



Grŵp Herio Cymru
Sero Net 2035

Wales Net Zero 2035
Challenge Group

PATHWAYS TO A PROSPEROUS AND RESILIENT WALES

in a changing future



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www.netzero2035.wales

CHAIR'S FOREWORD

1. I would first like to thank the Welsh Government and Plaid Cymru for their leadership in coming together through the Co-operation Agreement 2021 to seek our advice on accelerating action to address climate change in Wales. By planning a programme of urgent action now, from 2025-2035, we have an opportunity to realise significant benefits for the lives and livelihoods of people across Wales, whilst minimising our nation's exposure to the risks of climate change.

2. In this report, you will find the expert conclusions of our members based on their assessments of independent analyses by the Wales Centre of Public Policy, an open call for evidence, reviews of existing research and stakeholder engagements. I am very grateful to all the Group's members for volunteering their considerable time and expertise without payment over the last 20 months. I also want to thank our small, but perfectly formed, paid secretariat team, led by our exceptional secretary Stan Townsend. Together, we hope we have laid the foundations for a new journey and a new narrative in addressing net zero.

3. The framing of our work has been to situate it within the seven goals and the five ways of working enshrined into law in the Well-being of Future Generations (Wales) Act 2015. That law builds on the duty contained in the first Government of Wales Act 1998, which gave the then National Assembly for Wales a duty 'to promote sustainable development in the exercise of its functions' in everything it does. Following the large 'Wales

we Want' conversation run by the voluntary sector in Wales in 2014, the 2015 Act effectively turns the original duty to 'promote' into a duty to 'deliver' for all Welsh public bodies, including the Welsh Government. We have sought to create optimal pathways to net zero that deliver for our society, economy, culture and environment and '*meet the needs of current generations without compromising on the ability of future generations to meet their own needs*'.

4. Our focus has been to create 10-year action pathways from 2025-2035 to reach net zero in ways that are fair, create just transitions, are nature positive and offer wide-ranging benefits wherever possible. Our view from the outset, guided by existing evidence, has been that a long-term, planned transition will always be more effective than short-term reactions to unplanned shocks, which can lead to unintended consequences and increased costs.



5. Developing our pathway advice has been challenging, reflecting the difficult choices facing any Welsh Government.

However, despite our different backgrounds, expertise and ambitions, we have reached a unanimous view on what we have published today. We hope there can similarly be brave, collaborative leadership between parties in Wales determined to act responsibly on climate change to ensure consistent agreement on core issues over two administrative terms. This would build confidence, enable the public sector and other organisations in Wales to plan effectively, and become a model of good practice for other countries. In short, we hope our work will be the beginning of a new journey for Wales to deliver better outcomes for and by Welsh citizens by involving them in long-term decision making that benefits us all.

6. We are publishing in September 2024 to influence the Welsh Treasury budget process (Autumn 2024-February 2025), the Committee on Climate Change statutory advice to the UK Government (February 2025), and the Welsh Government (May 2025), as well as prospective manifestos for the Welsh General Election in 2026.

Following publication, our commission will be completed, and the job of delivering on our ambitions will fall to others.

7. It is important at this stage to say what is not in this report.

A big question for me is how do our nature positive proposals get delivered in qualitative and quantifiable ways by 2035? We are acutely aware that they need amplifying by urgent further work to optimise delivery pathways, as there are already legislative targets in place to deliver some agreed outcomes by 2030, but not the delivery plans. Perhaps the best route forward would be to commission further independent work on optimising nature positive pathways to ensure Wales meets its climate and nature ambitions in tandem.

8. We do believe that the way we have carried out our work, in the spirit of the five ways of working in the 'Well-being of Future Generations Act', will demonstrate the value of using such a process to reach our conclusions.

I hope our work will be a catalyst for decision makers, wherever and whoever they are, to respond bravely to the science by planning deliverable pathways to achieve positive climate and nature outcomes with and for their citizens. We are all dependent on such an outcome.



Jane Davidson

September 2024

SECRETARY'S FORWARD

1. I want to begin by expressing what an immense privilege it has been to participate in this work. This has been possible thanks to the unwavering commitment of our chair, the dedication of our members, and the hundreds of people I've engaged with, all working towards a better Wales for present and future generations.

2. This work offers a genuine pragmatism in dealing with challenge of climate change, for Wales and the world. Unlike the so-called 'pragmatism' that ignores problems, our approach acknowledges and confronts them head-on. Why is this important?

- a) The impacts of climate change are advancing faster than our efforts to mitigate them. We've established 10-year pathways to accelerate progress in both addressing the causes of climate change and seizing the benefits of a net-zero transition, before it's too late.
- b) Our goal goes beyond achieving net zero. We've aimed to deliver a net-zero transition that also addresses related challenges such as public health, inequality, economic stability and the nature crisis. This is what the people of Wales deserve.
- c) There is no comprehensive plan to address climate change. We've laid the foundation for an economy-wide strategy, exploring five critical areas and related themes. It is no longer acceptable to set targets without clear plans to achieve them, especially given the known impacts of a changing climate.

d) We have not avoided addressing politically or societally contentious issues. Our expert group has provided clear advice on the best path forward for Wales, as we see it. Although difficult decisions are inevitable, it is easier, less costly, and less disruptive to make them now rather than later.

3. As the great-grandson of a coal miner from the South Wales valleys, the Welsh history of unjust social and economic transitions is not lost on me. The challenge before us is daunting. To avoid repeating history, Wales needs a renewed approach to climate change, and that is precisely what this work offers.

4. Change can happen by crisis or choice. If you take anything from our work, know that there is always an alternative.



Stan Townsend
September 2024

VISION

1. In 2009, the then Welsh Assembly Government published 'One Wales, One Planet' for consultation¹, with its vision of what a sustainable Wales would look like and how it should be achieved 'within a generation' i.e. in the 2030s. The vision is instructive, with some proposals that are perhaps even more important today and have been reflected in our pathways.

