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Welsh Government
Consultation Document

Achieving our low-carbon pathway to 2030

Date of issue: 12 July 2018
Action required: Responses by 4 October 2018

Mae'r ddogfen yma hefyd ar gael yn Gymraeg.
This document is also available in Welsh.

Overview

We are required by law to reduce our emissions by at least 80% in 2050. This will require very significant changes to how we all live and work.

This consultation presents our initial thoughts on how we might reduce greenhouse gas emissions between now and 2030.

How to respond

You can respond to this consultation by answering the questions on the form available at www.gov.wales/consultations.

We are planning to run some events during the consultation period to capture views on the issues and ideas presented in this document. Details of the events will be available at www.gov.wales/consultations.

Further information and related documents

This document is available at www.gov.wales/consultations.

Large print, Braille and alternative language versions of this document are available on request.

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Data protection

How the views and information you give us will be used

The Welsh Government will be data controller for any personal data you provide as part of your response to the consultation. Welsh Ministers have statutory powers they will rely on to process this personal data which will enable them to make informed decisions about how they exercise their public functions. Any response you send us will be seen in full by Welsh Government staff dealing with the issues which this consultation is about or planning future consultations. It will also be seen by staff of the organisation we appoint to analyse or summarise responses on the Welsh Government's behalf.

In order to show that the consultation was carried out properly, the Welsh Government intends to publish a

summary of the responses to this document. We may also publish responses in full. Normally, the name and address (or part of the address) of the person or organisation who sent the response are published with the response. If you do not want your name or address published, please tell us this in writing when you send your response. We will then redact them before publishing.

Names or addresses we redact might still get published later, though we do not think this would happen very often. The Freedom of Information Act 2000 and the Environmental Information Regulations 2004 allow the public to ask to see information held by many public bodies, including the Welsh Government. This includes information which has not been published. However, the law also allows us to withhold information in some circumstances. If anyone asks to see information we have withheld, we will have to decide whether to release it or not. If someone has asked for their name and address not to be published, that is an important fact we would take into account. However, there might sometimes be important reasons why we would have to reveal someone's name and address, even though they have asked for them not to be published. We would get in touch with the person and ask their views before we finally decided to reveal the information. Your data will be kept for no more than three years. Under the data protection legislation, you have the right:

- to access the personal data the Welsh Government holds on you
- to require us to rectify inaccuracies in that data
- to (in certain circumstances) object to or restrict processing
- for (in certain circumstances) your data to be 'erased'
- to lodge a complaint with the Information Commissioner's Office (ICO) who is our independent regulator for data protection

The contact details for the Information Commissioner's Office are:

Wycliffe House
Water Lane
Wilmslow
Cheshire
SK9 5AF

Telephone: 01625 545 745 or 0303 123 1113
Website: www.ico.gov.uk

For further details about the information the Welsh Government holds and its use, or if you want to exercise your rights under the GDPR, please use the contact details below:

Data Protection Officer:
Welsh Government
Cathays Park
Cardiff
CF10 3NQ

Email address: Data.ProtectionOfficer@gov.wales

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Foreword from the Decarbonisation Ministerial Task and Finish Group

The United Nations Paris Agreement has set the context for tackling one of the biggest threats we will ever face: climate change. This context is set, not only for tackling the causes and consequences of climate change, but more fundamentally for the decarbonisation of the global economy.

We all have a global, national and individual responsibility to act. We also need to ensure our communities where we live and work take advantage of the transition to a low-carbon and resilient society. This consultation sets out how we are strengthening our delivery and ensuring we set a long-term clear pathway for decarbonisation in Wales.

Wales already has the right legislation in place through the Environment (Wales) Act 2016. We now need to ensure we optimise the opportunities and co-benefits of the global transition and are not left behind. Through our ambition to tackle climate change, we can also build a Wales which is **prosperous and secure**, **healthy and active**, **ambitious and learning** and **united and connected**. We will achieve this by laying the foundations that support all of Wales to take action.

Prosperity for All: the national strategy sets out the aims of this government. Prosperity is not material wealth. It is about every one of us having a good quality of life and living in strong, safe communities. Climate change is one of the biggest global challenges and threatens our prosperity by having an impact on all of our lives. However, it also provides one of the greatest opportunities to create a better Wales, for now and in the future. The transition to a low-carbon economy not only brings opportunities around clean growth, quality jobs and global market advantages, but also has wider benefits of enhanced places to live and work, with cleaner air and water and improved health outcomes. Decarbonisation is not a standalone policy area. It is an issue that frames all of our activity through the way we grow our food, build our homes, transport people, the jobs we go to and the public services we all rely on.

As a government we are working together more than ever before to drive forward action. We have formed a Decarbonisation Ministerial Task and Finish Group to tackle this issue together. We have developed our Economic Action Plan, which puts decarbonisation as a central pillar for future prosperity and we have released our refreshed Forestry Strategy. We have developed a consultation on ‘Brexit and our land’, and over the rest of the year we will involve people in updating our strategies for transport and waste, building on responses to this consultation.

Yet government action is not enough. We all have a role to play in ensuring we get the Wales we want. We know the transition to a low-carbon economy will require us to do things differently and innovatively, and will affect everyone in Wales. This is why we want to involve you in at the start of this long journey.

Ministerial Decarbonisation Task and Finish Group
Mark Drakeford AM, Cabinet Secretary for Finance
Hannah Blythyn AM, Minister for Environment
Lesley Griffiths AM, Cabinet Secretary for Energy, Planning and Rural Affairs
Rebecca Evans AM, Minister for Housing and Regeneration
Ken Skates AM, Cabinet Secretary for Economy and Transport
Alun Davies AM, Cabinet Secretary for Local Government and Public Services

Introduction

The 2015 Paris Agreement put in place a roadmap for decarbonisation of the global economy.[1] Our economy is changing and being reshaped, driven by the need to respond to the challenge of climate change and ensuring we are keeping pace with the rest of the world. Setting our own decarbonisation pathway in line with requirements in the Environment (Wales) Act 2016 provides the certainty and clarity needed to support and drive low-carbon action and investment in Wales.

The transition to a low-carbon economy brings opportunities around clean growth, quality jobs and global market advantages, as well as wider benefits such as better places to live and work, clean air and water, and better health. If we are to maximise these opportunities and realise the benefits, we need to have a whole government approach and work collectively with businesses, the third sector, and communities and people across Wales.

The well-being goals and the ways of working guide Wales's decarbonisation action.[2] We are considering how to achieve our long-term target by looking at what action we need to take, ensuring we collaborate and involve stakeholders to integrate decarbonisation within the way we work as a government to limit further effects of climate change.

Involving and collaborating with others will be vital to successful decarbonisation. To enable us to meet our 2030 target, we need to develop and implement actions now, across key areas such as agriculture, land use, transport, energy, the public sector, industry and homes. We also need to look at enabling mechanisms such as the skills and supporting mechanisms required to drive this transition.

What this consultation is about

We are already halfway through our first carbon budget period.[3] Our independent expert advisory body, the UK Committee on Climate Change (UKCCC), has advised that there is relatively little scope for new policy actions to affect emissions to 2020 and there needs to be a stable, long-term policy framework to drive down emissions in Wales.[4]

This consultation is seeking views on what actions we should take to reduce emissions to 2030. We think that is far enough away to give actions time to have an effect but not so far away that we can't anticipate most societal and technological changes with a reasonable level of confidence. By involving stakeholders early in the development of our ideas and policies, we should be able to maximise the opportunities and benefits that a low-carbon economy and society brings.

[1] https://unfccc.int/process-and-meetings/the-paris-agreement/what-is-the-paris-agreement
[2] https://gov.wales/topics/people-and-communities/people/future-generations-act
[3] The Environment (Wales) Act received Royal Assent in 2016. As part of the development of the regulations, by the end of 2018 we are required to set out our pathway for reaching the 2050 target and how we are going to account for emissions, recognising it will be halfway through the first carbon budget.
[4] Building a low-carbon economy in Wales: Setting Welsh carbon targets (UKCCC, 2017), p.8-9

This consultation:

- Raises awareness of the international context and the need to decarbonise our economy in order to remain competitive
- Highlights Wales's current emissions and the challenges and opportunities of decarbonising across different sectors
- Considers the role of others in achieving our low-carbon pathway to 2030
- Presents potential actions across different sectors
- Sets out a number of questions for your consideration.

This consultation is not about the level of emissions reduction we need to see by 2030 or the carbon budgets but how we are going to reach our 2030 target. Over the last year, stakeholders have been involved in developing our evidence base and understanding the Welsh context. This involvement has been in addition to the comprehensive stakeholder engagement, including Welsh events, utilised by the UKCCC to create an evidence base to underpin their advice to Welsh Government.[5]

What we're aiming for

In 2050, Wales will be among the best places in the world to live, learn, work and do business. Our businesses, public services, third sector and government will have worked together to achieve the goals that we set in the ground-breaking Well-being of Future Generations Act and the target to reduce emissions by at least 80% against the 1990 baseline.

We will have thought more about the long-term, worked better together, taken early action and engaged with citizens on this journey to a low-carbon economy and society. Wales will have faced up to the complex challenges outlined in our Future Trends reports. We will have created quality jobs that are future-proofed for the globalised low-carbon economy and have the right growth and skills to lift people out of poverty whilst at the same time improving their health and local environment. Our environment and communities will be more resilient to major environmental problems, such as addressing declining biodiversity. We will be healthier, achieving our potential and making Wales a more equal society.
We will have reduced our emissions in part by changing the products we buy, use and produce. We will have spent years doing things differently, looking forward so the choices we make will have secured a safe and prosperous future for ourselves and future generations. We will have been clear and consistent in describing the Wales we want, through setting long-term frameworks that provide clarity and certainty for low-carbon investment.

We will have moved from a centralised fossil fuel-based energy system, with fewer larger generation sites to a different model with the use of smaller localised energy generation, utilising technology and innovation to produce and store energy in a low-carbon way. Through localised production we will be harnessing more direct benefits to our local communities through skills, quality jobs and a greater retention of economic value. Our buildings will be more resource efficient and designed for adaptability and deconstruction at the end of their lives. Thanks to designing and

[5] Building a low-carbon economy in Wales: Setting Welsh carbon targets (UKCCC, 2017)

running our buildings differently, buildings will be cheaper to run and people will be able to adapt their buildings easily so they can stay in their homes longer in life.

In terms of our waste, we will have moved from a model of use and disposal to one where we recover and regenerate in new ways to create new products. Our businesses and industries will use resources more efficiently, as well as grasping the market opportunities from a low-carbon global economy and driving world-leading innovation and solutions. We will be more efficient and have less impact in the way we produce our food and manage our land and natural resources. We will have capitalised on the opportunities for carbon storage through increased tree cover. Walking and cycling will be common for more people, improving the health and safety of the nation. Public transport will be clean and efficient, stimulating local industries.

We will not be the only country to have addressed this challenge. Signatories to the Paris Agreement and the UN Sustainable Development Goals will have responded to their international commitments and cut their emissions. We will have learnt from what has worked elsewhere and found our own solutions, drawing on the strength of our local communities and building on our shared values.

How we developed this document

To achieve our long-term target and ambition, we need to collaborate and involve stakeholders at the start of the policy development process to help identify opportunities and solutions.

We have established a cross-government Ministerial Task and Finish Group to drive action and show leadership with a supporting Board to oversee the Decarbonisation Programme. Cross-departmental Working Groups have been established to help support delivery of the climate change elements of the Environment (Wales) Act 2016, focused around key emission sectors. We have worked across government to understand the scale of the challenge and look at the threats and opportunities from the low-carbon transition.

In the document we present a number of potential actions that could be taken, covering our key levers and emissions sectors such as industry, waste, agriculture, land use change and forestry, transport, power and buildings. By involving stakeholders at the beginning of this process it will help to shape our ideas. The potential actions within the document have been developed through looking at the recommendations from the UKCCC, wider evidence, discussions with stakeholders, learning from others and through thinking about the ways of working under the Wellbeing of Future Generations Act. A series of meetings and events were held earlier this year to inform the consultation, specifically on energy, innovation and behaviour change. In addition to the events, we held a competition for young people on what Wales will look like in 2050. The potential actions presented in this consultation reflect our initial thinking, which we now need to work with others to understand and develop further where appropriate.

