depth at the Welsh policies within the plan.
- I**ndependent Progress reports** from the CCC.
- Scrutiny from the **Senedd** and Senedd committees.

An overview of the monitoring and reporting approach for this Plan is set out below.

	Carbon Budget 2					Carbon Budget 3				
Year	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Publication of plans	**Publish Net Zero Wales Delivery Plan (CB2)**					**Publish Net Zero Wales Delivery Plan (CB3)**				
Welsh Government progress report with Monitoring and Reporting framework		**Final Statement for CB1 including Monitoring and Reporting Framework**					**Final Statement for CB2 including Monitoring and Reporting Framework**			
National Indicators tracking total emissions data										
Climate Change Commitee	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Senedd	UK progress including Wales	Response to progress report	UK progress including Wales	UK progress including Wales	UK progress including Wales	UK progress including Wales	Response to progress report	UK progress including Wales	UK progress including Wales	UK progress including Wales



Legislation

Our legislation was designed to assess overall progress against the targets and budgets, by including reporting requirements at the end of each budgetary period. The Environment (Wales) Act 2016 requires Welsh Ministers to prepare and lay a statement after each budgetary period setting out whether Wales has met the budget and relevant interim targets.

The statement must explain what the Welsh Ministers consider to be the reasons why the carbon budget and interim target has, or has not, been met. In particular, it must include the Welsh Ministers' assessment of the extent to which their proposals and policies for meeting the carbon budget for the period have been carried out, and have contributed to the carbon budget for the period being met (or not being met).

This report must be laid before the end of the second year after the budgetary period, allowing time for the emissions data to be compiled from the Greenhouse Gas Inventory, which requires 18 months from the close of year. The Carbon Budget 1 period was from 2016 – 2020, which means we will report on the Carbon Budget 1 period in 2022, and we will report on this plan in 2027.

For further information on our Greenhouse Gas Inventory please see Annex 4.

Indicators

Under the Well-being of Future Generations framework we already have a monitoring approach that measures national progress in achieving the seven well-being goals. Our national well-being indicators[103] tell the story of progress towards these goals and include measures of greenhouse gas emissions (both on a domestic and consumption basis). These are the national indicators most directly related to monitoring the impact of this Plan, but there are also many other indicators that the policies and proposals in this Plan will influence.

While National Indicators act as a way of measuring progress, National Milestones set out the expectations of progress, including the scale and pace of change required allowing us to assess whether we are on track. Both greenhouse gas emissions and the global footprint have been proposed as national milestones, reflecting the significant role they play in making progress towards the wellbeing goals and demonstrating the scale and pace of change needed by 2050.

Every year the Well-being of Wales Report[104] provides an updated assessment of long term and short term changes to Wales' economic, social, environmental and cultural well-being, drawing on the national indicators and milestones alongside other data. Within this framework we measure greenhouse gas emissions (Indicator #41 and 42) and our ecological (global) footprint (Indicator #14).

103 Wellbeing of Wales: national indicators | GOV.WALES (https://gov.wales/wellbeing-wales-national-indicators)
104 https://gov.wales/wellbeing-wales

Monitoring and reporting

The Net Zero Wales Plan monitoring and reporting framework allows for more detailed tracking of the policies within the Plan including implementation. It provides insight into how the policies set out in the Plan contribute to meeting the targets and budgets for the period.

The Monitoring, Reporting and Verification (MRV) system consists of a suite of quantitative performance indicators within a tiered structure, which seek to track progress from the national level down to the policy level. Performance indicators are:

> *Specific, measureable metrics that support systematic tracking of how policies are being implemented and whether they are on course to achieve their intended goals and objectives.*

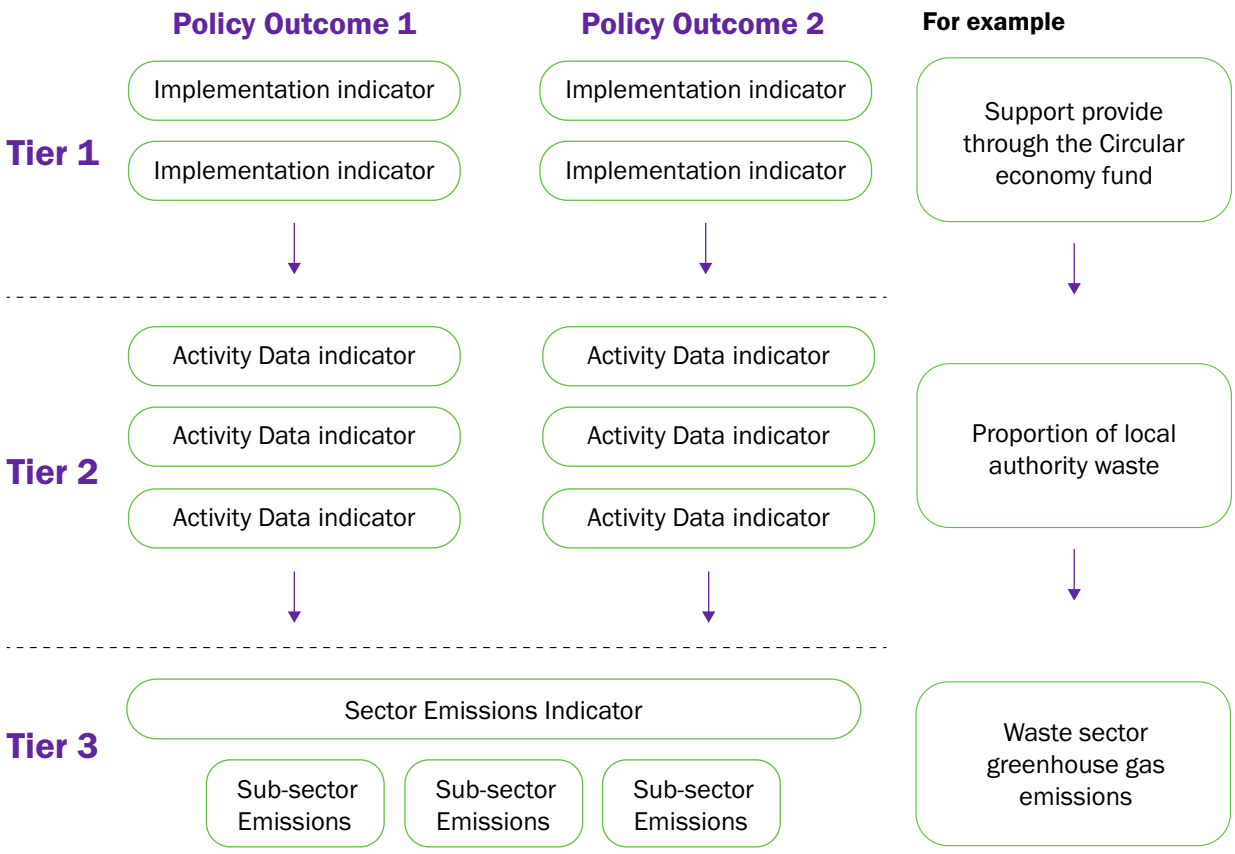
Used alongside the greenhouse gas inventory, performance indicators enable the progress of individual policies to be tracked in more granular detail. Crucially they enable both **implementation** (i.e. has a policy been initiated) and **effectiveness** (i.e. to what extent it is achieving its original aims) to be tracked. Such information can be used to establish a detailed feedback mechanism between evidence compilers and policy makers, allowing policies to be adapted or even terminated if not effective, or to establish if lack of impact is due to them not being effectively rolled out.