2. The 2009 vision envisaged an engaged society recognising the need to live sustainably and reduce our carbon footprint, with more equal, active, strong bilingual communities enjoying a better work life balance and more volunteering opportunities. It envisaged substantial local action to reduce emissions supported by local carbon budget programmes, economic regeneration promoting low carbon and low waste ways of working. and the development of training and qualifications in key sectors. It envisioned a society where waste is taboo, walking and cycling are commonplace, public transport is fast and reliable, all existing buildings are at least EPC C, and the public sector leads the way in renewable energy uptake. It called for a greater emphasis on preventative healthcare, healthy eating, land managed for ecosystem services and biodiversity gain, sustainably managed marine environments, increased access, and Wales being recognised internationally as a global leader.

3. Fast forward to 2014 and the second national conversation in Wales, 'The Wales we Want'²– this time linked to the UN's Sustainable Development Goals.

7,000 people took part, discussing the Wales they wanted to leave their children and grandchildren. The outcome: seven foundations of the wellbeing of future generations, including giving children the best start in life; thriving communities with a strong sense of place; living within global environmental limits; investing in growing our local economy; reducing inequality and valuing on diversity; and, as the seventh foundation states, 'greater engagement in the democratic process, a stronger citizen voice and active participation in decision making is fundamental for the well-being of future generations'. In some areas, we see that the last 15 years have taken us in the wrong direction.

4. Fast forward again to our work in 2024, and it is easy to see that it is the next logical step as part of the Welsh journey that started in 1998 to deliver for current and future generations. Legislatively, much has already been achieved with laws in place to deliver most, if not all, of the outcomes originally envisaged. In addition, substantial policy and practice has been recorded by the Future Generations Commissioner's Office. For a few of the original proposals, the environment has changed: e.g., a predicted consistent drop in energy and water demand is going in the wrong direction and, despite years of pilot investment, the idea of all fossil fuel plants being fitted with carbon capture and storage to reduce their emissions remains elusive.

¹<https://senedd.wales/media/dtcay03q/gen-ld7941-e-english.pdf>

²<https://www.gov.wales/written-statement-future-generations-bill-wales-we-want-2050>

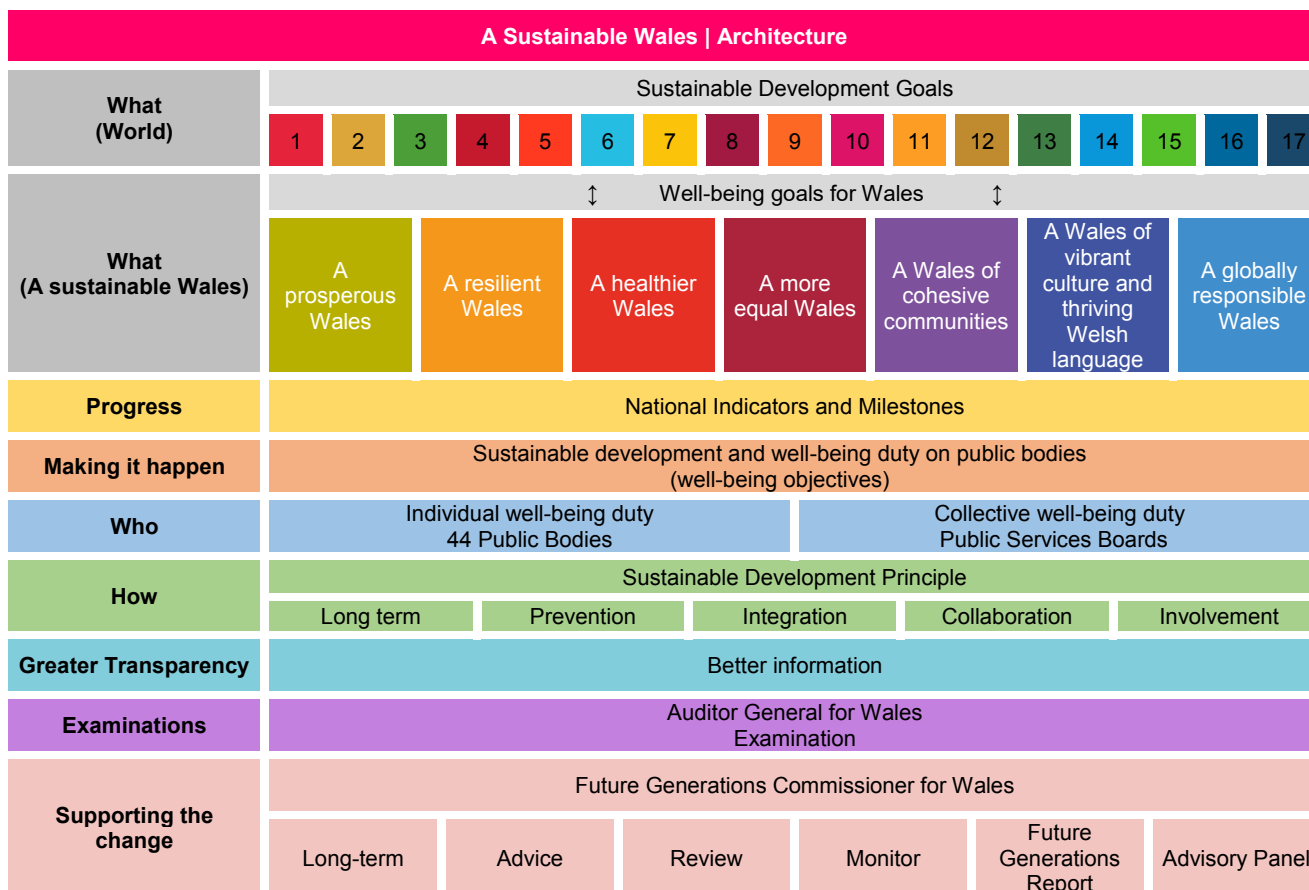


Figure 1: A sustainable Wales architecture³

5. What we have done through all our reports is outline a vision for radical action on climate that will positively affect citizens. In this way, we hope our work will add to the developing vision of a nation seeking to act fairly, and in a nature-positive way on our climate challenges.