The well-being goals and the ways of working guide Wales's decarbonisation action. We are using the national well-being goals, our own well-being objectives and ways of working to help identify areas for action throughout the consultation.

Our ways of working

- **Long-term:** By taking a view to 2030 the consultation is stimulating a debate about how to meet a long-term goal (the 2030 emissions reduction target). It can help us understand the potential short- and long-term issues associated with the potential actions, identify long-term trends and opportunities for action.
- **Prevention:** Collating evidence will allow us to better understand better the potential impacts of action. We will review our approach to limit unintended consequences and help mitigate negative impacts.
- **Integration:** The consultation will help us to understand how the potential actions could impact on other sectors or public bodies and how to maximise opportunities with their own decarbonisation and well-being work. The Public Sector chapter is particularly relevant here.
- **Collaboration:** Consulting and engaging at this early stage allows interested parties and the public to help shape our policy development, providing richer evidence in support of meeting our well-being objectives and allowing us to further understand the impacts of any action.
- **Involvement:** Involving individuals and their organisations, through the consultation process with supporting events and information will provide diverse views to inform the policy-making process.

What happens next

We are planning to engage with various stakeholders during the consultation period to capture views on the issues and ideas presented in this document. We will analyse this feedback and responses to the consultation document to help us identify ideas with the greatest potential for contributing to our emissions reduction targets and providing other benefits to the economy, society, environment and culture. We will use the results of the consultation to help develop our first Low Carbon Delivery Plan, due in March 2019. We will also seek further input in the coming years on any promising ideas arising from this consultation with a view to including them in Plans to be published in the 2020s.

The potential actions presented in this consultation reflect our initial thinking about some of the key areas that will help us reach our 2030 target. They represent the beginning of our journey under the new legislative framework. We have not yet assessed their possible economic cost, emissions reduction potential or wider impacts but will undertake this work if and when we consider them for inclusion as firm policies in future Plans.

Our targets and budgets

Welsh legislation

The Environment (Wales) Act 2016requires the Welsh Government to reduce emissions of greenhouse gases by at least 80% in 2050, against the 1990 baseline. Before then, the Act requires us to set targets for 2020, 2030 and 2040 to keep us on track for the 2050 target. The Act also requires us to set carbon budgets. These set out the amount of emissions Wales can produce in the years between our interim targets.

The Act establishes a rigorous and comprehensive statutory process that the Welsh Ministers must follow in establishing the level of the interim emissions targets and carbon budgets. We have received independent advice from the UKCCC on the interim targets and the first two carbon budgets (2016-20 and 2021-25). The science suggests we need to cut emissions further and faster than we have so far, and the UKCCC supports this view. However, the UKCCC also accepts that the circumstances in Wales make achieving an 80% reduction here more challenging than the equivalent reduction for the UK as a whole. This is due to Wales having a greater share of 'hard to reduce' emissions, for example in agriculture and industry, and fewer suitable sites to store CO_2.[6]

We have decided to accept the UKCCC's advice and have therefore set a more ambitious 2030 target than the EU's pledge under the Paris Agreement.[7] We will ask the Assembly to agree with our proposal to set the interim targets and the first two carbon budgets in regulations before the end of this year at the following levels:[8]

- 2020: 27% reduction
- **2030: 45% reduction**
- 2040: 67% reduction
- Carbon budget 1 (2016-20): Average of 23% reduction
- Carbon budget 2 (2021-25): Average of 33% reduction

Each time we publish a carbon budget we have to produce a plan that contains the actions we will take to stay within the level of emissions allowed in the budget. We will publish the plan for our first carbon budget (2016-20) by the end of March 2019.[9]

UKCCC advice

The UKCCC provided their independent advice on the appropriate levels at which to set interim targets and carbon budgets in December 2017.[10] In recommending these levels the UKCCC built a range of scenarios to understand the decarbonisation pathways available in order to meet the 2050 target. These scenarios take account of the current context in terms of Welsh emissions, trends and policies, as well as the specific challenges and opportunities to reduce emissions in Wales, which differ significantly from the UK as a whole.

We have decided to accept the UKCCC's advice on the overall level of the interim targets and first two carbon budgets. In this consultation we present the recommended 80% pathway as the basis for the emissions reduction Wales will aim to achieve. The UKCCC has also illustrated how, in their view, the recommended interim targets could be apportioned to individual sectors of the economy. We have not accepted the sector targets or policy measures but present them in this consultation as an example of a possible route by which Wales could achieve its emissions reduction targets.

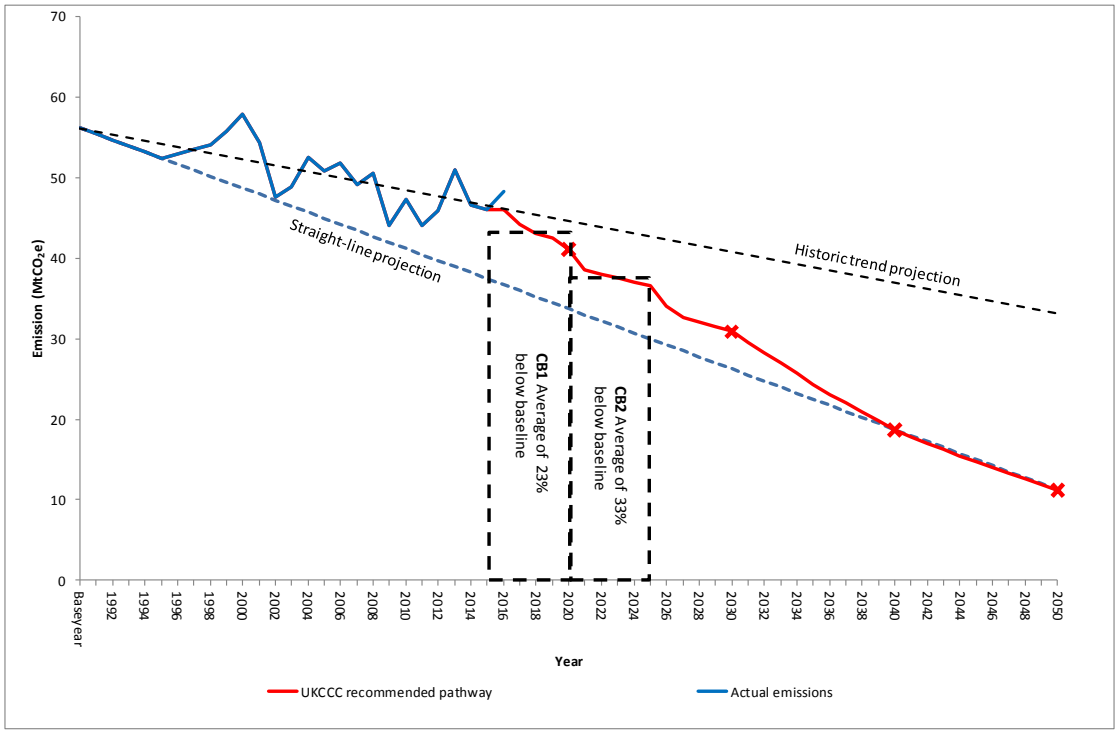
[6] Building a low-carbon economy in Wales: Setting Welsh carbon targets (UKCCC, 2017)
[7] See Written Statement: Setting our interim emissions reduction targets and first two carbon budgets
[8] All numbers are against the 1990 baseline.
[9] We must publish the report for our second carbon budget (2021-25) by the end of 2021.
[10] Building a low-carbon economy in Wales: Setting Welsh carbon targets (UKCCC, 2017)

This consultation adopts the sector classification set out by the UKCCC in their advice to us. All emissions statistics and future scenarios follow this sector classification.[11]

The UKCCC scenarios are based on the latest emissions data available at the time (1990-2015).[12] This has now been superseded by the 1990-2016 inventory data that was published on 12 June 2018.[13] This latest data provides an update to the entire time-series, providing an improved estimate of emissions in the base-year right through to the addition of new data for the year 2016. In our presentation of the UKCCC scenarios we have updated the UKCCC's advice to reflect the latest (1990-2016) emission information.[14] This is important to ensure that the recommended scenarios continue to deliver the interim targets and carbon budgets.

As a result of including the latest emissions data there may be a discrepancy on some graphs between the actual emissions (blue line) and the recommended scenario (red line). These discrepancies, where they occur, result from a combination of improvements to the inventory methodology which can revise the historical emissions estimates and actual emissions in 2016 being higher or lower than that recommended by the UKCCC's scenarios for that year.

Graph: Total Welsh emissions – historic data and future projections incorporating UKCCC advice



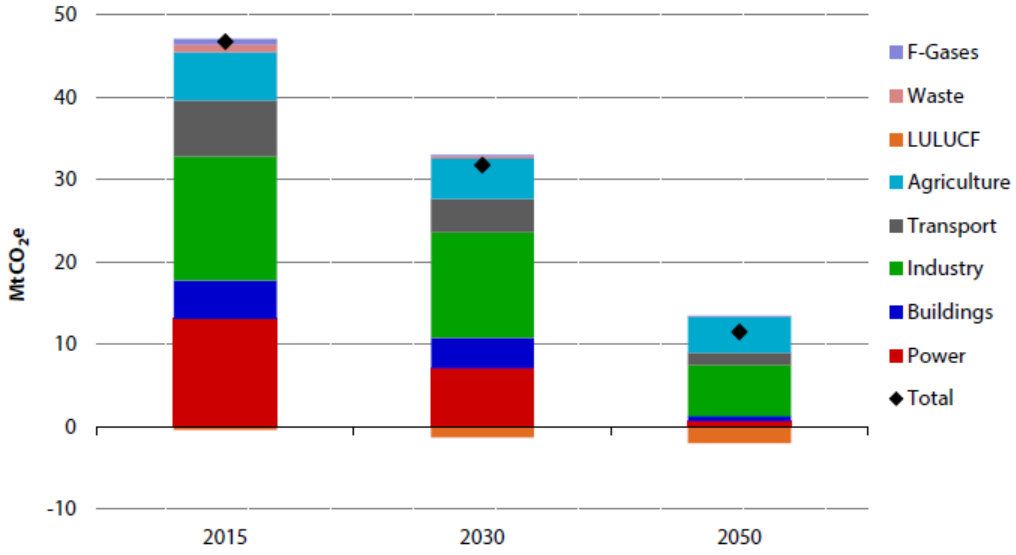
[11] More details of how the UKCCC have defined their sectors are provided in Annex 3.

[12] Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2015

[13] Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2016

[14] The only exception to this is for the LULUCF sector. For this sector the UKCCC took into account the 2016 inventory methodology changes at the time of publishing their advice, so no further update is required.

Graph: Welsh emissions by sector – current data and one possible pathway to 2050 modelled by the UKCCC[15]



What we've achieved so far

In 2016 emissions within the scope of the Environment (Wales) Act targets were 48.3 million tonnes of carbon dioxide (CO_2) equivalent, representing a decrease from the base year of 14 per cent.[16] A 4.8% increase in total Welsh emissions from 2015 to 2016 has resulted in Welsh emissions being above that recommended by the UKCCC advice for 2016. This increase was largely driven by an increase in power station emissions within the traded (EU-ETS) sector. Large point source emitters with the traded sector make up nearly 60% of Welsh emissions, a much higher proportion than the UK average (29%).[17] We have limited powers to influence emissions within the traded sector and because year-to-year variations within the traded sector can have a significant effect on our national emissions, performance against our targets is particularly volatile and specific annual emissions are difficult to predict. To mitigate this effect, our statutory targets are based on average emissions over the five year budget period from 2016 to 2020.

In 2017, there was a significant decrease in traded sector EU-ETS emissions driven by reductions in emissions from power plants in Wales. As the EU-ETS makes up a significant part of our total emissions, in 2017 we expect a significant reduction in Wales' overall emissions.

[15] Building a low-carbon economy in Wales: Setting Welsh carbon targets (UKCCC, 2017)
[16] Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2016
[17] Comparison is taken from Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2016 and includes emission from international aviation and shipping.

The international context

Globally, the UN has put in place a 2030 framework to drive forward sustainable development and climate change through the UN Sustainable Development Goals[18] and the Paris Agreement, which commits to keeping global temperature rise this century well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5°C. This sets the platform for global decarbonisation. The European Union, on behalf of Wales, the UK and all Member States, has pledged to reduce its emissions by at least 40% by 2030, against the 1990 baseline.