Tier 3 = Policy-specific indicators to monitor those policies set out in the Plan and which aim to drive emissions reduction over the specific carbon budget period

Tier 2 = Activity data, e.g. consumption and production information, that directly drives changes in emissions levels of the sector

Tier 1 = Overall sector emissions plus split of emissions by sub-sector, using data from the Greenhouse Gas Inventory

The following diagram sets out how these tiers are interrelated – the concept being that change in one tier effects change in the metrics at the tier below:



Approach to reporting

Similar to the UK and UN process, Wales measures emissions through a 5 yearly carbon budgeting process. The five yearly reporting cycle helps to smooth year to year volatility of emissions for example from colder winters or changes in large point source sites. The MRV system will be used to inform the final statement at the end of the carbon budget period, as set out above.

Independent progress reports

Part 2 of the Environment (Wales) Act 2016 states that Welsh Ministers may establish an advisory body. The purpose of the Advisory Body is to advise on interim targets, carbon budgets, achievement of or changes to the 2050 emission target, present progress reports to the Welsh Government and to provide advice on the progress of achieving interim targets.

The CCC has been appointed as the Advisory Body and they provide independent progress reports every year, which are made public and laid in the Senedd.

Governance

To support delivery and help drive action, we have established internal governance to develop and deliver Net Zero Wales consisting of :

- Cross-Government Cabinet supported by a dedicated Climate Change ministry, bringing together the big policy areas to help Wales reach its legally binding target of reaching net zero by 2050;
- A Portfolio Board chaired by the Climate Change SRO with lead officials for each emission sector and cross cutting area;
- Focused arrangements to monitor and drive delivery of the PfG.

We also welcome the scrutiny of the Senedd, both in plenary and though the activity of the various committees. While, the Climate Change, Environment and Infrastructure Committee has a particularly important role, we anticipate all Senedd committees will take a strong interest in action to respond to the climate and nature emergency given its significance across our economy and society.

Part 5 – Next steps

Net Zero Wales is the first all-Wales Plan to tackle the climate emergency, and the first which has net zero as its guiding ambition. We are at the start of a new phase in our journey.

This Plan is a snapshot in time. It does not contain a complete list of the policies or proposals to be developed within the current government term and we believe there will be many areas where we can work with others to develop new or strengthened policies. This plan does, however, signal our intent, our commitment and our direction. As we move through the early 2020's further policies will be developed and action across Wales will continue to apply downward pressure on our emissions.

This is the decade of action and so the next steps in the journey must be purposeful engagement and delivery of our commitments.

Purposeful engagement

The role of Welsh people, communities and businesses has never been more crucial. This Plan is a call for everyone in Wales to play their part in reducing our emissions and engagement will be fundamental to the delivery of our goals.

Key engagement opportunities and activities are discussed in Part 2, but will include:

- COP26. As set out in Part 1, the UN's Climate Change Conference of the Parties (COP26) in Glasgow on 1-12 November 2021 provides the opportunity for Wales to demonstrate how we will play our part in 'keeping 1.5 degrees' alive.
- COP Cymru including Wales Climate Week – A suite of activity before, during and after COP26 will provide us with the opportunity to launch this Plan, to be part of the wider UN Conference through regional events linked to the Glasgow hub, and then to reflect on the outcome of COP26 for Wales and discuss how we take this Plan forward, building on the momentum generated at the international level. We want to use COP Cymru to inspire, motivate and catalyse action across Wales.
- Ongoing consultations on specific policies and proposals – This is the real opportunity for stakeholders to get into the detail and shape the delivery of this Plan as well as the content of the next Plan, due to be published in 2026. While a high level overview is provided below, stakeholders are encouraged to engage with the government through climate change newsletters and briefs, webinars, and sector-led groups and panels, which play such an important role in shaping our policies and actions. These forums will highlight the best ways for the people and organisations of Wales to feed in their valuable insights and evidence.

As set out in Part 2, we will publish a full engagement plan for Net Zero Wales in Spring 2022, setting out how we will enable and ensure that people in Wales have a meaningful opportunity to contribute to delivering the actions set out in this Plan (Policy 15).

Delivery of our commitments

We believe that this Plan is an important milestone in our journey towards net zero, and the actions to deliver our ambitions are more important still. A high-level timeline for delivery of some of the most important government commitments is set out below. Alongside this, we will continue to work with and to influence the UK Government to play their fair part in delivering net zero for Wales.

2021

- Budget announcement including an updated budget improvement plan.
- Nature Recovery Action Plan updated in light of COP15 to the Convention on Biological Diversity.
- Consultation on the next iteration of the Warm Homes programme published.
- New business recycling regulations introduced.
- Pilot launched for woodland creation funding offer to replace Rural Development Plan funding.
- Publish our strategic policy position on combustion of fuels for electricity generation.
- Publish the new National Peatland Programme.
- First round of public sector emissions reporting completed.

2022

- Net Zero Wales engagement strategy published.
- Consultation on developing UK ETS published.
- Welsh Government Adaptation Plan updated in light of CCC advice.
- Skills Action Plan published.
- Innovation strategy published.
- Consult on strategy for societal change.
- Early outputs from integrated electricity network planning.
- Roads review report due.
- Launch a year-long pilot allowing businesses to compare their performance within the office sector to operationalise and test a new scheme.
- Timber strategy for Wales developed and published.
- Welsh Government's plan for net zero by 2030 published.
- All new cars and light goods fleet vehicles procured across NHS Wales after April 2022 will be battery-electric wherever practically possible.
- The first phase of a new regime for pollution control in industry using best available techniques (BAT) will be implemented.
- New Business Recycling Regulations introduced
- £800m invested in brand new rolling stock with more than half the trains assembled in Wales.

2023

- Legislation implemented for new decarbonisation readiness requirements for power plant.
- Heat strategy for Wales published.
- Default speed limit change from 30mph to 20mph in built up areas comes into force.
- A PAS 2035 survey (assessment for energy retrofit measures) and a clear plan for individual social homes will be required.
- The Warm Homes scheme will have supported at least a further 12,000 homes since 2021, with energy efficiency measures, with thousands more supported through the Optimised Retrofit Programme.
- A range of indicators and performance measures is developed to make sure our direct financial support assists projects which help Wales become a net zero economy,
- All public sector organisations have published plans to achieve collective net zero by 2030.
- Strategic Resource Areas for marine renewable energy will have been identified.
- A 4.5 kilometre test track expected to be constructed as part of the £150m Global Centre of Rail Excellence, based at Onllwyn.

2024

- All areas of Wales to have a detailed local energy plan to enable a cleaner future.
- At least one renewable hydrogen production site of 10+MW established.
- Tidal lagoon challenge developed.
- Extended producer responsibility for packaging introduced.
- UK ETS net zero cap implemented (at the latest).
- Transition to Sustainable Farming Scheme started.
- The South Wales Industrial Cluster (SWIC) deployment project will complete.
- Transformation of Core Valleys Lines completed, including electrification and enabling four trains per hour.
- A brand new rail station opened in St Clears.

2025/2026

- Single use plastics banned.
- All new City and Growth Deals will have carbon reduction at their core and will contain carbon reduction outputs as key metrics for monitoring and evaluation.
- At least six flexible working sites in the Valleys financially supported and delivered.
- A network of electric vehicle charging points on the strategic trunk road network every 20 miles across Wales to facilitate easier long distance travel delivered.