6. The biggest challenge is how to come together across the communities of Wales to build a positive vision reflected by the daily experience within people’s lives. The significant opportunity in Wales is that since 2015 the Well-being of Future Generations (Wales) Act has defined essential outcomes linked to the developing vision in law (see figure 1).

7. However, the law has its limits. While effectively a uniquely Welsh constitution guiding and mandating the interaction between the Welsh Government and Welsh citizens in

government and public services delivery, the law does not extend its reach beyond that e.g., to the private sector or to the areas of UK Government responsibility in Wales.

8. Engaging in a further honest national conversation about the climate and nature crisis in a holistic rather than piecemeal way is essential to bring all Welsh citizens into a dialogue about creating a safer and more prosperous future for current and future generations. Our report aims to demonstrate the fairest pathways to delivery, but they are still radical and require public consent to deliver. We would hope our commissioners - the Welsh Government and Plaid Cymru - will now engage together as widely as possible through Welsh public services and the Future Generations Commissioner in involving the people of Wales in how to test our proposals urgently and with agency.

³https://www.gov.wales/sites/default/files/publications/2019-07/supplementary-report-to-the-uk-review-of-progress-towards-the-sustainable-development-goals-2030_0.pdf

EXECUTIVE SUMMARY

Achieving net zero by 2035 will require a significant step change in ambition from the Welsh Government, support from the UK Government, and a greater societal mandate for change.

Huge benefits to the Welsh public are possible through a net zero transition, including improved public health, reduced pressure on our NHS, greater energy security, more resilient food supply and low-carbon job generation.

Urgent action is needed now to ensure Wales captures the value and benefits of a net zero transition over the long-term, whilst also limiting exposure to climate related risks and greater costs in dealing with the consequences of inaction.

Only a planned transition can be a just transition to net zero through proactive action to prepare Wales over the longer term and mitigate transition risks before more severe disruptions occur in the future.



Across Wales and the world, the impacts of climate change are increasingly being felt and we remain unprepared to both reduce and respond to the associated risks.

The Welsh Government and Plaid Cymru sought our support to explore potential pathways to achieve net zero by 2035. We have developed pathways of action from 2025-2035 across five key challenges. These plans, presented in separate reports, aim to put Wales on a pathway to achieving net zero sooner than 2050 to minimise the risks of climate change, increase our resilience, and realise a wide range of benefits for our collective prosperity.

Box

Through the [Cooperation Agreement \(2021\)](#), a Wales Net Zero 2035 Challenge Group was established to 'provide independent advice to examine potential pathways to net zero by 2035 – the current target date is 2050. This will look at the impact on society and sectors of our economy and how any adverse effects may be mitigated, including how the costs and benefits are shared fairly.'

As independent experts, we have volunteered our time over 18 months, to rapidly establish foundations for a more comprehensive and ambitious approach to climate change. In doing so, we have highlighted the difficult challenges facing the decision makers and citizens of Wales while providing advice on how best to navigate these challenges and ensure that the transition to net zero is just and aligned with the goals of the Well-being of Future Generations (Wales) Act 2015. Our work has been supported by a small secretariat team, independent analysis from the Wales Centre for Public Policy, and the generous time of stakeholders across Wales.

Given the wealth of modelling on how to reach net zero already in existence, with the Climate Change Committee advising the Welsh Government, we have focused our time on developing policy pathways of action,

setting out a course of action from 2025-2035. Across each of our five key challenges, we have provided our expert judgement on how net zero might be reached by 2035 in an optimal manner, with minimised impacts for key communities and sectors and maximised benefits across the seven goals of the Well-being of Future Generations (Wales) Act.

It is not our role to recommend legislating for a net zero goal by 2035. In most cases, our advice is relevant to achieving net zero in any timeframe, but we welcome the ambition of our commissioners to accelerate action in line with the science. We have worked to illustrate how critical elements of our pathway advice would vary in speed and scale of implementation for a 2035 instead of a 2050 scenario. We have also worked to avoid broad recommendations, which are of limited use to the Welsh Government, instead providing detailed policy advice. Naturally, further quantitative work will be needed to understand the exact costs, benefits and emissions reductions for Wales.

Achieving net zero by 2050, let alone 2035, presents a massive challenge for any Welsh Government that should not be understated. Doing so in a manner that minimises impacts and maximises benefits will require urgent action now to plan for both risks and opportunities. Delaying action will increase costs and potential disruption of a net zero transition, whilst reducing Wales' ability to realise the benefits, particularly as the impacts of climate change increase in the coming years and decades.

We hope that our work will support a renewed effort by the Welsh Government, supported by Plaid Cymru, by highlighting the politically challenging and societally contentious changes that require greater discourse, whilst offering our evidence-based views on how they could be delivered.

Enabling the transition to net zero

- Responsibility for net zero delivery should remain with the First Minister and be affirmed as an explicit cross-cutting cabinet level responsibility by 2025 to signal buy-in and provide leadership at the highest level.
- Optimise the use of the Well-being of Future Generations (Wales) Act's 5 Ways of Working to de-silo and integrate levels of government. This includes creating a Wales Transition Forum, developing a new cross party agreement and appointing net zero brokers to support cross government collaboration.
- Support local authorities to enable collaborative action towards net zero across households, communities, local businesses and other organisations.
- Lead and implement a blended finance initiative combining public, private and citizen finance. Establish a Wales Wealth Fund to capture returns on public investment.
- Review and reform the planning system to facilitate the pursuit of net zero.
- Restore nature at pace and scale for carbon sequestration and increased climate resilience, using a marine and land use framework to balance food production, nature restoration and renewable energy deployment.
- Wales must play its full role as a net zero champion at UK and international levels.



What could education, jobs and work, look like across Wales by 2035?

- Introduce a National Green Skilling Wage for full time study, work experience and apprenticeships to incentivise widespread upskilling that is accessible to all, aligned with Wales' net zero ambitions.
- Build on the model of Carmarthenshire County Council to establish teacher/student Climate Action Groups in every local authority in Wales by 2030 to mainstream climate education across all subjects and levels.
- Mandate climate and nature literacy modules for all further and higher education students.
- Conduct a sustainability audit of all tertiary education courses to ensure curricula are relevant to the climate and nature crises.
- Create a carbon and nature literate workforce by establishing a continuing professional development pathway for all professionals by 2028.