In Wales we are already delivering on our international commitments through the Environment (Wales) Act and the Well-being of Future Generations Act 2015. The goals in the Well-being of Future Generations Act provide a shared national vision for all public bodies and, along with the Sustainable Development Principle, provide a clear framework for public sector decision-making. We have set out our organisational well-being objectives that show our contribution to the national goals.[19]

Opportunities and challenges from the low-carbon transition

Decarbonisation will have significant impacts on all parts of the economy and society. We are using the national well-being goals, our own well-being objectives and ways of working to help identify and consider the costs and benefits of achieving our low-carbon pathway to 2030.

Opportunities

Achieving our low-carbon pathway to 2030 provides opportunities to maximise all 7 national well-being goals. There is significant potential to increase economic **prosperity**. Our low-carbon economy already consists of 4,500 businesses, employing 11,000 people and generating £1.7 billion turnover in 2015.[20] Analysis suggests that the UK's low-carbon economy could grow by around 11% per year to 2030 – four times faster than the average growth rate for the UK economy as a whole. It is also estimated that UK exports of low-carbon goods and services could be worth between £60 billion and £170 billion by 2030.[21] In its advice on Welsh targets the UKCCC found that, together with cost savings, their modelled emissions reduction pathway to 2030 would deliver a significant net benefit to Wales of approximately £250m per year.[22] Later this year we will publish our own analysis of the overall economic impacts of achieving our low-carbon pathway, including identifying who will bear the cost.

Ecosystems contribute to social, economic and ecological **resilience** but are under pressure from increasing temperatures and extreme weather events linked to climate

[18] https://sustainabledevelopment.un.org/post2015/transformingourworld
[19] http://gov.wales/about/programme-for-government
[20] Direct activity only (excludes supply chains). ONS (2016): Low-carbon and Renewable Energy Economy Survey.
[21] https://www.theccc.org.uk/publication/uk-energy-prices-and-bills-2017-report-supporting-research/
[22] Building a low-carbon economy in Wales: Setting Welsh carbon targets (UKCCC, 2017), p.47

change. Achieving our low-carbon pathway to 2030 and lessening and slowing the impacts of climate change will help ecosystems respond and adapt. Our **health** will benefit from action to tackle emissions through better living conditions in warmer, drier homes and more active travel. Countries which have more energy efficient housing have lower excess winter deaths,[23] while domestic energy efficiency measures have been demonstrated to improve health outcomes.[24]

Road transport, agriculture and the combustion of fuels are the main sources of many air pollutants such as particulate matter, nitrogen dioxide, sulphur dioxide, ammonia and carbon monoxide. These pollutants are associated with negative effects on human health, including respiratory and cardiovascular illness, cancer, enhanced response to allergens, and irritation of the eyes and nose. They also contribute to the acidification and eutrophication of sensitive habitats, leading to a loss of biodiversity and lower crop yield and quality.[25]

Taking action to reduce the use of fossil fuels in our power and transport systems will therefore not only help achieve our emissions reduction targets, but it will also make a vital contribution to improving air quality. Our Clean Air Zone Framework issued for consultation in April identified road traffic as a significant source of airborne pollution and suggested that Clean Air Zones, where implemented by local authorities, will require some level of restricted access for road vehicles.[26] The final Framework will be published and issued to local authorities this summer. In addition, we will publish a Clean Air Plan early in 2019, following consultation later this year. Throughout the 2020s the Framework and Plan will reduce the burden of poor air quality on human health and the natural environment.

Climate change is an **equality** issue as its impacts are felt more by those with limited ability to adapt, such as those on lower incomes or with disabilities. An unstable climate system can affect food production in all parts of the world and lead to increased, volatile food prices, which increases the vulnerability of people who may already be struggling to make ends meet. There are opportunities to increase **cohesion** through tackling climate change together, for example in the development of local renewable energy schemes and tree planting schemes to improve the local environment. We can protect the vibrancy of our **culture** by taking action to reduce emissions and minimising the impacts of climate change on our unique landscape and cultural heritage. Taking action on climate change to protect our own well-being will demonstrate **global responsibility** by lessening the effects of climate change around the world. In transitioning to a low-carbon economy, we need to minimise carbon leakage whereby emissions simply move to another country.

[23] The Health Impacts of Cold Homes and Fuel Poverty (Friends of the Earth and the Marmot Review Team, 2011)
[24] Fuel Poverty Data Project: https://gov.wales/statistics-and-research/fuel-poverty-data-linking-project
[25] https://uk-air.defra.gov.uk/assets/documents/What_are_the_causes_of_Air_Pollution.pdf
[26] https://beta.gov.wales/clean-air-zone-framework-wales

Challenges

There are some important differences between Wales and the wider UK that create some specific challenges:[27]

- More of our emissions come from large point-sources in the power sector and industry, which means performance against our targets is heavily reliant on emissions produced at a small number of sites
- More of our homes have solid walls, which means it costs more to improve their energy efficiency
- More of our homes are off the gas grid, which means it may be more expensive to deploy low-carbon heat
- Our cars are older on average, which means they are less efficient
- We make significantly fewer short trips, which means there is less opportunity to walk or cycle instead
- South Wales lacks potential CO_2 storage sites, which means carbon capture and storage is less economically attractive[28]

In addition, our Future Trends report identifies several relevant societal changes that we may see over the next 20 years.[29] Among them is a larger population, smaller households and a greater need for housing. This presents the challenge of achieving our low-carbon pathway to 2030 despite there being more people and houses in Wales than there are today.

Collaborating to drive forward the low-carbon transition

People

Each of us can choose to help reduce emissions. Towards 2030 we could see the shift away from a centralised, carbon-intensive energy system to one that is increasingly decentralised, which will see householders playing new roles and engaging with new energy system technologies, such as smart homes and electric vehicles. The potential actions in this document will be crucial in moving Wales towards a low-carbon future but the effectiveness of many of these measures will depend on how people adopt low-carbon behaviours and technologies.

Business

The global decarbonisation trajectory has been set, creating clarity and certainty to drive investment. This creates enormous economic opportunity. The International Energy Agency estimates $13.5 trillion of public and private investment in the global energy sector alone will be required between 2015 and 2030 (an average of $840

[27] Building a low-carbon economy in Wales: Setting Welsh carbon targets (UKCCC, 2017), p.32

[28] However, the UKCCC finds that despite the added cost of transporting CO_2 by ship to the sequestration point, "it could still be worth undertaking this abatement in Welsh industry, as the costs are still below the value of carbon saving." Building a low-carbon economy in Wales: Setting Welsh carbon targets (UKCCC, 2017), p.39

[29] http://gov.wales/statistics-and-research/future-trends

billion per year) if the signatories to the Paris Agreement are to meet their national targets.[30]

Which businesses and sectors survive and fail has historically defined the shape and direction of the country. The key to securing the viability of every business lies in seizing the opportunities presented by the move to a low-carbon economy. Whether it's revamping and refurbishing homes and buildings to cut energy, costs and carbon, embracing new modes of transport, or pioneering and manufacturing vital technologies for domestic and international markets, the potential is there to be grasped.

Public and voluntary sectors

Public bodies have a significant role to play in accelerating decarbonisation through the 2020s.Although the Public Sector only accounts for a small amount of Welsh emissions, leadership is needed at both the national and local level to achieve the depth of decarbonisation required. Local government and other public bodies, including town and community councils, are uniquely placed to not only ensure their buildings are efficient, but also influence emissions far more widely through the delivery of their services, procurement and influencing action through our local communities. Voluntary sector organisations can promote decarbonisation and influence others.

Working with the UK Government

We have decided to count all emissions in Wales against our targets as this is the most transparent and simplest way of measuring progress.[31] However, we are not responsible for policy in a number of important areas. For example, the UK Government retains responsibility for most economic and fiscal policy, large-scale power generation, electricity transmission, heating, vehicle standards and licensing, and heavy industry. Among other things, we are responsible for agriculture and land use, most planning matters, building standards for new properties, smaller-scale power generation, public transport and waste. We also set policy for public services, such as schools and hospitals.

As a result many emissions in Wales are produced in areas that are the responsibility of the UK Government. We are therefore working closely with the UK Government on the implementation of their Clean Growth Strategy to ensure they deliver the reductions we need and Welsh households and businesses are able to access UK-wide funding.[32]

We do, however, have a clear role to play in demonstrating leadership and enabling others to act by providing the right conditions through devolved legislation and policy, financial incentives and bringing people together. We also have significant levers at our disposal to aid decarbonisation, including the planning framework, skills and innovation.

[30] https://www.iea.org/newsroom/news/2015/october/climate-pledges-for-cop21-slow-energy-sector-emissions-growth-dramatically.html
[31] http://gov.wales/about/cabinet/cabinetstatements/2017/carbonbudgetingframework
[32] https://www.gov.uk/government/publications/clean-growth-strategy

Brexit

The UK leaving the European Union will have a significant and wide-ranging impact on Wales. We may see changes to our economy and migration into Wales from Europe and beyond. However, our targets for reducing greenhouse gas emissions are set in Welsh law and will continue to apply after the UK leaves the EU.

The UKCCC estimates that most of the projected reduction in UK emissions to 2030 will occur in areas covered by EU policies.[33] There is much in existing EU law that will help us achieve the required cut in greenhouse gas emissions if the UK Government chooses to maintain or strengthen the approach. However, Brexit also provides an opportunity to improve in some areas. Among these is the Common Agricultural Policy, which does not currently focus on reducing greenhouse gas emissions and its replacement could more closely align to our climate change goals.

The UK Government's EU (Withdrawal) Bill will convert and preserve existing EU laws into UK law once we leave the EU. Some of these EU laws apply to areas that are devolved to Wales and are the responsibility of the Welsh Government, including agriculture, forestry and waste. The Welsh Government has come to an agreement with the UK Government on the Bill, which recognises that devolved areas remain devolved, but there are some limited areas where there is a need to agree UK-wide frameworks to replace those currently at an EU-wide level. The Bill was recently passed by Parliament and is awaiting Royal Assent.

How we'll get there: Creating the right conditions

With a challenge as serious as climate change and an opportunity as great as clean growth, we will use all our levers to ensure we derive the maximum benefit to Wales. We must create the right conditions, markets and regulatory regimes to provide certainty and clarity for all. We can do this through the use of our levers such as planning, innovation, procurement and skills to enable others to act. Along with utilising our levers, we can look how the public sector can be a leader and help to drive change in others areas.

The following chapters set out some of the potential actions to reduce emissions to 2030, covering our key levers and emission sectors such as industry, waste, agriculture, land use change and forestry, transport, power and buildings. It is important when we are looking at the transition in the emission sectors we do not look at them independently of each other, as they are part of wider, joined-up systems. If we get it right, we can look at how we utilise all our levers together to drive maximise benefit for Wales.

Prosperity for All and our Economic Action Plan

Last year we published our national strategy, Prosperity for All.[34] It describes what we will deliver over this Assembly term and how what we do aligns to our well-being objectives. Many of the commitments within the strategy have very strong links to reducing emissions, not least improving the energy efficiency of homes, creating an

[33] Meeting carbon budgets: Implications of Brexit for UK climate policy (UKCCC, 2016), p.4
[34] http://gov.wales/about/programme-for-government

integrated public transport network, developing a charging network for low-emission vehicles and our ambition to make the public sector carbon neutral by 2030.

Following Prosperity for All, we published an Economic Action Plan (EAP) with more detail about how we will grow the economy and reduce inequality.[35] We will develop our first Low Carbon Delivery Plan in line with Prosperity for All and the EAP. We will show how actions to meet our emissions reduction targets will benefit not just the environment, but also our economy, society and culture.

Our strategic planning framework

The way we use our planning levers can help drive coordinated and regional solutions. For instance, the way we set policy and provide guidance helps good land use planning through our planning system, the way we look after our natural resources and the way we guide decisions on the sustainable use of our seas through the forthcoming Marine Plan.