- Part L buildings regulations changed, raising the bar to require new homes to produce a minimum of 75% less CO_2 emissions than ones built to current requirements.
- 20,000 new low carbon social homes built.
- Food waste halved and recycling rate increased to at least 70%.
- No biodegradable materials sent to landfill.
- More than 3,000 hectares of peatland restored.
- National Forest created, with 30 new woodlands and 100 Tiny Forests.
- The whole Traws Cymru bus fleet will be zero tailpipe emission by 2026.
- The Global Centre for Rail Excellence will open its second, longer high speed test track, bringing the site into full operation.

We will be publishing our next Plan in 2026 with the development of the plan commencing in 2025. We will also set our Carbon Budget 4 (2031 – 2035) in regulation in 2025.

Annexes

Annex 1: List of policies

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Policy 2 – Nature emergency 21

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Policy 4 – Building climate resilience and reducing emissions in complementary ways 24

Policy 5 – A circular economy 25

Policy 6 – Planning Policy 27

Policy 7 – Regional Economic Frameworks 28

Policy 8 – Updated Budget Improvement Plan 33

Policy 9 – New Infrastructure Investment Strategy 33

Policy 10 – Carbon pricing – decarbonisation of power generation, industry and further scheme development 34

Policy 11 – Skills Action Plan 36

Policy 12 – Innovation for a net zero economy 39

Policy 13 – Digital Strategy 39

Policy 14 – International action to support decarbonisation at home and abroad 40

Policy 15 – Publish Stakeholder Engagement Plan for Net Zero Wales – Spring 2022 43

Policy 16 – Consult on Public Behavioural Change Engagement Strategy – Summer 2022 46

Policy 17 – Reducing emissions from the combustion of fuels for electricity generation 62

Policy 18 – Planning frameworks to restrict fossil fuel extraction 63

Policy 19 – Reducing emission growth from new energy from waste plants in Wales 64

Policy 20 – De-risking and integrating investment in Wales through energy planning 64

Policy 21 – Planning the delivery of the electricity and gas grid we need for Wales 65

Policy 22 – Increasing renewable energy developments on land through our planning regime 66

Policy 23 – Consenting storage projects to support a flexible and responsive energy system 67

Policy 24 – Marine evidence, planning and licencing: supporting offshore and marine renewable energy deployment 67

Policy 25 – Innovation in new renewable energy technology to drive faster and deeper decarbonisation and support the green economy 68

Policy 26 – Locally owned energy developments to secure an economic return for Wales 70

Policy 27 – Maximising Welsh benefit from commercially operated infrastructure projects in Wales 71

Policy 28 – Scope out the challenges and opportunities around low-carbon heat 73

Policy 29 – Increase the use of waste heat and low carbon heat sources 73

Policy 30 – Enable people to work at or near to home 86

Policy 31 – Increase trip mode share of active travel from a current estimated proportion of 27% to 33% by 2030 and at least 35% by 2040 86

Policy 32 – Increase trip mode share of public transport from a current estimated proportion of 5%1 to 7% by 2030 and 13% by 2040 88

Policy 33 – Reduce emissions from freight and logistics 90

Policy 34 – Land use planning 90

Policy 35 – Accelerate the uptake of zero emission cars and vans 91

Policy 36 – Plan for and invest in EV charging infrastructure 92

Policy 37 – Zero emission bus fleet 93

Policy 38 – All taxis and private hire vehicles to be zero emission by 2028 93

Policy 39 – Decarbonise the rail network 94

Policy 40 – Zero emission HGVs 94

Policy 41 – Reduce emissions from aviation 95

Policy 42 – Reduce emissions from shipping 96

Policy 43 – The Optimised Retrofit Programme (ORP) 105

Policy 44 – Welsh Housing Quality Standard (WHQS) – Improving energy efficiency for existing social homes 106

Policy 45 – Part L Building Regulations 109

Policy 46 – Social homes will lead by example being built to standards in excess of Part L 109

Policy 47 – Developing innovative construction techniques and increasing the use of sustainable materials 110

Policy 48 – Incentivising energy efficiency of homes through our Help to Buy Wales (HtBW) 111

Policy 49 – Piloting smart flexible and digitalised systems to [maximise use of assets] and help reduce demand 112

Policy 50 – Develop behaviour change interventions alongside our wider programmes 114

Policy 51 – Drive decarbonisation through the manufacturing sector 125

Policy 52 – Increased resource efficiency in industry and business through regulation and funding 127

Policy 53 – Implement a new regime for pollution control Best Available Techniques (BAT) for industry 127

Policy 54 – Business Wales – using our financial and advice services to encourage business emission reduction 127

Policy 55 – Climate Change Levy (CCL) and Climate Change Agreements (CCAs) – UK Government 129

Policy 56 – Improvements to the Energy Saving Opportunity Scheme (ESOS) 130

Policy 57 – Streamlined Energy and Carbon Reporting (SECR). 130

Policy 58 – Development Bank of Wales (DBW) – decarbonisation to be included as a policy priority within the next remit letter to be issued in autumn 2021 136

Policy 59 – Economy Futures Fund (EFF) 137

Policy 60 – UK Government funding streams for industrial decarbonisation and energy efficiency 137

Policy 61 – Regulations to reduce agricultural pollution 146

Policy 62 – Glastir 147

Policy 63 – Farm Business Grant (FBG) 147

Policy 64 – Sustainable Production Grant (SPG) 147

Policy 65 – Wales Animal Health and Welfare Framework (WAHWF) 147

Policy 66 – Red Meat Development Programme 148

Policy 67 – Dairy Improvement Programme (DIP) 148

Policy 68 – Farming Connect 149

Policy 69 – Agriculture Bill 149

Policy 70 – Create a National Forest for Wales 167

Policy 71 – Woodland Creation Scheme 167

Policy 72 – Implementing a peatland restoration Programme over Carbon Budget 2 170

Policy 73 – Reduce waste sent to landfill 178

Policy 74 – Further increase recycling 180

Policy 75 – Be Mighty Campaign 181

Policy 76 – All public sector organisations should use the Routemap and Reporting Guide to develop and publish plans by March 2023 to achieve a collective net zero public sector by 2030 190

Policy 77 – The Welsh Government's plan to achieve net zero as an organisation by 2030 will be published in spring 2022 190

Policy 78 – The Welsh Government to include Net Zero Wales commitments in our remit letters and sponsor arrangements with public bodies in Wales 191

Policy 79 – Make Carbon Reduction Plans a mandatory part of tenders for Welsh Government procurement contracts over £5m from April 2022 and prioritise products which are fully recyclable, multi-use or able to be re-purposed as part of a more circular approach to waste. 194

Policy 80 – All new public sector cars and light goods vehicles should be zero/ultra-low emission by 2025 and heavy goods by 2030 196

Policy 81 – All public sector organisations should understand the sequestration potential of land in their ownership by March 2023 and commit to taking action to realise this potential by March 2030 198

Policy 82 – NHS Wales is committed to the collective net zero ambition by 2030 delivering through the NHS Decarbonisation Strategic Delivery Plan 199

Policy 83 – A joint NHS Wales and LG Social Care Decarbonisation Plan should be created to support the achievement of a collective net zero by 2030 199

Policy 84 – The Local Government Decarbonisation Strategy Panel and WLGA will support the commitments made by local government organisations to meet the collective net zero ambition by 2030 203

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Proposal 2 – Making new thermal Power Generation ready for Net Zero 63

Proposal 3 – Updated targets for renewable energy developments to support our net zero pathway 70