How could Wales feed itself by 2035?

- Secure a just transition for farmers and growers with long-term financial support and extended tenancy agreements.
- Prioritise locally sustainably produced food through public procurement to develop local markets and distribution chains.
- Implement a land and marine use framework and national food strategy.
- Reduce the dominance of livestock production and incentivise growing a wider range of sustainable crops to replace imports.
- Enhance food literacy within the education system.

How could Wales meet energy needs by 2035 whilst phasing out fossil fuels?

- Increasing planning capacity and streamlining the consenting process to speed up the deployment of renewable energy.
- Urging National Grid and the UK Government to accelerate GB-wide electricity transmission system initiatives, including the Transmission Acceleration Action Plan.
- Choreographing industrial decarbonisation through regional economic bodies to deliver better outcomes and realise supply chain opportunities
- Seeking devolution of the Crown Estate in Wales and establishing a Wales Wealth Fund, reinvesting income from renewable energy projects for the long-term benefits of future generations across Wales.
- Encouraging a baseline for community benefit funds to ensure communities benefit from renewable energy projects.

How could Wales heat and build homes and workplaces by 2035?

- Prioritise the installation of heat pumps in private homes, upgrading building fabric where necessary to avoid increased bills.
- Fund insulation for fuel poor homes, installing heat pumps wherever possible.
- Launch a low interest green loan for homeowners, which crowds in private finance, develops supply chains and creates new jobs.
- Design local delivery partnerships for heat switching, to help people choose the best low carbon heat option for their home, street, or neighbourhood.
- Support existing tradespeople to join the heat and retrofit workforce in the short term, and work with colleges to develop training for young people.

How could people and places be connected across Wales by 2035?

Travel less:

- Boost digital connectivity so all communities can use broadband to connect remotely to people and services.
- Love local by supporting shops and services to make it easier for people to work, shop and play without having to drive.
- Upscale repair, refill and reuse schemes and curb advertising to minimise the movement of goods.

Travel differently:

- Invest in fairer fares for public transport and free bus travel for all under 22s and other disadvantaged groups.
- Activate active travel through major investment in local road improvements, including school streets and car-free city centres, making it safer, fun and more convenient to walk or cycle instead of driving. Implement financial measures, such as higher parking charges, to make driving less attractive.
- De-carb the commute by partnering with big employers like councils and the NHS to incentivise walking, cycling and public transport for work journeys

Travel better:

- Establish e-hubs by working with car dependent rural and urban communities to offer affordable and convenient access to electric vehicles without ownership.
- Incentivise rail freight over road haulage and deliver to parcel consolidation centres using small electric vans and cargo bikes for last mile deliveries.
- Position Wales as a Sustainable Aviation Fuel leader by establishing a Centre of Excellence at Cardiff Airport and a production plant at Port Talbot.

A Our opportunity

1. We have a history of innovation in Wales, from the opening of the first passenger railway, to the introduction of the state pension and the creation of the National Health Service for Britain. Strong and urgent action now, through a planned and just net zero transition, could see us leading the way again, ensuring that Wales becomes more prosperous and resilient despite the risks of climate change.

- a) Mitigating extreme weather events** – by reducing our own greenhouse gas emissions and working internationally to drive global reductions, we will limit our exposure to floods, storms and heatwaves.
- b) Stimulating prosperity** – through job generation in lower carbon sectors like renewable energy, building retrofits, and horticulture.
- c) Improving public health** – by enabling more active travel across society and increasing access to healthier, more sustainable diets, further reducing pressure on our NHS.

- d) Enhancing social equality** – by properly considering lower-income households and vulnerable communities as we transition to net zero, who are disproportionately affected by climate change.
- e) Protecting nature** – by limiting climate change risks and prioritising nature in our net zero transition through our agricultural support, creating climate and ecologically literate citizens and place-making.
- f) Increasing economic resilience** – through more domestic energy generation, greater diversity in food production and retaining jobs in Wales.
- g) Greater social mandate for change** – by effectively involving the Welsh public in decision making to improve policy making, build trust and ensure effective communication.



B Our context

1. Leading global scientists have issued what they call “our final warning” to address climate change⁴. While action to reduce emissions can limit future impacts, as the Intergovernmental Panel on Climate Change makes clear, significant climate disruption is now unavoidable, which is true for Wales and the world.

- a) **Progress has stalled on reaching net zero** – in their most recent reports to the Welsh Government, the Climate Change Committee made it clear that emissions reductions need to accelerate to ensure Wales meets its current and future carbon budgets and net zero targets⁵.
- b) **Welsh citizens expect governments to step up** – a majority (60%) of people in Wales would be most likely to vote for a party pledging to speed up efforts to reach net zero, or one that is pledging to continue at a similar pace to the current government⁶.
- c) **Our climate has changed** – 2023 was the hottest year on record for Wales, and 2022 was the second hottest⁷, with an official declaration of drought⁸. This change is already affecting the Welsh economy, with droughts and floods in 2018 alone costing Welsh farmers an estimated £175 million⁹.
- d) **Nature is disappearing** – unsustainable farming practices are the major driver of nature loss and Wales is one of the most nature depleted countries in the world, with 1 in 6 species at risk of extinction¹⁰. The current land management practices undermine the stability of our ecosystems, which underpin our long-term ability to produce food and the profitability of farming.
- e) **Our public health is under pressure** – our current economy leads to several avoidable public health outcomes, such as illnesses associated with obesity that projected to cost the Welsh NHS more than £465 million per year by 2050¹¹, and the burden of long-term air pollution exposure which is estimated to be the equivalent of 1,000-1,400 deaths each year in Wales¹². Climate change will impact the health and wellbeing of the entire population of Wales, with some groups are likely to experience disproportionately negative impacts¹³.
- f) **Resource security is at risk** – Wales has already witnessed impacts on the costs of food and energy supplies through the COVID-19 pandemic and the invasion of Ukraine. Climate change amplifies potential security risks both domestically and overseas, including food, water and biosecurity¹⁴.