Land use planning

The planning system has an important role in facilitating decarbonisation. National planning policy is set out in Planning Policy Wales (PPW). A recent consultation on the revised PPW introduced the concept of placemaking and set the creation of sustainable places as the goal of the planning system.[36] The revised PPW also includes the following policy changes aimed at facilitating decarbonisation:

- Strengthening the policy objective of reducing travel by private vehicles and increasing walking, cycling and public transport use
- A new policy to encourage the use of Ultra Low Emission Vehicles
- The use of an energy hierarchy for planning, which sets out our preferred approach to energy planning, to guide energy-related choices in the planning system
- Identifying the extraction of coal and onshore oil and gas as the least preferred source of fuel for power generation
- Requiring local planning authorities to establish targets for renewable energy generation in their development plans and to identify spatial areas in their development plans, where renewable energy developments will be permitted

We are also preparing a National Development Framework (NDF). The NDF will be a development plan for the whole of the country. It will set out national planning policies for the next 20 years and express spatially our long-term economic, social and environmental objectives. The NDF will form part of the statutory plan for determining planning applications and will assist in the determination of Developments of National Significance.

We have consulted this year on the issues, options and preferred option for the NDF.[37] The preferred option states that the NDF will ensure the planning system in Wales plays a key role in facilitating clean growth and decarbonisation, and helps build resilience to the impacts of climate change. Achieving our strategic

[35] http://gov.wales/topics/businessandeconomy/welsh-economy/economic-action-plan
[36] Planning Policy Wales: Edition 10 Consultation
[37] https://beta.gov.wales/national-development-framework-issues-options-and-preferred-option

decarbonisation goals is highlighted as a key driver, which all development plans must support.

Sustainable management of natural resources

Our Natural Resources Policy sets out the national priorities, opportunities and challenges for managing Wales' natural resources sustainably.[38] Among the opportunities that are relevant to our low-carbon pathway are the ways in which managing our natural resources promote green growth and innovation, and support a more resource-efficient economy. We also recognise that climate change and the decline in biological diversity is a key challenge facing our natural resources.

We have developed three national priorities for managing our natural resources:

1. Delivering nature-based solutions, including the role that natural resources provides for carbon sequestration and storage
2. Increasing renewable energy and resource efficiency
3. Taking a place-based approach to deliver better results at the local level

The Natural Resources Policy will drive action across Welsh Government and also through Natural Resources Wales' area statements, which will deliver the policy in a local context.

Marine planning

We recently consulted on proposals for a Welsh National Marine Plan to guide the future use of our seas.[39] The 20-year vision we presented in the draft Plan acknowledges the contribution our seas will make to our emissions reduction targets through the responsible deployment of low-carbon technologies. Renewable energy (wind, wave and tidal stream and range) is identified as one of 5 marine sectors as having significant opportunity for sustainable growth and one of the Plan's objectives relates to maximising the sustainable development of these renewable energy resources. We intend to publish the final Plan in April 2019.

Supporting business to decarbonise

Whilst significant steps have already been taken by many businesses to reduce their emissions, it is crucial to create the right conditions for further decarbonisation to take hold in the economy.

Potential action to 2030
Collaborate with business to further decarbonise their activities, whilst at the same time improving their competitiveness and productivity to take advantage of the opportunities arising from the transition to a low-carbon economy

These opportunities include working on energy efficiency, innovative use of resources at all scales, smart energy development and management, energy storage, transportation, forestry and construction.

[38] https://gov.wales/topics/environmentcountryside/consmanagement/natural-resources-management/natural-resources-policy
[39] https://beta.gov.wales/draft-welsh-national-marine-plan

Current position

Many of our companies operate in both UK and international markets and are subject to considerable price sensitivity. A potential consequence of an uncompetitive business environment is that such industries will not remain in the UK, with their output substituted by imported products produced with higher carbon emissions.

Why we are considering this action

Ensuring an affordable low-carbon transition is paramount. We need to steer the growth of a resilient economy where we can continue to exploit our capabilities in new low-carbon technologies and markets, underpinned by a mature and competitive industrial base.

Our Economic Action Plan (EAP) sets out a vision for inclusive growth and future-proofed businesses and economy.[40] Supporting people, businesses and places in the transition to a low-carbon and resource-efficient future is at the heart of that vision and is a common theme throughout the EAP. In particular, our future relationship with business will be framed by an Economic Contract and this will enable us to work with those businesses that show a commitment to lowering their carbon footprint and encourage others to follow a similar path.

Our calls to action described in the EAP set out those key areas of activity that we will co-invest in with businesses to help future-proof those businesses and the wider economy. Decarbonisation is one call to action against which we invite individual businesses or groups of businesses to come forward with investment proposals. Moreover, innovation and Research and Development (R&D) feature within other calls to action and are highly relevant given that decarbonisation will be shaped by technological advances, driven by innovation and R&D.

Our EAP recognises the close integration between business and the economy in Wales and the wider UK. Significant policy levers are held at a UK level and UK Government policy can have a material impact on outcomes in Wales. This makes it important that we seek to influence the UK Government's agenda for the benefit of Wales. This includes continuing to press the case for Wales through the UK Industrial Strategy.

Skills

Those people and businesses that choose to meet the challenge and harness the opportunities associated with the transition to a low-carbon economy will find that different skill sets are needed. We need to equip everyone with the right skills for a changing world. We will enable people to develop the skills they need to get the jobs they want, thereby supporting businesses to start, innovate, and grow, and creating decent, secure employment within the low-carbon economy. We are committed to investing in the skills required for the low-carbon economy.[41]

The Regional Skills Partnerships (RSPs), Careers Wales and Business Wales all have specific contributions to make when it comes to promoting closer links between

[40] Prosperity for All: Economic Action Plan (2017)
[41] Taking Wales Forward: https://gov.wales/about/programme-for-government

schools, colleges, universities, employers, businesses and public services to better anticipate the skills needs through the transition. We need to capture employers' changing demands from the skills and education system and will work to bring together emerging intelligence and advice from employers to inform service delivery priorities.

Potential action to 2030

Work with Regional Skills Partnerships to anticipate future skills needs, focusing on priority growth sectors identified within regions

Potential action to 2030

Review all current skills and work-based learning programmes to explore whether they can respond more flexibly to emerging requirements such as those represented by decarbonisation, working closely with employers

Innovation

We need new technologies, approaches and solutions across all sectors to achieve our ambitious emissions reduction targets. This requires the public and private sectors, academia and the voluntary sector to collaborate in supporting the development of new innovative low-carbon products, processes and services.

Opportunities include:

- Buildings: new products and delivery models for low-carbon new-builds and retrofitting
- Industry: new technologies and processes, including Carbon Capture Use and Storage (CCUS)
- Power: new holistic solutions to reduce energy consumption at source, generate renewable energy and optimise its distribution
- Resource management: new processes to optimise the sustainable use of resources and assist our transition to a Circular Economy

Potential action to 2030

Conduct a gap analysis of options where innovation can support decarbonisation and maximise the opportunities

Current position

We encourage innovation by collaboration and promoting an innovation culture. We work extensively with other Welsh Government departments and key external stakeholders.

We provide wide-ranging support for innovation including direct financial assistance for Welsh businesses to develop new technology and services. We also assist academia to collaborate with industry. Our support helps attract additional public and private funding, maximising the impact of our intervention. Current innovation

programmes are largely EU-funded until 2023. Future funding is yet to be determined.

Why we are considering this action

To provide robust evidence to support the role of innovation in helping deliver decarbonisation. It is envisaged that the action would facilitate key demonstrator activities to address challenges and identify potential disrupters across sectors.

Enabling others to act

Meeting emissions reduction targets and our well-being goals will involve transformation across all sectors and levels of society. Some progress has been made in certain areas, such as domestic recycling, but there remain others which are more resistant to change, such increasing active travel.

Low-carbon behaviours have many co-benefits relating to individual health, public health and household income. The type of interventions required in different areas will vary. For example, the changes we may want people to adopt around buildings could be at the individual level, while changes in mobility could require fundamental alterations to infrastructure to enable people to change their behaviour.

The move to more flexible, integrated systems will bring some opportunity for change but it could largely depend upon securing 'buy in' from individuals. We therefore need to involve citizens in designing this transition. In addition, as we design policy we have to learn from any mistakes from the past and be mindful of unintended consequences. This includes dealing with equity and making decisions in line with the framework established under the Well-being and Future Generations Act.

Potential action to 2030

Collaborate with organisations across all levels of society and involve citizens in achieving our low-carbon pathway

Current position

Our 2010 Climate Change Strategy highlighted the role and importance of behavioural change and included an Engagement Strategy and action plan.[42]

Why we are considering this action

Since 2015 the Well-being and Future Generations Act requires public bodies listed in the Act to think more about the long-term, work better with people and communities and each other, look to prevent problems and take a more joined-up approach. To develop with key stakeholders an approach within the context of our well-being legislation that will:

- Involve people in the transition to a low-carbon society
- Identify and realise the multiple co-benefits that are available alongside action to reduce emissions

[42] https://gov.wales/topics/environmentcountryside/climatechange/emissions/climate-change-strategy-for-wales

Global responsibility

The Wales for Africa programme supports and encourages civil society, business and public bodies in Wales to take action on poverty in Africa through active global citizenship, skills exchanges and mutual learning, partnership working and climate change action in support of the UN Sustainable Development Goals.

A major part of the programme is our support for the Mbale Trees Project in Eastern Uganda, in association with the Size of Wales.[43] This is a long-term partnership with local authorities, community-based organisations and a Fairtrade coffee co-operative to promote agroforestry on Mount Elgon, a previously heavily-forested region near the equator. The project promotes sustainable livelihoods, climate change adaptation and climate change mitigation to subsistence farmers.

Potential action to 2030

Provide fruit, shade and fuel trees for the entire Mount Elgon region, Uganda by 2030

[43] https://sizeofwales.org.uk/

Transitioning to a decarbonised energy system

The rapid decarbonisation of energy presents both enormous challenges and opportunities. In recent history provision of power, heating and transport fuel has been largely separate and centralised. This system is now undergoing significant change, with energy generation and delivery becoming more distributed in the communities where the energy is used.