Proposal 4 – A pause and review of existing road proposals and a new methodology for assessing the appropriateness of future road schemes 85

Proposal 5 – Supporting Private Rental Sector (PRS) landlords to improve energy efficiency 106

Proposal 6 – Supporting the owner-occupied sector to improve energy efficiency and shift to low carbon heat 107

Proposal 7 – Bringing empty homes back into use and helping owners to start their journey to net zero 109

Proposal 8 – Water Efficiency and Water Labelling 111

Proposal 9 – Develop evidence and analysis of the industry and business sector to ensure cost effective and rapid emission reduction 124

Proposal 10 – Prioritise financial, and other, support for clean and green jobs leading to a decarbonised economy 124

Proposal 11 – Develop a Decarbonisation Action Plan for the food & drink manufacturing sector by 2026, to be underpinned by research and evidence 125

Proposal 12 – Fishing and fish supply chain decarbonisation 126

Proposal 13 – Review and development of Business Wales 128

Proposal 14 – Build on our Foundational Economy 128

Proposal 15 – Industrial clusters – fuel switching 135

Proposal 16 – Engage with the UK Government on their policies in support of fuel switching 132

Proposal 17 – Continue to build our evidence base on CCUS over Carbon Budget 2. 133

Proposal 18 – Industrial Clusters – Carbon Capture Utilisation & Storage 134

Proposal 19 – Greenhouse gas removals 134

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Proposal 21 – Property Energy Efficiency Rating Scheme (PEERS) 135

Proposal 22 – Develop new support mechanisms to encourage and support innovation in industrial decarbonisation 136

Proposal 23 – Sustainable Farming Scheme (SFS) 149

Proposal 24 – Work with farmers and the waste sector to improve resource efficiency and increase circularity on farms 150

Proposal 25 – Fuel Efficiency 151

Proposal 26 – Support innovation in renewable energy/technology 151

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Proposal 30 – Explore the potential to support horticulture 155

Proposal 31 – Attracting private sector investment into woodland creation 168

Proposal 32 – New Sustainable Farming Scheme (woodland strand) 168

Proposal 33 – Supporting tree planting by families and communities 168

Proposal 34 – Develop a new Timber Industrial Strategy for Wales 169

Proposal 35 – The ban of the sale of peat in compost 171

Proposal 36 – Investigating the potential contribution of blue carbon to achieve net zero 171

Proposal 37 – Further increase CH4 capture and utilisation in Welsh landfill sites by 2030 179

Proposal 38 – UK Government organisations who have a significant presence in Wales to develop and publish plans setting out how they will support Wales' ambition for a net zero public sector by 2030 192

Proposal 39 – All future public sector properties being built or undergoing major refurbishment achieve a net zero standard by 2030 194

Annex 3: List of policies & proposals by portfolio

KEY: Main portfolio M **Associated portfolio A**

Action	**Finance & Local Government**	**Economy** (Arts and Sport)	**Rural Affairs**	**Social Justice** (Social Partnership)	**Climate Change**	**Education & Welsh Language**	**Health & Social Services** (Mental health & Wellbeing & Social Services)
Policy 1: Just transition				A	M		A
Policy 2: Nature Emergency			A	A	M		A
Policy 3: The Clean Air Plan				A	M		A
Policy 4: Building climate resilience			A	A	M		
Policy 5: A Circular Economy					M		
Policy 6: A place based approach – Planning Policy Wales					M		
Policy 7: Regional Economic Frameworks		M					
Policy 8: Updated Budget improvement plan	M						
Policy 9: New Infrastructure Investment Strategy	M						
Policy 10: Carbon Pricing – decarbonisation of power generation, industry and further scheme development					M		
Policy 11: Skills Action Plan		M					
Policy 12: Innovation for a net zero economy		M					
Policy 13: Digital Strategy					M		
Policy 14: International action to support decarbonisation at home and abroad					M		
Policy 15: Publish Stakeholder Engagement Plan for Net Zero Wales – Spring 2022	A	A	A	A	M	A	A

Action	**Finance & Local Government**	**Economy** (Arts and Sport)	**Rural Affairs**	**Social Justice** (Social Partnership)	**Climate Change**	**Education & Welsh Language**	**Health & Social Services** (Mental health & Wellbeing & Social Services)
Proposal 1: Develop a long-term strategy to promote a dietary shift to a healthier and suitable diet			A	A	A		A
Policy 16: Consult on Public Engagement Strategy – Summer 2022	A	A	A	A	M	A	A
Policy 17: Reducing Emissions from the Combustion of Fuels for Electricity Generation		A		A	M		A
Policy 18: Planning frameworks to restrict fossil fuel extraction		A			M		A
Proposal 2: Making New Thermal Power Generation Ready for Net Zero		A			M		A
Policy 19: Reducing emission growth from new Energy from Waste plants in Wales		A			M		A
Policy 20: De-risking and Integrating Investment in Wales through Energy Planning					M		
Policy 21: Planning the delivery of the electricity and gas grid we need for Wales	A	A			M		
Policy 22: Increasing renewable energy developments on land through our planning regime	A	A			M		
Policy 23: Consenting storage projects to support a flexible and responsive energy system		A			M		
Policy 24: Marine evidence, planning and licencing: supporting offshore and marine renewable energy deployment					M		

Action	Finance & Local Government	Economy (Arts and Sport)	Rural Affairs	Social Justice (Social Partnership)	Climate Change	Education & Welsh Language	Health & Social Services (Mental health & Wellbeing & Social Services)
Policy 25: Innovation in new renewable energy technology to drive faster and deeper decarbonisation and support the green economy		A			M		
Proposal 3: Updated targets For Renewable Energy Developments to Support our Net Zero Pathway		A			M		
Policy 26: Locally Owned Energy Developments to Secure an Economic Return for Wales		A			M		
Policy 27: Maximising Welsh benefit from Commercially Operated infrastructure projects in Wales		A			M		
Policy 28: Scope out the challenges and opportunities around low-carbon heat		A			M		
Policy 29: Increase the use of Waste Heat and low carbon heat sources		A		A	M		
Proposal 4: A pause and review of existing road proposals and a new methodology for assessing the appropriateness of future road schemes					M		
Policy 30: Enable people to work at or near to home				A	M		A
Policy 31: Increase trip mode share of Active Travel from a current estimated proportion of 27% to 33% by 2030 and at least 35% by 2040				A	M		A

Action	Finance & Local Government	Economy (Arts and Sport)	Rural Affairs	Social Justice (Social Partnership)	Climate Change	Education & Welsh Language	Health & Social Services (Mental health & Wellbeing & Social Services)
Policy 32: Increase trip mode share of public transport from a current estimated proportion of 5%1 to 7% by 2030 and 13% by 2040				A	M		A
Policy 33: Reduce emissions from freight and logistics					M		A
Policy 34: Land use planning					M		
Policy 35: Accelerate the uptake of zero emission cars and vans		A		A	M		A
Policy 36: Plan for and invest in EV charging infrastructure		A		A	M		A
Policy 37: Zero emission bus fleet					M		A
Policy 38: All taxis and private hire vehicles to be zero emission by 2028					M		
Policy 39: Decarbonise the Rail network					M		A
Policy 40: Zero emission HGVs					M		A
Policy 41: Reduce emissions from aviation					M		A
Policy 42: Reduce emissions from shipping					M		A
Policy 43: The Optimised Retrofit Programme(ORP)				A	M	A	A
Policy 44: Welsh Housing Quality Standard (WHQS) – Improving energy efficiency for existing social homes				A	M	A	A
Proposal 5: Supporting PRS landlords to improve energy efficiency		A		A	M	A	A