⁴<https://www.ipcc.ch/assessment-report/ar6/>

⁵<https://www.theccc.org.uk/publication/2023-progress-report-reducing-emissions-in-wales/>

⁶<https://climateoutreach.org/britain-talks-climate/climate-big-picture-2024/wales/>

⁷<https://www.metoffice.gov.uk/about-us/news-and-media/media-centre/weather-and-climate-news/2023/2023-was-second-warmest-year-on-record-for-uk>

⁸<https://naturalresources.wales/about-us/news-and-blogs/news/all-of-wales-in-drought-status-after-months-of-dry-weather/?lang=en>

⁹https://www.wwf.org.uk/sites/default/files/2024-03/5126%20-%20FARMING%20IN%20WALES_REPORT_v3.pdf

¹⁰<https://stateofnature.org.uk/>

¹¹https://www.gov.wales/sites/default/files/consultations/2019-01/consultaton-document_0.pdf

¹²<https://phw.nhs.wales/services-and-teams/environmental-public-health/air-quality/air-pollution-and-health-fact-sheet/>

¹³https://phwwhocc.co.uk/wp-content/uploads/2023/07/PHW-Climate-Change-HIA-Summary-Report-E-17_07-FINAL-1300.pdf

¹⁴<https://researchbriefings.files.parliament.uk/documents/POST-PN-0680/POST-PN-0680.pdf>

g) Vulnerability is unequal across Wales –

Wales has consistently had the highest levels of relative income poverty across the UK in the last decade¹⁵. Between 2020-2022, 21% of all people in Wales were living in relative income poverty¹⁶. The impacts of climate change will not be felt equally, with economically and socially disadvantaged people disproportionately affected¹⁷.



¹⁵https://www.audit.wales/sites/default/files/publications/Time_for_%20Change_%20Poverty_English.pdf

¹⁶(Financial Year Ending 2020-2022) <https://www.gov.wales/relative-income-poverty-april-2021-march-2022-html#:~:text=Children%20in%20relative%20income%20poverty,FYE%202019%20to%20FYE%202021>.

¹⁷<https://www.jrf.org.uk/climate-change-justice-and-vulnerability>



Our risk of inaction

1. Wales is not unfamiliar with a disruptive and unjust transition. For example, the rapid closure of the South Wales coal mines left a legacy that is still being repaired today. Failure to take urgent and sustained action, starting now, will result in a more costly and disruptive transition later or jeopardise achieving net zero.

- a) **Missed opportunities for the wellbeing of Wales** – there are significant co-benefits that can be realised as part of a net zero transition, from public health improvements to job creation and reducing energy bills to food security.
- b) **Increased exposure to climate risks** – As the UK Climate Change Risk Assessment highlights, alongside our report, the risks of a changing climate are numerous, from extreme weather damage to key infrastructure and homes to water availability and supply chain disruptions.
- c) **A more costly transition** – Investing in net zero today will be cheaper than delaying. Analysis included in the Independent Review of Net Zero suggests that delaying action by ten years could mean UK debt being 23% of GDP higher in 2050¹⁸, doubling the fiscal cost of achieving net zero¹⁹.

¹⁸<https://assets.publishing.service.gov.uk/media/63c0299ee90e0771c128965b/mission-zero-independent-review.pdf>

¹⁹<https://obr.uk/fiscal-risks-report-2021-2/#>

A GUIDE TO OUR WORK

What we've done

1. Through the Co-operation Agreement, we've been presented with a unique opportunity to advise the Welsh Government and Plaid Cymru on an ambitious and rapid net zero transition.

Wales, like the rest of the world, faces many challenging decisions in addressing climate change and progress is slowing. By exploring a shorter, 10-year window of opportunity to transition to a net zero economy, we can illustrate why urgent action now is vital and support politicians in identifying and prioritising decisions. To achieve this, rather than providing a long list of broad recommendations, we have produced comprehensive pathways of action from 2025-2035.

2. In Wales, we are fortunate to have the Well-being of Future Generations (Wales) Act 2015 (*The Act*), which puts sustainable development at the heart of public bodies' work to protect future generations.

Placing *The Act* at the heart of our work has enabled us to take a very different approach to net zero than much of the world, including the UK government. In doing so, we have developed pathways of action that also deliver wider wellbeing outcomes for Wales, from improving public health and enhancing our food security to addressing inequalities and increasing job opportunities. We see climate change as the principal systemic threat facing Wales and the world, with our net zero target acting as the key driver to address our contribution to climate change. However, we recognise that climate change is one of many related challenges facing Wales.

How we've done it

1. As described, *The Act* has been critical in shaping how we've undertaken our work by enabling us to address net zero in a holistic manner, moving beyond typical siloed thinking regarding net zero.

Instead of breaking down the challenge into economic sectors (i.e., Agriculture, Industry, Transport, etc.), we decided to pose ourselves five key challenges:

a. How could Wales feed itself by 2035?

b. How could Wales meet energy needs by 2035 whilst phasing out fossil fuels?

c. How could Wales heat and build homes and workplaces by 2035?

d. How could people and places be connected across Wales by 2035?

e. What could education, jobs and work, look like across Wales by 2035?

2. Alongside our key challenges, we have also explored a range of 'enablers' that are critical to achieving net zero:

- a) Finance
- b) Just Transition
- c) Nature
- d) Digital and Technology
- e) Engagement & Communication
- f) Futureproofing
- g) Governance & Legal
- h) Psychology & Behaviour
- i) Circular Economy
- j) International impacts
- k) Co-benefits

3. We chose to undertake our work through six separate 'working groups', one for each challenge and a sixth to address the enablers.