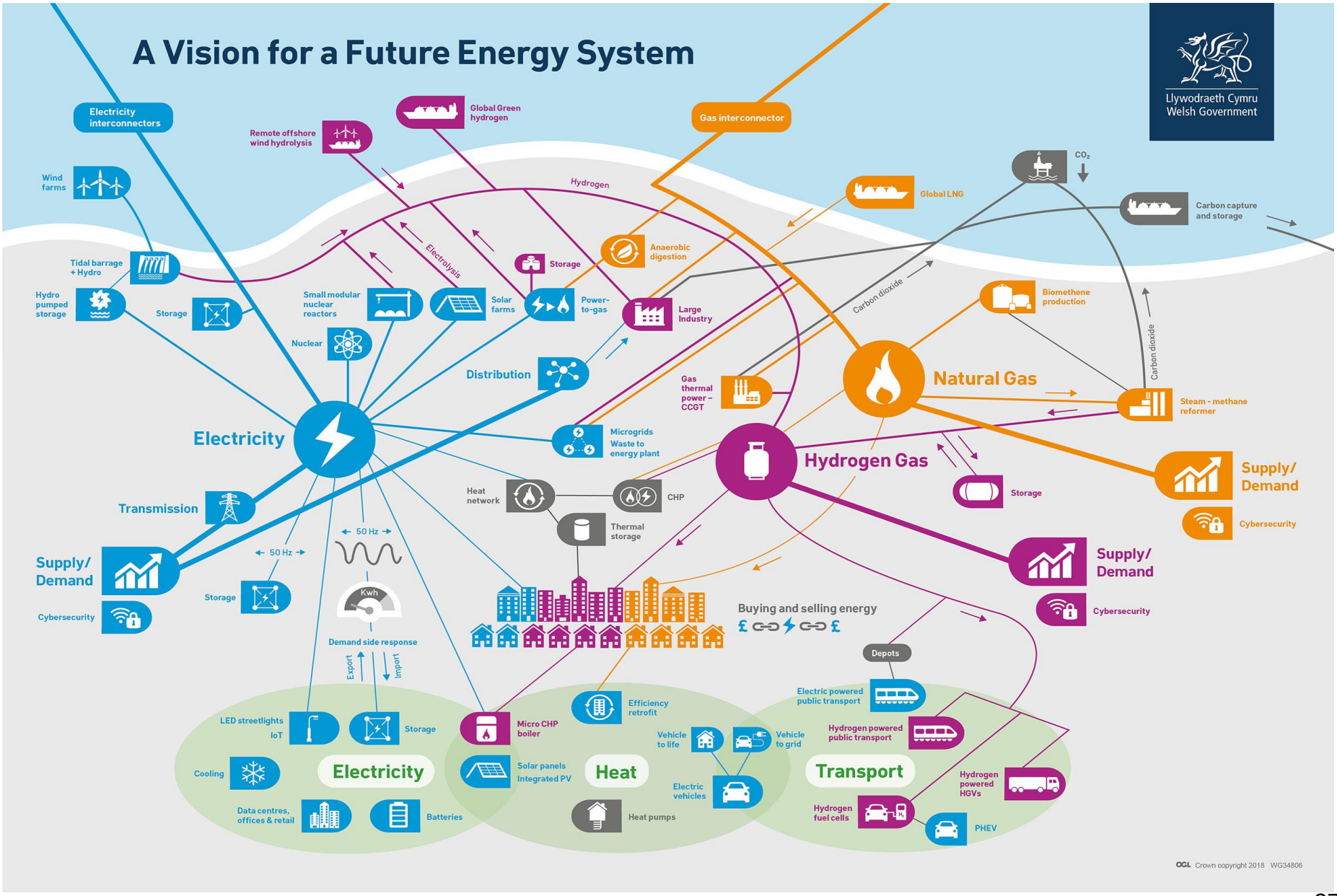
The boundaries between the systems are also becoming blurred, with energy being converted into different forms to address a range of needs. This approach is often termed a multi-vector system and will be required to fully exploit the inter-relationships and synergies between the power, heat and transport sectors. A vision of an energy system in 2030 gives an insight into how integrated power, buildings and transport systems could meet our needs. For instance, electric vehicle batteries may transfer electricity from workplace solar charging to homes to supply them during the evening peak demand. Heating may be from hybrid heat pump and boiler systems that decide whether electricity or gas is the fuel that will place least demand on the system at that time. We are likely to see low-carbon gas in the form of biomethane or hydrogen playing a greater role. We may also increasingly see electricity generated from renewable source being stored when demand is low by conversion to gas. The gas may then be converted back to electricity through combustion or used as a heating or transport fuel.

A multi-vector system could deliver the low-carbon energy transition at low cost to citizens, preserving security of supplies, even at peak demand. This affordable, high security, low-carbon energy transition offers an attractive low-carbon investment at both a large central and smaller local scale. New smart use of energy and storage will be driven by the powerful global digital revolution and be much more locally determined. Distribution and transmission networks will provide the grid balancing and security of supply.

We will also see greater energy efficiency in buildings and appliances, and the use of new building fabrics turning buildings into power stations.

These changes will also have significant regulatory implications. People value the warmth, light or power that electricity and gas provide. People currently pay electricity and gas bills but this may change, and models are already emerging where people can buy services providing warmth, lighting and power rather than units of electricity and gas. Service providers will compete for customers by delivering services most efficiently, perhaps by offering to improve appliances and home insulation, or supplying local generation or storage.

This is a very different model from the current separate and centralised system of recent history and may create even greater system complexities, especially in our electricity markets. This consultation sets out potential actions in relation to power, buildings and transport but also recognises and responds to the changes underway in our energy system as a whole.


A Vision for a Future Energy System
Llywodraeth Cymru
Welsh Government
Electricity interconnectors
Global Green hydrogen
Remote offshore wind hydrolysis
Gas interconnector
Wind farms
Hydrogen
Global LNG
CO_2
Carbon capture and storage
Tidal barrage + Hydro
Electrolysis
Storage
Anaerobic digestion
Hydro pumped storage
Storage
Small modular nuclear reactors
Solar farms
Power-to-gas
Large Industry
Carbon dioxide
Biomethene production
Nuclear
Distribution
Natural Gas
Carbon dioxide
Gas thermal power – CCGT
Steam - methane reformer
Electricity
Microgrids
Waste to energy plant
Hydrogen Gas
Supply/ Demand
Cybersecurity
Heat network
CHP
Storage
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Thermal storage
50 Hz
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Storage
Kwh
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Demand side response
Export
Import
Depots
Efficiency retrofit
Electric powered public transport
LED streetlights
IoT
Storage
Micro CHP boiler
Vehicle to life
Vehicle to grid
Hydrogen powered public transport
Cooling
Electricity
Solar panels
Integrated PV
Heat
Electric vehicles
Transport
Hydrogen powered HGVs
Data centres, offices & retail
Batteries
Heat pumps
Hydrogen fuel cells
PHEV
OGL Crown copyright 2018 WG34806

Work underway

- Our Smart Living demonstrators are providing insights into how this new energy system will function in practice[44]
- We have published a report on the role of local electricity supply companies[45]
- Work is underway in Bridgend to understand potential pathways to decarbonise heat, with the support of the Energy Systems Catapult
- District Network Operators are developing their understanding of the increasing pressure on their electricity and gas networks
- Cardiff University, working with the Institute of Welsh Affairs, has published half hourly demand data for domestic and commercial buildings[46]
- There has also been a study exploring the potential for decarbonising the energy system in the Swansea Bay City Region area. There are other similar projects, including development of a zero carbon area in Pembrokeshire.

Potential actions to 2030

Support the development of regional and local energy planning to address the supply, distribution, and use of energy

Whilst the national planning framework is well developed, we recognise the need for more local or regional energy planning in order to inform, guide and drive action to meet the 2030 target and beyond. Detailed energy planning and modelling developed and owned at the local or regional level could also ensure that specific opportunities and constraints are considered within the context of an evolving energy system. At the national level, such local plans could provide the basis for national infrastructure planning, as well as developing coherence between regional plans.

Local authorities have a significant role to play in this agenda and some have interesting work already under way, such as the Local Area Energy Strategy being developed by Bridgend County Borough Council with the Energy Systems Catapult using the EnergyPath Network tool. However, it can be difficult for public bodies to address these challenges alone.

We have a role to play in supporting the development of these plans. We believe there are transformative opportunities in developing local or regional energy plans, driven by network and/or national regional energy data, which will help decision-making and enable us to meet our decarbonisation objectives.

Support innovation and commercialisation of new products, processes and services in the energy system

In recent years Wales has developed disruptive technology and capacity in smart energy. This includes the concept of buildings as power stations, capacity building in

[44] https://gov.wales/topics/businessandeconomy/creating-a-sustainable-economy/smart-living
[45] http://gov.wales/topics/environmentcountryside/energy/publications/an-energy-company-for-wales
[46] http://www.iwa.wales/wp-content/uploads/2018/04/FINAL-Half-Hourly-Energy-Demand-Profiles-for-Wales-for-2016.pdf

smart systems and heat, introducing medium voltage direct current test beds and defining and creating a zero carbon area. As part of this work, we have the potential to host strategic innovation demonstrators which will showcase examples of innovative housing designs, small modular (nuclear) reactors, heat and ultra-low emission transport in the short to long-term timescales. All this activity needs a high degree of innovation in order to work effectively in ways which will meet people's expectations of reliability and affordability. We have provided significant funding to support innovation within the energy system.EU funding from Horizon 2020, INTERREG and other Research and Development sources has also supported innovation in this field.

Wales will proactively exploit and scale its energy innovation credentials through deployment of the foundational work in the numerous demonstrator areas to create the right environment for innovative actions to take place. This will allow us to promote Wales as a place where we encourage businesses to participate in scaled, accredited demonstrators where they can pilot and test their innovation across the core strands (buildings, power and transport) to develop commercial marketable outcomes.

To compete for funding and develop supportive innovation funding models, we will explore with academic and commercial partners how to build on FLEXIS (Flexible Integrated Energy Systems) [47]and SPECIFIC (the Sustainable Product Engineering Centre for Innovative Functional Industrial Coatings)[48] and other funding sources.

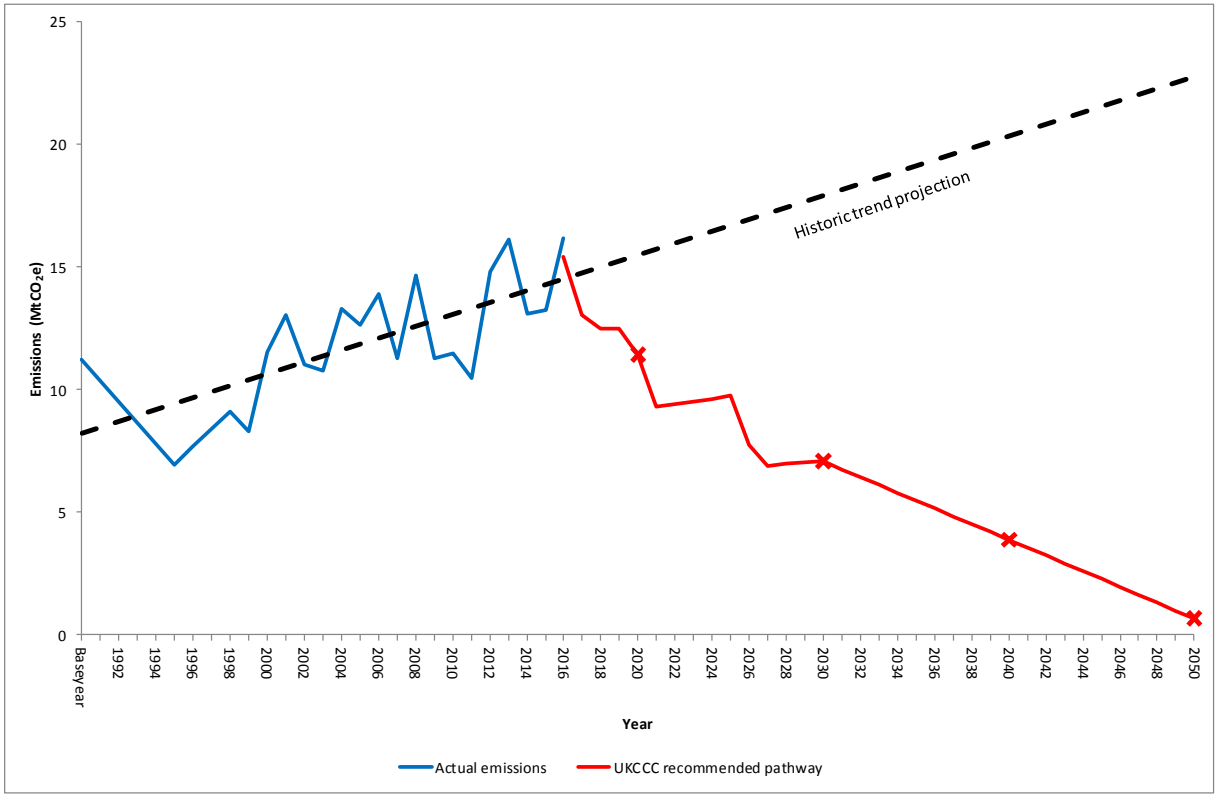
[47] http://www.flexis.wales/
[48] http://www.specific.eu.com/

Power

What changes in power might we need to see by 2030?

The power sector covers a large share of Welsh emissions and is comprised of emissions from the production of energy in power stations, along with minor contributions from electrical generators located in Welsh businesses.

Graph and table: UKCCC modelling to show a possible route for power sector emissions reduction as a contribution to an 80% reduction in all Welsh emissions in 2050[49]



Change to date (1990-2016)	+44%
Modelled 2020 reduction	+2%
Modelled 2030 reduction	-37%
Modelled 2040 reduction	-65%
Modelled 2050 reduction	-94%

[49] Against the 1990 baseline. The UKCCC has illustrated how, in their view, the recommended interim targets could be achieved. We have not accepted the sector targets or policy measures. The advice is not intended to be policy prescriptive and illustrates just one possible route by which the targets could be achieved. However, it is recognised that there is limited flexibility in the options available given the high ambition set by the Environment (Wales) Act. Historic data from Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2016 and future projections from Building a low-carbon economy in Wales: Setting Welsh carbon targets (UKCCC, 2017).