Action	Finance & Local Government	Economy (Arts and Sport)	Rural Affairs	Social Justice (Social Partnership)	Climate Change	Education & Welsh Language	Health & Social Services (Mental health & Wellbeing & Social Services)
Proposal 6: Supporting the owner-occupied sector to improve energy efficiency and shift to low carbon heat		A		A	M		A
Proposal 7: bringing empty homes back into use and helping owners to start their journey to net zero		A		A	M	A	A
Policy 45: Part L Building Regulations				A	M	A	A
Policy 46: Social Homes will lead by example being built to standards in excess of Part L				A	M	A	A
Policy 47: Developing Innovative construction techniques and increasing the use of sustainable materials				A	M	A	A
Policy 48: Incentivising energy efficiency of homes through our Help to Buy – Wales		A		A	M	A	A
Policy 49: Piloting Smart Flexible and Digitalised Systems to [maximise use of assets] and help reduce demand				A	M		A
Policy 50: Develop behaviour change interventions alongside our wider programmes				A	M		A
Propsal 8: Water Efficiency and Water Labelling				A	MA		A
Proposal 9: Develop Evidence and Analysis of the Industry and Business sector to ensure cost effective and rapid emission reduction – Welsh Government		M					

Action	Finance & Local Government	Economy (Arts and Sport)	Rural Affairs	Social Justice (Social Partnership)	Climate Change	Education & Welsh Language	Health & Social Services (Mental health & Wellbeing & Social Services)
Proposal 10: Prioritise financial, and other, support for clean and green jobs leading to a decarbonised economy		M			A	A	
Policy 51: Drive Decarbonisation through the Manufacturing Sector		M			A		
Proposal 11: Develop a Decarbonisation Action Plan for the food & drink manufacturing Sector by 2026, to be underpinned by research and evidence			M				A
Proposal 12: Fishing and fish supply chain decarbonisation			M		A		
Policy 52: Increased resource efficiency in business and industry through regulation and funding		M					
Policy 53: Implement a new regime for pollution control Best Available Techniques (BAT) for industry		M					
Policy 54: Business Wales using our financial and advice services to encourage business emission reduction		M			A	A	
Proposal 13: Review and development of Business Wales		M					
Proposal 14: Build on our Foundational Economy		M					
Policy 55: Climate Change Levy (CCL) and Climate Change Agreements – UK Government					M		
Policy 56: Improvements to the Energy Saving Opportunity Scheme (ESOS)		M					

Action	Finance & Local Government	Economy (Arts and Sport)	Rural Affairs	Social Justice (Social Partnership)	Climate Change	Education & Welsh Language	Health & Social Services (Mental health & Wellbeing & Social Services)
Policy 57: Streamlined Energy and Carbon Reporting (SECR)		M					
Proposal 15: Industrial Clusters – fuel switching		M					
Proposal 16: Engage with the UK Government on their policies in support of fuel switching		M					
Proposal 17: Continue to build our evidence base on Carbon Capture Utilisation & Storage over carbon budget 2		M					
Proposal 18: Industrial Clusters – Carbon Capture Utilisation & Storage		M					
Proposal 19: Greenhouse gas removals		M					
Proposal 20: Property Delivery Plan		M					
Proposal 21: Property Energy Efficiency Rating Scheme (PEERS)		M					
Policy 58: Development Bank of Wales – Decarbonisation to be included as a policy priority within the next remit letter to be issued in Autumn 2021		M			A		
Proposal 22: Develop new support mechanisms to encourage and support innovation in Industrial Decarbonisation		M			A		
Policy 59: Economy Futures Fund		M			A		
Policy 60: UK Government Funding Streams for Industrial Decarbonisation and Energy Efficiency		M			A		

Action	**Finance & Local Government**	**Economy** (Arts and Sport)	**Rural Affairs**	**Social Justice** (Social Partnership)	**Climate Change**	**Education & Welsh Language**	**Health & Social Services** (Mental health & Wellbeing & Social Services)
Policy 61: Regulations to reduce agricultural pollution			M		A		A
Policy 62: Glastir			M		A		
Policy 63: Farm Business Grant (FBG)			M		A		
Policy 64: Sustainable Production Grant (SPG)			M		A		
Policy 65: Wales Animal Health and Welfare Framework (WAHWF)			M		A	A	
Policy 66: Red Meat Development Programme			M		A	A	
Policy 67: Dairy Improvement Programme (DIP)			M		A	A	
Policy 68: Farming Connect			M		A	A	
Policy 69: Agriculture Bill			M		A		
Proposal 23: Sustainable Farming Scheme (SFS)			M		A		
Proposal 24: Work with farmers and the waste sector to improve resource efficiency and increase circularity on farms			M		A		
Proposal 25: Fuel Efficiency (Welsh Government)			M		A		
Proposal 26: Support innovation in renewable energy/technology			M		A	A	
Proposal 27: Organic conversion			M		A		
Proposal 28: Precision Farming			M		A		
Proposal 29: Land Sharing			M		A		

Action	**Finance & Local Government**	**Economy** (Arts and Sport)	**Rural Affairs**	**Social Justice** (Social Partnership)	**Climate Change**	**Education & Welsh Language**	**Health & Social Services** (Mental health & Wellbeing & Social Services)
Proposal 30: Explore the potential to support Horticulture			M		A		
Policy 70: Create a National Forest for Wales			A		M		A
Policy 71: Woodland Creation Scheme			A		M		A
Proposal 31: Attracting private sector investment into Woodland Creation			A		M		
Proposal 32: New Sustainable Farming Scheme (woodland strand)			M				
Proposal 33: Supporting tree planting by families and communities			A		M		A
Proposal 34: Develop a new Timber Industrial Strategy for Wales		A			M		
Policy 72: Policy Implementing a Peatland Restoration Programme over Carbon Budget 2			A		M		
Proposal 35: The ban of the sale of peat in compost			A		M		
Proposal 36: Investigating the potential contribution of blue carbon to achieve net zero			A		M		
Policy 73: Reduce waste sent to landfill			A		M		A
Proposal 37: Further increase CH4 Capture and utilisation in Welsh landfill sites by 2030					M		
Policy 74: Further increase recycling					M		
Policy 75: Be Mighty Campaign					M		

Action	**Finance & Local Government**	**Economy** (Arts and Sport)	**Rural Affairs**	**Social Justice** (Social Partnership)	**Climate Change**	**Education & Welsh Language**	**Health & Social Services** (Mental health & Wellbeing & Social Services)
Policy 76: All public sector organisations should use the Routemap and Reporting Guide to develop and publish plans by March 2023 to achieve a collective Net Zero public sector by 2030.	M		A		A	A	M
Policy 77: The Welsh Government's plan to achieve net zero as an organisation by 2030 will be published in spring 2022.	M				A		
Policy 78: The Welsh Government to include Net Zero Wales commitments in our remit letters and sponsor arrangements with public bodies in Wales	M			A	A	A	A
Proposal 38: UK Government organisations who have a significant presence in Wales to develop and publish plans setting out how they will support Wales' ambition for a net zero public sector by 2030	A				A		A
Policy 79: Make Carbon Reduction Plans a mandatory part of tenders for appropriate public procurement contracts and prioritise products which are fully recyclable, multi-use or able to be re-purposed as part of a more circular approach to waste.	M	A		A	A	A	M
Proposal 39: All future public sector properties being built or refurbished achieve a net zero standard by 2030 (Policy)	A			A	M		A
Policy 80: All new public sector cars and light goods vehicles should be zero/ultra-low emission by 2025 and heavy goods by 2030	A	A		A	M		A