Each working group (excluding enablers) was provided with an independent report by the Wales Centre of Public Policy, summarising up to date academic evidence relevant to each challenge. These reports can be found at: www.wcpp.org.uk/project/net-zero-35/. Our working groups carried out further evidence gathering and analysis in various ways, including an open call for evidence for each challenge, analysis of existing pathways to net zero and relevant research, alongside roundtables and structured interviews with stakeholders. Further details on the approach of each working group can be found in their respective reports.

4. Members considered three definitions of net zero to guide our work:

- a) Net zero means that the UK's total greenhouse gas (GHG) emissions would be equal to or less than the emissions the UK removed from the environment (UK and Welsh Government);
- b) Net-zero emissions means that the total of active removals from the atmosphere offsets any remaining emissions from the rest of the economy. The removals are expected to be important given the difficulty in entirely eliminating emissions from some sectors. (Climate Change Committee);
- c) Net zero means cutting greenhouse gas emissions to as close to zero as possible, with any remaining emissions re-absorbed from the atmosphere by oceans and forests, for example (UN Net Zero Coalition).

Who we are

1. The Group was comprised of independent members, who are acknowledged experts in their fields, from academia to the private sector.

Members were supported by several observers from a wide range of organisations, including the UK's statutory advisor, the Climate Change Committee and Welsh Government officials. Members, observers and the Chair voluntarily engaged with the Group and received no remuneration for their time.

2. Acting independently of the Welsh Government, the Group was hosted by the Wales Centre for Public Policy within Cardiff University

and supported by a small secretariat team funded by the Welsh Government (approx. 1.4 FTE).

3. The Minister for Climate Change and the Designated Member for the Cooperation Agreement attended meetings regularly for updates.

The Wales Net Zero 2035 Challenge Group members

Our Chair



Jane Davidson

Jane Davidson is the Chair of Wales Net Zero 2035 and the author of *#futuregen: Lessons from a Small Country* – the story of how Wales became the first country in the world to legislate in the interest of future generations. She is a patron of the UK Chartered Institute of Ecologists and Environmental Managers and Pro Vice-Chancellor Emeritus at the University of Wales Trinity Saint David. From 2000 to 2007, she was Cabinet Minister for Education where her proposed curriculum changes - introducing a new Foundation Phase and the Welsh Baccalaureate - were adopted into the new Welsh national curriculum in 2022. From 2007 to 2011 she was Cabinet Minister for Environment and Sustainability, where she proposed legislation to make sustainability the central organising principle of government: the Wellbeing of Future Generations (Wales) Act came into law in 2015. She introduced the first plastic bag charge in the UK, and her recycling regulations took Wales to among the best in the world. She oversaw the creation of a Climate Change Commission for Wales, the post of Sustainable Futures Commissioner, One Planet Developments and the Wales Coast Path.

Our members



Paul Allen

Paul joined the Centre for Alternative Technology in 1988, helping develop a range of renewable energy systems including solar medical systems. Since 2007, he has been a key part of CAT's ground-breaking Zero Carbon Britain research team; liaising directly with Government, business, public sector and the arts. Paul also regularly presents this research at official UNFCCC side-events at COP summits.



Jyoti Banerjee

Jyoti is CEO and co-founder of North Star Transition. He leads Wales Transition Lab, a place-based forum which brings together unlikely allies from different disciplines and cultures from across the nation to reframe problems, identify obstacles of change, and create novel co-creative solutions. The goal of Wales Transition Lab is to 'imagineer' a Wales that reconnects, food, health and nature. Jyoti hopes that the work of the Wales Net Zero 2035 group will use the high values of the Wellbeing of Future Generations Act to tackle the super-wicked problem of the climate / biodiversity / inequalities emergency we face. It is only through taking a wider lens that we will be able to take head-on the defining crisis-opportunity of our generation.



Professor Gavin Bunting

Gavin is a Professor in the Faculty of Science and Engineering at Swansea University. He chairs the Circular Economy and Research and Innovation Group, Wales (CERIG) bringing together circular economy expertise throughout Wales. Materials Engineer by background, his research and teaching is focused on circular economy, life cycle analysis, sustainability and environmental policy. Gavin is delighted to sit on the Net Zero Wales 2035 Challenge Group, recognising the importance of circular economy in reducing emissions. His ambition for the group is to inspire transformative change, which embraces the Wellbeing for Future Generations Act to deliver a sustainable and just transition. Wales, again, has the opportunity to lead the way, demonstrating what can be achieved when there is real commitment for change.



Sarah Dickins

Sarah Dickins has for the last ten years been BBC Wales Economics Correspondent, and prior to that was Business Correspondent and Presenter for BBC1 and BBC 2. Sarah is now working independently as a Sustainable Economics Adviser to help companies and organisations overcome barriers to their Net Zero targets. She is looking forward to contributing to the Wales Net Zero 2035 Challenge Group. She hopes to use her experience to inspire sustainable change and overcome perceived barriers.



Will Evans

Will is a mixed enterprise farmer from Wrexham, where his family have farmed for hundreds of years. Will is also the current chair of the Oxford Farming Conference and write a weekly column in Farmer's Weekly. In his Will's words "as a farmer I'm uniquely placed to be able to help, and the decisions that I and my fellow farmers make in the way we manage our land can have a huge impact on our entire society in Wales now, and for generations to come. However, we need the support of wider society and Government in order to be able to put these positive changes in place, and I hope that by becoming part of the Wales Net Zero 2035 Group I can help make a difference so we can find a way forward together".



Professor Hillary Kennedy

Hilary Kennedy is a biogeochemist whose research focusses on wetland carbon cycling and greenhouse gas emissions and removals, with particular interest in coastal ecosystems and their role in mitigating climate change. In the last 20 years her research experience has been focussed on seagrass ecosystems in Asia and Europe. She is currently chair of the UK Blue Carbon forum, which aims to be a positive, solutions-focused group committed to cross-sector collaboration and the incorporation of blue carbon into the UK's climate mitigation strategy.



Matthew Knight

Matthew Knight is Head of Market and Government Affairs for Siemens Energy in the UK, where he spends his time making sense of the energy transition to net zero. He has a background in electricity grid projects and offshore wind farms. As a member of the Net Zero Wales 2035 Challenge Group I hope to bring an insight into energy systems, how to decarbonise them and what gets businesses and their supply chains to invest in and deliver energy infrastructure.