In 2016 power sector emissions increased by 22% compared to 2015, driven by a 22% increase in emissions from power stations, in particular from natural gas combustion. The UKCCC scenario requires this upward trend to be reversed by 2017 and by 2020 power sector emissions to have reduced to a level close to that in the 1990 base year. This is driven by a reduction in the share of coal used in fossil fuel generation. Although decreasing in favour of gas, the scenario assumes that there are continued significant levels of emissions from unabated coal generation up to 2020.

Between 2020 and 2030 substantial reductions in power sector emissions drive the reduction trend in overall emissions for Wales, with the power sector reducing significantly to 37% below 1990 levels in 2030 and achieving a carbon intensity of 138gCO_2/kWh for electricity generation. This reduction is achieved by the limited operation of unabated coal power stations for the period 2020 to 2025[50]. Beyond 2025, unabated coal generation has ceased in line with current UK Government policy and there is no equivalent fossil fuel replacement at these sites.

Between 2030 and 2050 the power sector continues to reduce its emissions but at a slightly slower rate. Post-2030 either gas power plants have Carbon Capture and Usage or Storage (CCUS) and run at full capacity, or more probably they are unabated because of the difficulties of Carbon Capture and Storage (CCS) and run at restricted load, providing backup for renewable power. At the same time, increasing electrification of transport and heating is likely to increase electricity demand, in spite of increasingly efficient end use.

UKCCC recommendations

- Continue to work with the UK Government to find ways to deploy onshore wind in areas where the local population supports it.
- Encourage low-carbon electricity through use of public procurement and planning powers.

Where are we now?

At 16.2 MtCO_2e, power generation accounted for 34% of Welsh emissions in 2016 making it the single largest sector. In 2016 99.9% of sector emissions were from power stations.

Despite improvements in the efficiency of energy generation and the use of natural gas to replace some coal and other fuels, total emissions from the power sector have grown by 44% between the base year and 2016. Practically all power emissions (99.6%) are emissions of carbon dioxide.

[50] 1,500 hours per year, required under the Limited Hours Derogation to the Industrial Emissions Directive (IED).

Graph: Power sector emissions in 2016 ($MtCO_2e$)[51]

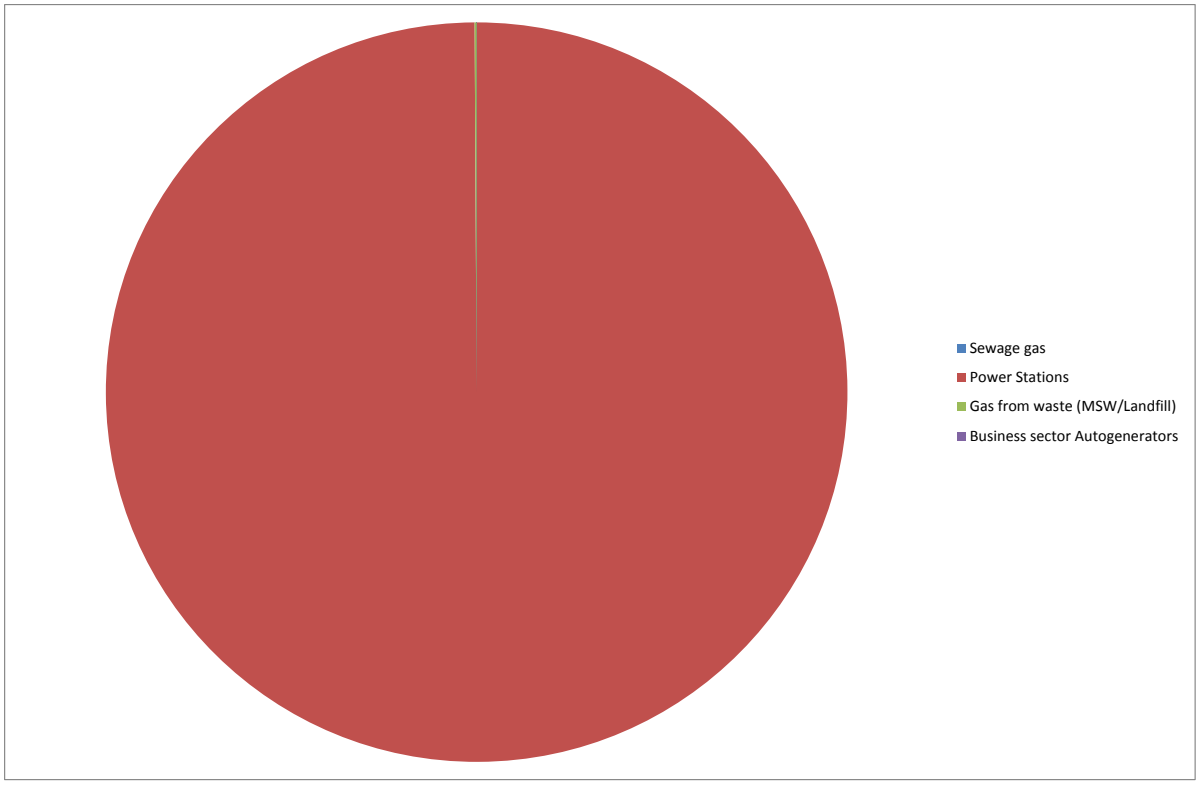


Table: How the biggest emissions sources in the power sector contribute to the Welsh total

Source	% of total Welsh emissions
Power stations	34

Opportunities and challenges

Business growth

In the low-carbon economy, Wales saw the largest proportional increase in turnover of any UK country between 2015 and 2016.[52] This was driven in large part by increases within the low-carbon electricity sector.[53] In 2016 Wales saw an increase in estimates of onshore wind turnover, to £0.3 billion. Most of this growth was within the manufacturing and construction industries.

With the expected transition to a more decentralised energy system, Wales could benefit from increased Welsh ownership of generation and greater opportunities for local supply. This includes employment in the advice, development, construction, installation and maintenance of generation and storage equipment, and the retention

[51] The emissions data is sourced from the Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2016 and aligned to the UKCCC sectors as described in Annex 3.
[52] UK Environmental Accounts: Low Carbon and Renewable Energy Economy Survey: 2016 final estimates: https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/finalestimates/2016
[53] Includes activities related to the production of electricity from nuclear, wind, solar, hydro and other renewable sources such as tidal or geothermal.

of money locally where self supply reduces the money exiting Wales from electricity and gas bills.

Large point-sources

The high proportion of emissions from large point-sources in the power sector means that performance against our targets is more volatile. Any change in output at a single site such as our major fossil fuel power stations will be visible in our national emissions inventory.

Nuclear

A new nuclear power station on Anglesey would be an enormous capital investment and we are working with partners to capture the maximum possible benefit for Wales from its construction and ongoing operation. Small Modular Reactors (SMRs) may provide potential benefit building on the existing technical capacity at existing Welsh nuclear sites. These are very much dependent on UK Government funding decisions.

Smart innovation

Innovative solutions are needed to deliver the low-carbon energy transition. This requires collaboration between public and private sectors and academia to develop new products, processes and services to address local needs. This could be new technology that enables us to better manage our energy use at home, or new models for mobility as a service that increases the uptake of ultra-low-carbon emissions for public transport. Equally it could be smart integration of different technologies and the way we use energy to deliver solutions.

Grid capacity

The changing transport, power and heating systems are changing the role of the existing electricity and gas grids. In response to the UKCCC's Call for Evidence, the Institute for Welsh Affairs reported: "*Capacity issues are acting as a barrier to increased local renewable energy supply and because of this many renewable energy projects have not been connected to the electricity system. This threatens the country's prospects for a low-carbon future.*"[54]

Greater uptake of low emission vehicles will also require a network of charging points of different types. Managing this transition and ensuring continuity of supply, possibly of a range of fuels, could either be a significant challenge, or an opportunity to solve other challenges. The demand for and availability of low emission vehicles will drive these challenges but cost effective and equitable rollout of these new technologies may need more localised solutions.

[54] https://www.theccc.org.uk/wp-content/uploads/2018/01/Institute-of-Welsh-Affairs-CfE-Welsh-Carbon-Budgets.pdf

Potential actions to 2030

The ideas for action around power focus on the transition from fossil fuels and increasing renewable energy production.

Develop and implement Wales' policy position around the extraction and combustion of fossil fuels in power generation

Current position

In 2016, 18% of Welsh power generation was from renewables, 17% was from coal and 65% was from gas.[55]

A number of large fossil fuel installations dominate the power sector. Aberthaw coal-fired power station represented 37% of Welsh power emissions and 12% of total Welsh emissions in 2016[56]. Pembroke gas-fired power station represented 30% of Welsh power emissions in 2016[57] .

We need to take action to consider the levers and opportunities to reduce emissions from fossil plants, whilst also considering their role in our economic prosperity.

Why we are considering this action

To inform future actions and decisions, particularly in relation to the consent of energy generating developments, in order to reduce emissions from power generation. This may, for instance, involve the introduction of a moratorium on gas-fired power stations.

This will also involve developing and implementing policies on the extraction of fossil fuels in light of new Power under the Wales Act (2017).

Accelerate the deployment of renewable generation whilst encouraging local ownership

Current position

We have set stretching though achievable renewable electricity targets:

- Generating 70% of Wales' electricity consumption from renewables by 2030
- 1 GW of renewable electricity capacity in Wales to be locally owned by 2030
- Renewable energy projects to have at least an element of local ownership by 2020

We estimate the current of deployment of renewable electricity generation delivered sufficient energy to deliver 43% of Wales' electricity consumption in 2016. The "*Energy Generation in Wales*" survey shows there was 2,854 GW of renewable electricity capacity installed and estimates that this generated 6.9TWh in 2016.By the

[55] Energy Generation in Wales 2016
[56] EU-Emissions trading System (EU-ETS) data: http://ec.europa.eu/environment/ets/oha.do?languageCode=en
[57] EU-Emissions trading System (EU-ETS) data: http://ec.europa.eu/environment/ets/oha.do?languageCode=en

end of 2016 there was 397 MW of locally owned renewable electricity capacity and 177 MW of locally owned renewable heat capacity.[58]

Why we are considering this action

To ensure a sufficient supply of electricity as we reduce our dependence on fossil fuels generation and also to increase supply in anticipation of increased demands as we decarbonise heat and transport. This also provides the opportunity to maximise the benefits for Wales. We aim to do this by:

- Identifying and mapping opportunities for the deployment of renewable technologies both onshore and offshore at a strategic level
- Identify potential future energy demands and options for generation locally through local and regional planning
- Reflecting strategic and locally identified opportunities though planning at a strategic level, through the National Development Framework
- Working with infrastructure operators to ensure that the energy infrastructure supports our ambitions, including the increased use of flexibility and storage

This is intended to deliver net benefit to Wales through maximising shared/local ownership, building the supply chain, and delivering economic and social benefits. Our work will create the conditions for delivery of a smarter energy system.