Action	**Finance & Local Government**	**Economy** (Arts and Sport)	**Rural Affairs**	**Social Justice** (Social Partnership)	**Climate Change**	**Education & Welsh Language**	**Health & Social Services** (Mental health & Wellbeing & Social Services)
Policy 81: All public sector organisations should understand the sequestration potential of land in their ownership by March 2023 and commit to taking action to realise this potential by March 2030			A		M		
Policy 82: NHS Wales is committed to the collective net zero ambition by 2030 delivering through the NHS Decarbonisation Strategic Delivery Plan					M		A
Policy 83: A joint NHS Wales and LG Social Care Decarbonisation Plan should be created to support the achievement of a collective net zero by 2030					M		A
Policy 84: The Local Government Decarbonisation Strategy Panel and WLGA will support the commitments made by Local Government organisations to meet the collective net zero ambition by 2030	M			A	A	A	A

Annex 4: Sector definitions

The sectors described in Part 3 are matched to specific emission activities (IPCC Categories) within the Welsh Greenhouse Gas Inventory, as follows:

Emission Sectors	National Communiation Format	IPCC category
Electricity and Heat Production	Energy supply	1A1ai_Public_Electricity&Heat_Production 1A1aiii_Public_Heat_Production
Industry and Business	Business	1A2a_Iron_and_steel 1A2b_Non-Ferrous_Metals 1A2c_Chemicals 1A2d_Pulp_Paper_Print 1A2e_food_processing_beverages_and_tobacco 1A2f_Non-metallic_minerals 1A2gvii_Off-road_vehicles_and_other_machinery 1A2gviii_Other_manufacturing_industries_and_construction 1A4ai_Commercial/Institutional 2B8g_Petrochemical_and_carbon_black_production:Other 2D1_Lubricant_Use 2D3_Other_NEU 2E1_Integrated_circuit_or_semiconductor 2F1a_Commercial_refrigeration 2F1b_Domestic_refrigeration 2F1c_Industrial_refrigeration 2F1d_Transport_refrigeration 2F1e_Mobile_air_conditioning 2F1f_Stationary_air_conditioning 2F2a_Closed_foam_blowing_agents 2F2b_Open_foam_blowing_agents 2F3_Fire_Protection 2F5_Solvents 2F6b_Other_Applications:Contained-Refrigerant_containers 2G1_Electrical_equipment 2G2_Military_applications 2G2_Particle_accelerators 2G2e_Electronics_and_shoes 2G2e_Tracer_gas 2G3a_Medical applications 5C2.2b_Non-biogenic:Other

Emission Sectors	National Communiation Format	IPCC category
Industry and Business	Energy Supply	1A1b_Petroleum_Refining 1A1ci_Manufacture_of_solid_fuels 1A1cii_Oil_and_gas_extraction 1A1ciii_Other_energy_industries 1A2gviii_Other_manufacturing_industries_and_construction 1B1ai_Underground_mines:Abandoned 1B1ai_Underground_mines:Mining_activities 1B1ai_Underground_mines:Post-mining_activities 1B1aii_Surface_mines:Mining_activities 1B1b_Solid_Fuel_Transformation 1B2b3_Gas_processing 1B2b4_Gas_transmission_and_storage 1B2b5_Gas_distribution 1B2c_Flaring_Gas 1B2c_Venting_Gas
	Industrial Processes	2A1_Cement_Production 2A3_Glass_production 2A4b_Other_uses_of_Soda_Ash 2A4d_Other_process_uses_of_carbonates:_Other 2B10_Chemical_Industry:Other 2B8b_Ethylene_Production 2B8c_Ethylene_Dichloride_and_Vinyl_Chloride_Monomer 2C1a_Steel 2C1b_Pig_iron 2C1d_Sinter 2C3_Aluminium_Production 2C4_Magnesium_production 2G3b_N2O_from_product_uses:_Other

Emission Sectors	National Communiation Format	IPCC category
Transport	Exports	Aviation_Bunkers Marine_Bunkers
	Transport	1A3a_Domestic_aviation 1A3bi_Cars 1A3bii_Light_duty_trucks 1A3biii_Heavy_duty_trucks_and_buses 1A3biv_Motorcycles 1A3bv_Other_road_transport 1A3c_Railways 1A3d_Domestic_navigation 1A3eii_Other_Transportation 1A4ai_Commercial/Institutional 1A4ciii_Fishing 1A5b_Other:Mobile 2D1_Lubricant_Use 2D3_Non-energy_products_from_fuels_and_solvent_use:Other
Residential buildings	Residential	1A4bi_Residential_stationary 1A4bii_Residential:Off-road 2D2 Non-energy_products_from_fuels_and_solvent_use:Paraffin_wax_use 2F4a_Metered_dose_inhalers 2F4b_Aerosols:Other 2G3b_N2O_from_product_uses:_Other 5B1a_composting_municipal_solid_waste 5C2.2b_Non-biogenic:Other 5C2.2b_Non-biogenic:Other_Accidental fires (vehicles)
Waste Management	Waste Management	5A1a_Managed_Waste_Disposal_sites_anaerobic 5B1a_composting_municipal_solid_waste 5B2a_Anaerobic_digestion_municipal_solid_waste 5C1.1b_Biogenic:Sewage_sludge 5C1.2b_Non-biogenic:Clinical_waste 5C1.2b_Non-biogenic:Other_Chemical_waste 5D1_Domestic_wastewater_treatment

Emission Sectors	National Communiation Format	IPCC category
Agriculture	Agriculture	1A4ci_Agriculture/Forestry/Fishing:Stationary 1A4cii_Agriculture/Forestry/Fishing:Off-road 2D1_Lubricant_Use 3A1a Enteric Fermentation – dairy cows 3A1b Enteric Fermentation – other cattle 3A2 Enteric Fermentation – sheep 3A3 Enteric Fermentation – swine 3A4 – Enteric Fermentation – other livestock 3B11a Manure management – CH4 – dairy cows 3B11b Manure management – CH4 – other cattle 3B12 Manure management – CH4 – sheep 3B13 Manure management – CH4 – swine 3B14 Manure management – CH4 – other livestock 3B21a Manure management – N2O and NMVOC – dairy cattle 3B21b Manure management – N2O and NMVOC – other cattle 3B22 Manure management – N2O and NMVOC – sheep 3B23 Manure management – N2O and NMVOC – swine 3B24 Manure management – N2O and NMVOC – other livestock 3B25 Manure management – N2O and NMVOC – indirect N2O emissions 3D11 Inorganic N Fertilizers 3D12a Animal manure applied to soils 3D12b Sewage sludge applied to soils 3D12c Direct emissions from digestate 3D13 Urine and Dung deposited by grazing animals 3D14 Crop Residues 3D15 Mineralisation/immobilisation associated with loss/gain of soil organic matter 3D16 Cultivation of Organic soils 3D21 Atmospheric Deposition 3D22 Nitrogen Leaching and Run-off 3F11_Field_burning 3F12_Field_burning 3F14_Field_burning 3G1_Liming – limestone 3G2_Liming – dolomite 3H Urea Application