Professor Karen Morrow

Karen Morrow is Professor in Environmental Law, Swansea University. Her research interests centre on public participation in environmental law and policy making, with particular emphasis on global climate change governance, sustainability law and policy and their intersection with gender matters, and she has published extensively in these areas. Karen is delighted to sit on the Net Zero Wales 2035 Challenge Group, recognising that a legal perspective has much to add to the innovative cross-disciplinary conversation that it is undertaking to develop recommendations facilitating a step change in Wales's progress towards net zero. She believes that the unique legal provision on sustainability and the environment that applies in Wales offers significant opportunities to cultivate the all-Wales approach to the urgent challenges of living well and within our environmental means, both locally and globally, in the short and long term, that is essential in the face of the triple environmental crisis.



Dr Eurgain Powell

Dr Eurgain Powell is an experienced sustainability practitioner with 20 years of experience of working on sustainable development and climate change. She has advised on policy development across transport, decarbonisation, procurement and housing, and was recently included on the Future Generations Commissioner's Changemaker 100 list. Eurgain is currently a Sustainable Development Programme Manager for Public Health Wales' Health and Sustainability Hub. In 2022 she was appointed to the National Infrastructure Commission for Wales, and was a member of the Roads Review Panel from 2021-22. Eurgain is looking forward to contributing to the work of the Net Zero Wales 2035 Challenge group. With progressive, world-leading legislation, Wales is showing that it wants to take a different path – one that can develop solutions to climate, nature and social challenges in a way that supports well-being today and for future generations.



Ben Rawlence

Ben Rawlence is a writer, activist and educator. He has worked in formal politics, social movements and NGOs. He has written three books, most recently, 'The Treeline: The Last Forest and the Future of Life on Earth' (Penguin, 2022). He is the founder and director of Black Mountains College, a new college devoted to climate action and adaptation. Ben hopes the 2035 challenge group can inspire ambition in Wales to seize the opportunity that small nations have to set an example for other countries.



Andy Regan

Andy leads Nesta's A Sustainable Future mission in Wales, which focuses on accelerating the decarbonisation of homes. Before joining Nesta Andy worked at independent think tank the IWA (Institute of Welsh Affairs), overseeing a policy research strategy to contribute to a successful, clean, green and fair economy, and stronger, more confident democracy in Wales. Prior to that Andy specialised in energy policy in roles at Ofgem, and Citizens Advice – co-chairing the Fuel Poverty Coalition Cymru.



Dr Jennifer Rudd

Dr Jennifer Rudd is a senior lecturer at Swansea University's School of Management, teaching on environmental management and sustainability. She has a background in climate techno-fixes including dye-sensitised solar cells, hydrogen production and carbon utilisation. She moved from developing techno-fixes to effecting behavioural change. Since 2018 she has launched an interdisciplinary climate change education programme, You and CO₂, to effect behavioural change in secondary school pupils, worked with the public and third sector to embed circular economy principles within their operations, helped developed a primary school education programme on fast fashion and collaborated on climate change education for teachers in Ebonyi State, Nigeria. Jennifer is a proud climate activist, house retrofitter and No Fly pledger, and is looking forward to working with the Net Zero Wales 2035 Group to push beyond business as usual. She hopes that the work done by the group will give her 7 year old son a hope and a future, stimulating a collective global effort to deliver tangible actions, not just empty promises.



Rachel Sharp

Rachel is the Director of Wildlife Trusts Wales, an umbrella organisation for the five Wildlife Trusts in Wales. Over the last twenty years, she has increased awareness of the nature crisis, including advocating for new environmental legislation and resources for nature conservation work. She is now involved in innovative environment financing and gaining recognition of the importance of the marine environment. She has been a lead advocate for nature-based solutions to climate change and to invest in sustainable land management in Wales. Rachel is a member of numerous forums covering wildlife conservation on both land and sea and is a trustee of Wales Environment Link. Invited to assist Welsh Government on the European Advisory Group and is a member of the Hinckley Point Reference Group. Voted as one of the 50 Shape Changers by the Future Generations Commissioner for her work on stopping damage to nature proposed by the M4 Relief Road. She remains passionate about achieving a nature positive Wales and sees a clear role for nature in tackling climate change.



Paul Southall

Paul joined National Trust Cymru some 15 years ago as a Climate and Environmental Advisor with the remit to lead for climate and environmental programmes developing an integrated organisational Environmental Management system. Throughout his career Paul has been passionate about working with communities, together with a broad range of organisations, which culminated in the establishment of the Fit for the future environmental network – “an environmental dating agency” matching those who have opportunities with those who have first hand experience of developing and delivering solutions. Paul has experience of heating and energy management, the appropriate integration of renewable technologies, together with “hands on” project delivery. Paul believes that together Wales can collectively achieve something greater than the sum of its parts in addressing the environmental challenges we all face, while keeping services resilient and affordable for future generations.



Dr Judith Thornton

Judith has held postdoctoral positions at the University of Leeds (water footprinting and water efficiency) and Cardiff University (low carbon futures, history of infrastructure transitions). She has also had teaching positions at the University of Padua and was an MSc tutor at the Centre for Alternative Technology, Machynlleth. Judith is now based at IBERS, Aberystwyth University and is interested in natural resources, bio-refining and the circular economy in general terms, and more specifically in plants as building materials. Her ambition for the group is that we create a sufficiently positive vision of what a zero carbon Wales looks like for us to be able to engage the breadth of societal groups who are typically resistant to change, and input particularly on how land use might look in a zero carbon Wales.



Professor Lorraine Whitmarsh

Lorraine is an environmental psychologist, specialising in perceptions and behaviour in relation to climate change, energy and transport, based in the Department of Psychology, University of Bath. She is Director of the ESRC-funded UK Centre for Climate Change and Social Transformations (CAST). She regularly advises governmental and other organisations on low-carbon behaviour change and climate change communication, was one of the expert leads for Climate Assembly UK, and Lead Author for IPCC's Working Group II Sixth Assessment Report. Her research projects have included studies of meat consumption, energy efficiency behaviours, waste reduction and carrier bag reuse, perceptions of smart technologies and electric vehicles, low-carbon lifestyles, and responses to climate change.