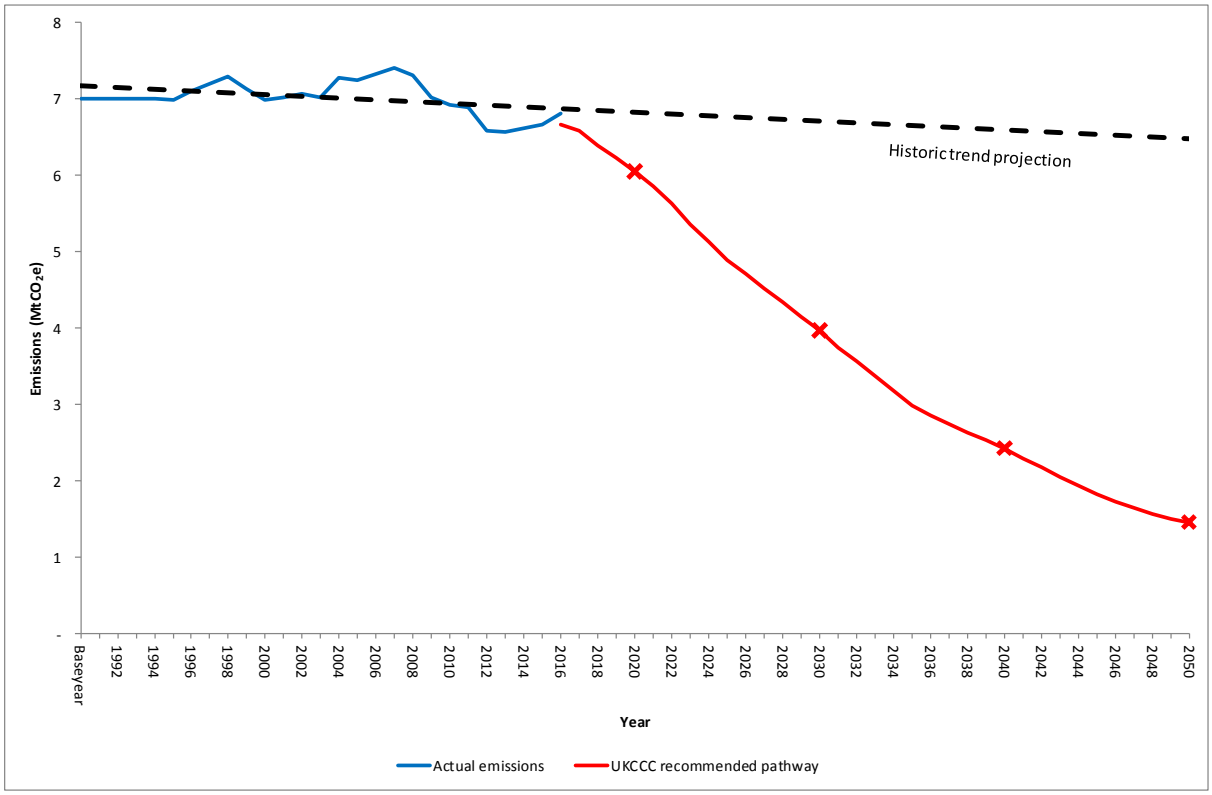
[58] https://gov.wales/topics/environmentcountryside/energy/renewable/energy-generation-in-wales

Transport

What changes in transport might we need to see by 2030?

The transport sector covers emissions from the way we move goods and people around within Wales. It also includes emissions associated with Wales' share of international aviation and international shipping. A large proportion of transport emissions are from road transport.

Graph and table: UKCCC modelling to show a possible route for transport sector emissions reduction as a contribution to an 80% reduction in all Welsh emissions in 2050[59]



Reduction to date (1990-2016)	-3%
Modelled 2020 reduction	-14%
Modelled 2030 reduction	-43%
Modelled 2040 reduction	-65%
Modelled 2050 reduction	-79%

[59] Against the 1990 baseline. The UKCCC has illustrated how, in their view, their recommended interim targets could be achieved. We have not accepted the sector targets or policy measures. The advice is not intended to be policy prescriptive and illustrates just one possible route by which the targets could be achieved. However, it is recognised that action to reduce Transport emissions must reflect the high ambition set by the Environment (Wales) Act. Historic data from Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2016 and future projections from Building a low-carbon economy in Wales: Setting Welsh carbon targets (UKCCC, 2017).

The scenario includes a significant and immediate reduction in transport emissions to 2020. This reduction increases further between 2020 and 2030 to achieve levels 43% below 1990 levels in 2030.

The modelling proposes one way that these changes could be achieved:

- New vehicle efficiency improves by 38% for new cars and 33% for new vans from 2010 to 2030
- Biofuels contribute around 11% of liquid fuel energy by 2030
- Hydrogen fuel cell buses make up 25% of new bus sales
- Electric vehicles make up 65% of new car and van sales by 2030 (35-40% Battery Electric Vehicles)
- Behavioural changes in passenger transport and freight

The modelling also suggests that cost parity between EVs and conventional vehicles could be reached by 2028 when looking at total cost of ownership to the private consumer over a five year period.[60]

The scenario proposes that international aviation and shipping emissions achieve a reduction of 8% below the 1990 baseline in 2020. Post-2020, the sector delivers greater rates of emissions reduction reaching a 36% reduction by 2050, driven largely by international action in the sector.

Other research commissioned found that nearly 29,000 public charging points are needed across Great Britain by 2030 to meet future EV charging needs.[61] Around 85% of these need to be fast or rapid chargers. Taking 5% of the GB figure as illustrative, this could mean around 1,500 charging points in Wales over the next 12 years.

UKCCC recommendations

- Increase uptake of public transport and especially active travel.
- Strengthen the electric vehicle charging network and tackle other non-financial barriers (e.g. through parking, use of priority lanes, raising awareness and public procurement). This needs to occur across all of Wales, not just the main transport corridors across the north and south.

The UKCCC does not make any specific policy recommendations for Wales to take action on international aviation and shipping sector but to support international progress. This in part reflects the view that unilateral action is challenging and that global agreements are likely to provide the most effective route to tackling these emissions.

[60] Technical Annex to Building a low-carbon economy in Wales (UKCCC, 2017), p.17

[61] Plugging the Gap: An Assessment of Future Demand for Britain's Electric Vehicle Public Charging Network (UKCCC 2018). The research analyses the supply and demand for two categories of public EV charging: long-distance en route charging on the strategic road network and parking-based charging at the destination of trips, often around local towns. The research acknowledges uncertainties around this estimate as the analysis relies on some key simplifying assumptions.

Where are we now?

At 6.8 $MtCO_2e$, transport accounted for 14% of Welsh emissions in 2016.While this proportion is significantly less than the UK average (33%), transport is our third largest carbon emitting sector, following the power and industry sectors.

Although vehicles are increasingly efficient, we are also travelling more so this figure has barely moved since the 1990 baseline of 7.0 $MtCO_2e$, declining by 3% to 2016. Practically all transport emissions (99%) are emissions of carbon dioxide.

Graph: Transport sector emissions in 2016 ($MtCO_2e$)[62]

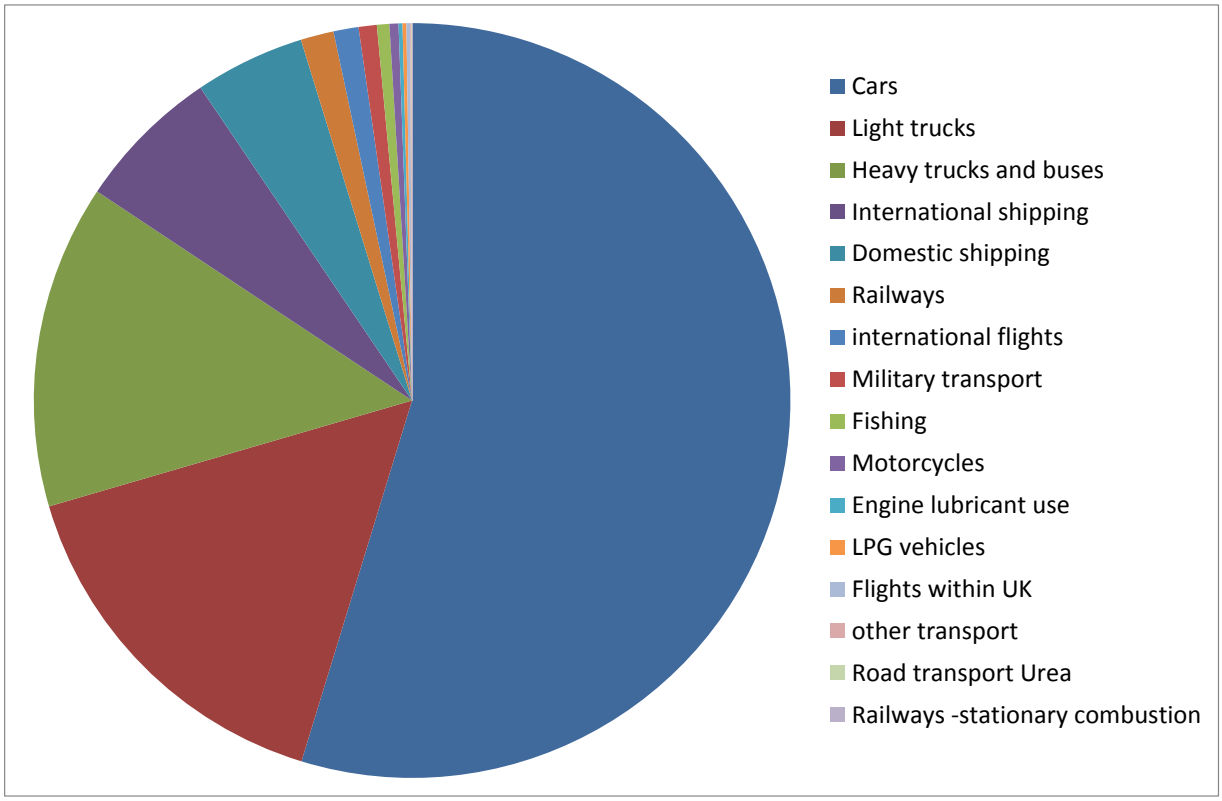


Table: How the biggest emissions sources in the transport sector contribute to the Welsh total

Source	% of total Welsh emissions
Cars	7.7%
Light trucks	2.2%
Heavy trucks and buses	2.0%

[62] The emissions data is sourced from the Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2016 and aligned to the UKCCC sectors as described in Annex 3.

Opportunities and challenges

Air quality and improved health

The transport sector can help to drive local health benefits through the increasing active travel and reducing car use, which not only improves people's personal health improve local air quality and reduce emissions.

Ultra Low Emission Vehicles

In contrast to some sectors, a broad vision is emerging for how transport might decarbonise significantly in the next decade. This vision is based largely around the transition to ultra-low emission vehicles (ULEVs), particularly electric. We can expect relatively low electric vehicle sales to continue to 2025 but then a significant uptake between 2025 and 2030 as the price of electric vehicles becomes competitive without subsidy.[63] The UKCCC believes that potential for switching to electric vehicles is broadly similar in Wales as in the rest of Great Britain. There are an estimated 2,500 plug-in vehicles in Wales, which comprise around 0.2% of total registrations (against 1.8% for the UK as a whole). 2017 saw a 35% increase in registrations of new plug-in vehicles in Wales, from 565 in 2016 to 760 in 2017.

In 2030, the UK's potential share of the global market for low-emission vehicle products and services is between £46 billion and £95 billion per year, rising to between £120 billion and £240 billion by 2050.[64] Wales is well-placed to capitalise on this opportunity. Around a third of all engines produced in the UK are made in Wales,[65] reflecting the world-class skills and experience in our long-established automotive industry. It currently features around 150 companies, employing 18,000 people and generating £3 billion each year.[66]

Vehicle efficiency

Cars in Wales are, on average, older than those in the UK as a whole.[67] This means that we drive less efficient vehicles for longer and it will take longer for industry improvements in the efficiency of conventional vehicles to affect our emissions.

Trip length

The average car trip length in Wales is slightly longer than the Great Britain average.[68] It is easier to replace shorter car journeys with walking or cycling. As we make fewer shorter car trips than the rest of Great Britain, we have slightly less potential for cutting emissions by reducing demand for car travel.

https://www.theccc.org.uk/wp-content/uploads/2017/12/CCC-Building-a-low-carbon-economy-in-Wales-Setting-Welsh-climate-targets.pdf

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[63] Electric Vehicle Outlook 2017, Bloomberg New Energy Finance. The UKCCC also suggests that cost parity between EVs and conventional vehicles could be reached by 2028 when looking at total cost of ownership to the private consumer over a five year period. This assumes other perceived and real barriers to uptake are reduced.

[64] UK business opportunities of moving to a low-carbon economy (Ricardo for UKCCC, 2017), p.30

[65] https://tradeandinvest.wales/wales-and-automotive-sector-0

[66] https://tradeandinvest.wales/advanced-materials-manufacturing/automotive

[67] Building a low carbon economy in Wales: Setting Welsh climate targets (UKCCC, 2016), p.32

[68] Building a low carbon economy in Wales: Setting Welsh climate targets (UKCCC, 2016), p.32

Devolved powers

Although we don't have powers in relation to vehicle or fuel standards, we can encourage the uptake of ULEVs, infrastructure, public transport and active travel.

Geography and demography

Switching from private cars to public transport, cycling or walking is difficult in much of rural Wales where the viability of rail and bus services is challenging and the geography can act as a deterrent to active travel. Compared to the UK as a whole, Wales has a higher number of people aged 65 and over.[69] This affects our potential to reduce emissions by replacing car journeys with active travel because these people are less likely to cycle and walk than younger age groups.[70]

Electricity grid

At the moment, large parts of Wales lack the supporting infrastructure that is likely to be required for a major roll-out of electric vehicle charging points. This means more preparatory work needs to be done if a fair and equitable charging network is to be created across Wales.