Emission Sectors	National Communiation Format	IPCC category
Land Use, Land Use Change, and Forestry	Land Use, Land Use Change, and Forestry	4_Indirect_N2O_Emissions 4A_Forest Land_Emissions_from_Drainage 4A1_ Forest Land remaining Forest Land 4A2_Cropland_converted_to_Forest_Land 4A2_Grassland_converted_to_Forest_Land 4A2_Land_converted_to_Forest_Land_Emissions_from_ Fertilisation 4A2_Settlements_converted_to_Forest_Land 4B1_Cropland Remaining Cropland 4B2_Forest_Land_converted_to_Cropland 4B2_Grassland_converted_to_Cropland 4B2_Settlements_converted_to_Cropland 4C_Grassland_Emissions_from_Drainage 4C1_Grassland Remaining Grassland 4C2_Cropland_converted_to_Grassland 4C2_Forest_Land_converted_to_Grassland 4C2_Settlements_converted_to_Grassland 4D_Wetlands_Emissions_from_Drainage 4D1_Wetlands remaining wetlands 4D2_Forest_Land_converted_to_Wetlands 4D2_Land converted to Wetlands 4E_Settlements_Emissions_from_Drainage 4E1_Settlements remaining settlements 4E2_Cropland_converted_to_Settlements 4E2_Forest_Land_converted_to_Settlements 4E2_Grassland_converted_to_Settlements 4G_Harvested Wood Products
Public sector	Public	1A4ai_Commercial/Institutional

Annex 5: The Greenhouse Gas Inventory

Where do we get our data from?

The Welsh Greenhouse Gas Inventory[105] provides the basis for our assessment of emissions of greenhouse gas emissions on a territorial basis for Wales. It is produced in consistency with the international reporting guidelines issued by the United Nations Framework Convention on Climate Change and UK Greenhouse Gas inventory reporting protocol. From the close of year it takes approximately 18 months to compile the Welsh Greenhouse gas inventory meaning at present the latest inventory data for Wales is for the year 2019.

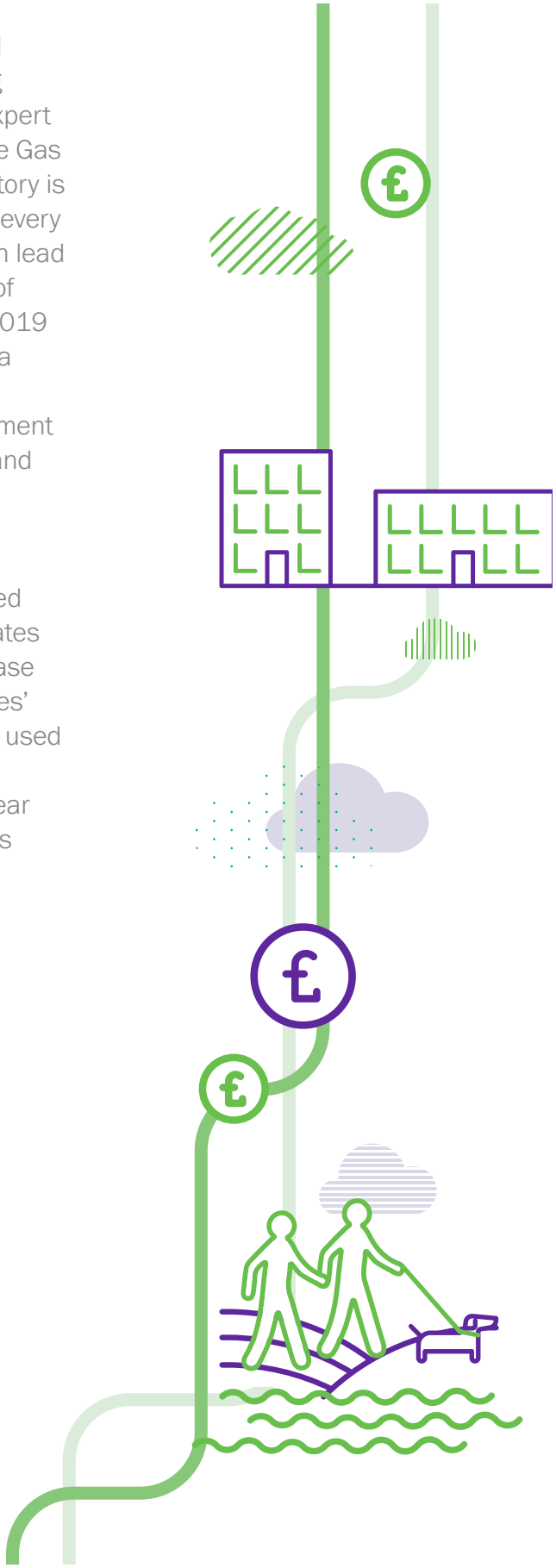
Accounting for uncertainty in the Welsh Greenhouse Gas Inventory

The UK and the associated DA Greenhouse Gas Inventory is one of the most comprehensive and detailed inventories in the world, but it does have inherent uncertainties. The Greenhouse Gas Inventory does not provide a direct measure of atmospheric emissions in Wales. Rather, it provides a modelled estimate of emissions based upon a wide range of data sources detailing activities (e.g. total passenger car miles driven in Wales) and their associated emissions factors (e.g. greenhouse gas emissions per mile driven). Ultimately the accuracy of the emissions estimates are driven by the quality and quantity of the underlying data and the modelling approach. In addition, the natural variability in processes (e.g. emissions from farming practices under different climatic conditions and across soil types, carbon content of fuels, and performance of industrial production plant and abatement plant) that are being "modelled" introduces a degree of uncertainty.

For Wales, our emissions are dominated by carbon dioxide emissions from well-documented emission sources such as heavy industry (power generation, oil refining and iron and steel production), and characterised by a low contribution from the uncertain sources of methane and nitrous oxide. As such the Welsh inventory is estimated to have a relatively low overall uncertainty of ±3 per cent. However, when emissions are assigned to individual sectors these uncertainties can be larger. This is especially the case for more uncertain categories where we understand less about the distribution and intensity of the estimates such as nitrous oxide emissions from agricultural soils (~±18%), particularly from the variability of soil types and fertiliser application, as well as carbon dioxide from Land Use, Land Use Change and Forestry. Whilst the Welsh inventory has a relatively low overall uncertainty there is a constant drive to improve our understanding of greenhouse gas emissions. The nature of emission inventories is such that ongoing improvements to data collection or estimation techniques will inevitably lead to some revisions of historical data and our understanding of the trends especially in sectors with greater uncertainty.

105 https://naei.beis.gov.uk/reports/reports?report_id=1024

As a result of these improvements, along with any changes in international reporting guidelines or changes arising from recommendations following the expert review by the UN of the UK Greenhouse Gas Inventory, each year when a new inventory is published it updates the estimates for every year back to 1990. These revisions can lead to changes in the historical estimates of emissions. For instance, the 1990 – 2019 Greenhouse Gas Inventory underwent a major methodological change with the implementation of the Wetland Supplement for UK peatlands, whereby emissions and removals from drainage and rewetting of peatlands are now better accounted for in the inventory. As a result of this, the LULUCF time-series has experienced a general increase in emissions estimates across and in early years (e.g. a decrease of the net LULUCF sink), such that Wales' LULUCF sector is a net source where it used to be reported as a net sink previously. As previously, the base year to latest year trend is one of decline, but in 2019 this decline is greater in magnitude