Our Observers



Ben Burgraaf

In 2022 Ben was appointed as the Chief Executive Officer for a newly established body called Net Zero Industry Wales, supporting the industrial clusters in Wales on their Journey to Net Zero. Ben is looking forward to supporting industry in Wales and their stakeholders, to make Wales the country of choice for sustainable goods and services. The work done by the South Wales Industrial Cluster and its partners, has built a great foundation to start developing a truly sustainable, prosperous and resilient industry across the whole of Wales. I truly believe that this is key to creating a healthier, more equal and cohesive Wales.



Dr David Clubb

David Chairs the National Infrastructure Commission for Wales; he is passionate about the long-term future for Wales, and uses the role to challenge orthodoxy in a range of areas. He changed the remit of the Commission to encompass 80 years in the future, and has innovated in policy and communication. David is a passionate advocate for open source software and social media platforms. He has been a moderator on the Welsh Mastodon instance, toot.wales, and is now a member of its governing Board. In February 2022 he published Afallen's first white paper, on the value of open source to Wales.



Rhiannon Hardiman

Through the Future Generations Commissioner's Office, Rhiannon is supporting public bodies in Wales to reach net zero by 2030 and to take action to address the climate and biodiversity emergencies. Rhiannon has previously worked in the public sector across Welsh Government, NHS, Senedd and local authorities where for 10 years she led the Rural Development Programme team at Bridgend CBC supporting sustainable and cohesive community development and thriving rural economies.



Rachel Solomon Williams

Rachel is Executive Director at the Aldersgate Group, a cross-sectoral alliance of businesses and other organisations championing a prosperous, environmentally sustainable economy. Rachel has 22 years' experience of working in environment and climate policy, as a civil servant (including as policy lead on the Climate Change Act) and in other sectors, with her last role being in KPMG's energy transition team. She works with Aldersgate Group members to develop robust recommendations and press the Government for change in vital areas across climate and environment policy.

Our Secretariat



Sarah Clayton

Sarah is secretary for the education working group. She is a doctoral researcher at the University of York focusing on climate change education in secondary science. She is also involved in public education around climate change as a Climate Fresk facilitator. Sarah has previously worked as a secondary school teacher and curriculum leader for science, and holds an MA in Educational Leadership.



Jo Jones

Jo is secretary to the buildings working group. She has a background in complex project management and multi-stakeholder engagement across industries, from local government to CICs to start ups. Building on her undergraduate degree in sustainability and climate and a MSc in Housing, Jo's focus is now on supporting purposeful organisations to move us towards a regenerative relationship with the planet. Informed by her upbringing on a Welsh farm and witnessing the effects of conservation work there, Jo believes passionately in a positive future for Wales.



Luke Penny

Luke is secretary for the enablers working group/ Luke works to create meaningful connections between people, organisations and issues to configure and facilitate systems change for better futures. Currently Luke is working with a range of public sector, 3rd sector and private landowners to coproduce management solutions to balance recreation and conservation in protected woodlands in Wales. He is also an associate of North Star Transition, working on Wye-Usk Transition Lab. After completing his MRes in Earth and Environmental Science from Cardiff University, Luke co-authored a paper on evolutionary dynamics of paleoclimatic proxies published in PLOS One. He lives in Cardiff.



Olafiyin Taiwo

Olafiyin is the Group's Minutes Secretary. She is a Chartered Town Planner committed to improving the quality of life and experiences of communities in a way that promotes common interest. She has extensive experience leading climate action programmes to deliver effective carbon reduction, capacity building and behavioural change across public, private, and civil society sectors at local, regional and international levels. Her work focuses on integrated approaches to urban development for the creation of sustainable cities and human settlements that are safe, healthy, and resilient.



Sarah Toy

Sarah is the secretary to the connecting people and places working group. Her work as a practitioner-researcher is focused on the future of low carbon and sustainable mobility for people and planetary health. Alongside her doctoral research at the University of Bath she works with public and third sector organisations to engage stakeholders and co-create low carbon visions, strategies and action plans. In her previous role as Bristol's Chief Resilience Officer she led the development of a 50-year Resilience Plan. She took inspiration from the Well-being of Future Generations Act so is delighted to be part of the Wales Net Zero 2035 Group.



Stanley Townsend

Stan is the Secretary for the Group, having recently moved back home to Wales to pursue more ambitious climate action. Stan has worked in a number of roles within UK government, including: net zero strategy, green finance and circular economy policy. Stan joins the Group from the Cabinet Office, where he was a UK negotiator within the United Nations climate process, attending COP26 and COP27. Stan is hopeful that the Group can push forward holistic, meaningful action that makes Wales a more thriving and resilient country. Whilst demonstrating to the world the courage and ambition truly needed in this critical decade.



Dan Ward

Dan is secretary for the enablers working group. Coming from a background in ecology and ecosystem services in delivery and policy across Wales and the UK, Dan utilises systems thinking and stakeholder engagement to enable systems change. Helping tackle the complex poly-crises we face, from climate change to biodiversity collapse, from policy to practice. Dan works with a range of organisations, including as an associate with North Star Transition on the Wye-Usk Transition Lab, food systems in the Welsh public sector, and on the Fens Transition Lab. Dan is eager to see the Wales we could create by taking on the decarbonisation pathway proposals from the net zero 2035 commission, seeing great opportunity for Wales in taking progressive action.



Juliette Webb

Juliette is secretary for the energy working group. She is a specialist in energy policy, working on the intersectionality of renewable energy and the natural environment. Juliette has previously worked for the offshore wind industry and closely with UK Government and eNGOs and believes in meaningful policy that balances both the climate and biodiversity crisis. Juliette is passionate about an urgent response to the climate crisis, whilst also advocating for decision making that takes a long term and holistic approach to policy making necessary to reimagine and create a better world for generations to come.