Annex 6: Summary of engagement activity since the launch of Engagement Plan

Sector	Examples of consultations and events which have fed and will feed into this Plan.
Waste	Beyond Recycling – a strategy to make the circular economy a reality in Wales
Transport	Llwybr Newydd – a new Wales Transport Strategy
Transport	EV Charging Strategy
Energy	Coal Policy
Homes	Fuel Poverty Strategy
Industry and Business	A manufacturing future for Wales: a framework for action
Agriculture	Agriculture Bill White Paper
Air Pollution	White Paper on a Clean Air (Wales) Bill
Hydrogen	Hydrogen in Wales Consultation
Transport	Swansea Bay and West Wales Metro consultation
ETS	UK Emissions Trading Scheme free allocation review: Call for Evidence
Buildings	Building Regulations Part L and F stage 2B (Non-domestic buildings) consultation
National Forest	Start of National Forest consultation
Remote Working	Remote Working – Shape the Future of the Welsh Workforce
Innovation Strategy	Innovation and social challenges Scoping the future of Innovation Policy in Wales
Decarbonisation Readiness	Joint Call for Evidence
Cross Sector	Wales Climate Week
Cross Sector	Young Persons Conference
Cross Sector	CCC call for evidence
Cross Sector	Launch of CCC Advice
National Forest	Your National Forest
Cross Sector	CCC Event Series
International	St David's Day, Wales and the World
Health	Green Health Wales
Cross Sector	ECO Schools

Acronyms

AD Anaerobic Digestion

BEIS UK Government Department for Business, Energy and Industrial Strategy

BREEAM Building Research Establishment Environmental Assessment Method

CAP Common Agricultural Policy

CB1 Carbon Budget One (first carbon budget)

CB2 Carbon Budget Two

CCA Climate Change Agreement

CCL Climate Change Levy

CCS Carbon Capture and Storage

CCUS Carbon Capture Usage and Storage

CHP Combined Heat and Power

CO_2 Carbon Dioxide

COP Conference of the Parties

COP26 Conference of the Parties in Glasgow, United Kingdom

CPF Carbon Price Floor

DNS Developments of National Significance

EAP Economic Action Plan

EPC Energy Performance Certificate

EPS Environmental Protection Scheme

ERDF European Regional Development Fund

ESC Energy Systems Catapult

EU European Union

ETS Emissions Trading System

EV Electric Vehicle – (Included but not shortened)

FBIS Food Business Investment Scheme

F-gases Fluorinated gases

FLEXIS Flexible Integrated Energy Systems research programme

FREEDOM Flexible Residential Energy Efficiency Demand Optimisation and Management

GDP Gross Domestic Product

GHG Greenhouse Gas

GHGI Greenhouse Gas Inventory

GW Giga Watt

GWh Gigawatt Hours

HCC Hybu Cig Cymru

HESG Home Energy Services Gateway

HFCs Hydroflurocarbons

IAs Impact Assessments

IETF Industrial Energy Transformation Fund

IHP Innovative Housing Programme

IHRS Industrial Heat Recovery Support

IPCC Intergovernmental Panel on Climate Change

IWA Institute of Welsh Affairs

JTA Joint Transport Authorities

kW Kilowatt

LULUCF Land Use, Land Use Change and Forestry

MRV Monitoring, Reporting and Verification

$MtCO_2e$ Million tonnes of Carbon Dioxide Equivalent

MW Megawatt

NDCs Nationally Determined Contributions

NDF National Development Framework

NF3 Nitrogen trifluoride

NICW National Infrastructure Commission for Wales

NRW Natural Resources Wales

NWEA Net Welsh Emissions Account

NWEAB – RSP North Wales Economic Ambition Board – Regional Skills Partnership North Wales

ODS Ozone-depleting substances

OFGEM Office of Gas and Electricity Markets

PES Payment for Ecosystem Services

PFCs Perfluorocarbons

PHW Public Health Wales

PPW Planning Policy Wales

PV Photovoltaic

R&D Research and Development

RHI Renewable Heat Incentive

RICE Reducing Industrial Carbon Emissions

RSL Registered Social Landlords

RSPs Regional Skills Partnerships

SA Sustainability Appraisal

SAP Standard Assessment Procedure

SF6 Sulfur hexafluoride

SME Small and Medium Enterprises

SPECIFIC Sustainable Product Engineering Centre for Innovative Functional Industrial Coatings

SPG Sustainable Production Grant

SRA Sustainable Risk Assessment

SSAFO Silage, Slurry and Agricultural Fuel Oil

TWh Terawatt hour

UKCCC UK Committee on Climate Change

UKCCSRC UK Carbon Capture and Storage Research Centre

UKFS UK Forestry Standard

ULEV Ultra Low Emission Vehicle

UN United Nations

UNFCCC United Nations Framework Convention on Climate Change

WHCS Welsh Housing Condition Survey

WHQS Welsh Housing Quality Standard

WIIP Wales Infrastructure Investment Plan

WNMP Welsh National Marine Plan

WRAP Waste and Resources Action Programme

Glossary of terms

Anaerobic Digestion The break down biodegradable material in the absence of oxygen.

Decarbonisation The process of reduction or removal of greenhouse gas emissions from our activities, to create a low carbon economy.

Carbon Capture and Storage The process of trapping carbon dioxide produced by burning fossil fuels or other chemical or biological process and storing it in such a way that it is unable to affect the atmosphere.

Carbon leakage Occurs when industry relocates to countries with less stringent environmental regulation, resulting only in displacement of emissions rather than a reduction, at no benefit to the environment.

Prosperity for All: A Low Carbon Wales The Welsh Government's first statutory decarbonisation plan covering Carbon Budget 1 (2016–2025)

Carbon sequestration The removal and storage of carbon from the atmosphere in carbon sinks (such as oceans, forests or soils).

Circular Economy A circular economy aims to maintain the value of products, materials and resources for as long as possible by returning them into the production cycle at the end of their use, while minimising the generation of waste.

Consumption emissions Emissions of greenhouse gasses whether in Wales, or elsewhere, that may reasonably be attributed to the consumption and use of goods and services in Wales.

Contracts for Difference A Contract for Difference is a form of subsidy support for UK renewable electricity and low carbon generation.

Decarbonisation Pathway A modelled route showing how emission reductions are distributed over time, and across sectors, to deliver the target of at least net zero in the year 2050.

Fossil fuels A fuel derived from geological deposits of plant and animal remains, such as coal, oil, or natural gas.

National Milestones for Wales are intended to assist Ministers in assessing progress towards achieving a prosperous, resilient, more equal and healthier Wales, with cohesive communities, a vibrant culture and thriving Welsh language and a globally responsible Wales.

Paris Agreement The UNFCCC's Paris Agreement sets a global ambition for tackling climate change. The current pledge under the Paris Agreement to limit the global average temperature rise to less than 2° Celsius requires governments around the world to take action to decarbonise their economies, while striving to keep the temperature rise to 1.5° Celsius.

Smart energy Smart energy can be considered as an approach using the internet to coordinate different intelligent devices and sensors across the energy system.

Smart energy systems are now beginning to expand into integrating and interlinking with transport and heat systems.

Smart technology allows homes, businesses and communities to use energy and other resources more efficiently. It offers the potential to generate, store and use energy in ways not previously available, in order to provide comfort and mobility and improve our health. It could enable local energy trading and other community sharing opportunities.

The UK Greenhouse Gas Inventory (UK GHGI) reports annually on estimated UK emissions of the seven direct greenhouse gases under the Kyoto Protocol. (http://naei.beis.gov.uk/)

The DA Greenhouse Gas Inventory (DA GHGI) provides an annual report on estimated greenhouse gas emissions for Wales, England, Scotland and Northern Ireland.