International shipping

The UKCCC has advised us to pursue international policy action to reduce emissions from international shipping because unilateral action may lead to Welsh emissions simply moving to other countries. Although our influence over international policy is limited, we can continue to work with the UK Government to represent our interests at the International Maritime Organisation.

Potential actions to 2030

The ideas for transport focus on increasing active travel, developing clean public transport solutions and enabling the uptake of ULEVs.

Develop a charging network that encourages early take-up of electric vehicles (EVs) and explore the merits of other measures, including access to bus lanes and free municipal parking

Current position

Wales has around 500 publicly available charging sites, approximately 3% of the UK total. Evidence suggests most EVs will be charged at home. However home charging is not usually an option currently unless there is off-road parking within the curtilage of the property. Workplace charging can also be convenient particularly for those employees with a longer commute or for visitors during the day, while for businesses with an EV fleet it can be an essential operating factor.

Evidence also suggests that until battery range improves, range anxiety for longer journeys will continue to be a factor in dampening take-up even where home and/or workplace charging is available.

[69] 20.4% in Wales versus 18% across the UK as a whole. National level population estimates by year, age and UK country (Mid-year 2016)

[70] Walking and cycling in Wales: Active travel 2016-17, p. 4-5

Why we are considering this action

To support early adopters of EVs and ensure that Wales is ready for the large-scale transition to EVs resulting from the UK Government's decision to end new registrations of new petrol and diesel cars and vans from 2040.

We will ensure that any measure that we take to achieve our decarbonisation goals by encouraging the uptake of ULEVs during the transition from combustion engines recognises the relationships between timing trajectories elsewhere in the UK and beyond, so as to maximise opportunities for the sector in Wales.

Reduce the carbon footprint of taxis and buses to zero within 10 years to achieve the aim in the Economic Action Plan

Current position

The public bus fleet comprises 2,132 vehicles, which covered 100 million service kilometres in 2016/17. As at October 2015, 15% of the fleet met the latest Euro 6 emissions standard. This provides an opportunity to upgrade the current fleet with a consequential reduction in direct emissions by the industry.

Bus services are de-regulated, which means that operators are currently responsible for fleet procurement and capability. Whilst operators are considering the use of alternative forms of propulsion, including electric, hybrid and hydrogen, the significant cost implications, together with the infrastructure and operational constraints have hindered their deployment in Wales to date.

We are considering providing financial incentives to meet the marginal cost of upgrading the public bus fleet to a minimum of Euro 6, including:

- Retro-fit affected buses to Euro 6 standard
- Scrappage scheme to replace high emission vehicles with new Euro 6 vehicles
- Deploy alternative technology propulsion vehicles (such as electric or hydrogen), including their associated infrastructure

There are currently around 9000 vehicles licensed as taxis. The majority are saloon cars purchased from discount car retailers with low mileage. We are considering specifying the vehicle characteristics to be met and achieved by taxis through our proposed national taxi standards.

Double the percentage of adults making cycling journeys at least once a week and increase the percentage of people making walking journeys at least once a week by 25% from the 2016 baseline

Current position

2016 data shows that:

- 5% of adults cycled at least once a week for active travel
- 61% of adults walked at least once a week for active travel
- 44% of children walked or cycled to primary school

- 34% of children walked or cycled to secondary school

Our Active Travel Action Plan contains an ambition for 10% of adults to cycle and 80% of adults to walk for active travel at least once a week. Under the Active Travel Act, every 3 years local authorities have to produce Integrated Network Maps of new and improved routes and related facilities. The first maps were produced in November 2017. We accepted 18 of them in February 2018 and the remaining 4 will be re-submitted in August 2018.

In 2017-18, we awarded £19m to local authorities for active travel schemes and are carrying out a review of active travel funding and future demand. £20m has been awarded to local authorities in 2018-19 to deliver active travel schemes with a further £20m announced for 2019-20 and £30m in 2020-21.

Why we are considering this action

To ensure local authorities have the financial resources to deliver infrastructure commitments in the Active Travel Act and encourage behaviour change.

Explore the relationship between speed limits and greenhouse gas emissions, with a view to considering environmental factors in speed limit reviews

Current position

We are the highway authority for the trunk road network and regularly conduct a review of speed limits on the network.[71] We currently consider the nature of the road, safety of the road and use of the road by the community, in line with guidance.[72]

Why we are considering this action

To understand the impact of changing speed limits on greenhouse gas emissions. To explore the evidence behind the UKCCC's finding that reducing and enforcing the national speed limit on motorways and dual carriageways to 60mph could save 7% of fuel.[73]

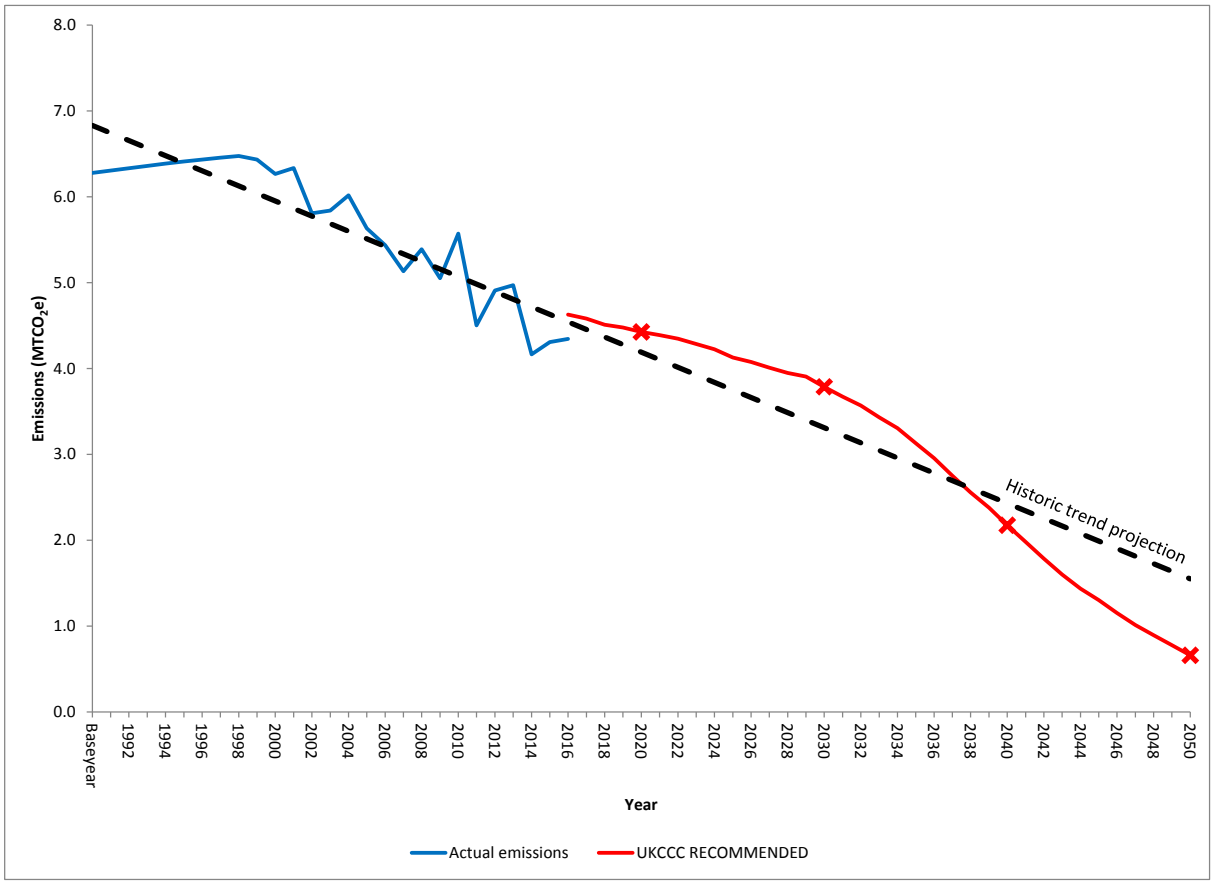
[71] Results of the latest review are available on Traffic Wales.
[72] Setting local speed limits in Wales
[73] Technical Annex to Building a low-carbon economy in Wales (UKCCC, 2017), p.18

Buildings

What changes in buildings might we need to see by 2030?

The buildings sector covers emissions from heating, lighting and cooking in our homes, businesses and public sector buildings.

Graph and table: UKCCC modelling to show a possible route for buildings sector emissions reduction as a contribution to an 80% reduction in all Welsh emissions in 2050[74]



Reduction to date (1990-2016)	-31%
Modelled 2020 reduction	-30%
Modelled 2030 reduction	-40%
Modelled 2040 reduction	-65%
Modelled 2050 reduction	-90%

[74] Against the 1990 baseline. The UKCCC has illustrated how, in their view, the recommended interim targets could be achieved. We have not accepted the sector targets or policy measures. The advice is not intended to be policy prescriptive and illustrates just one possible route by which the targets could be achieved. However, it is recognised that there is limited flexibility in the options available given the high ambition set by the Environment (Wales) Act. Historic data from Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2016 and future projections from Building a low-carbon economy in Wales: Setting Welsh carbon targets (UKCCC, 2017)

From 2020 the modelled scenario requires a steady reduction in building sector emissions up to 2030, with a further 9% reduction against 1990 levels achieved over this time period. The UKCCC suggests that this reduction can be achieved by energy efficiency measures (fabric efficiency, heating controls and behavioural measures) and the progressive introduction of low-carbon heat (mainly heat pumps and heat networks). Between 2030 and 2050 significant improvements to the building stock are required to achieve overall reductions of 90% compared to 1990 levels. Whilst the measures to achieve this dramatic reduction are likely to be largely similar, their roll out will need to be greatly increased.

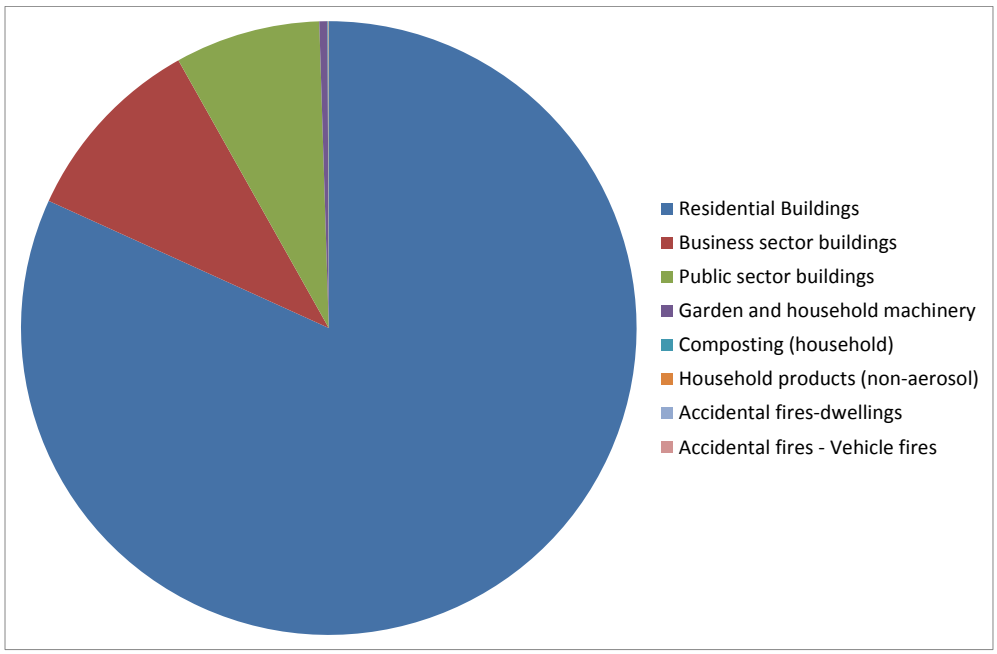
UKCCC recommendations

- Standards for new-build properties should demand a high standard of energy efficiency and accommodate low-carbon heating systems. This will avoid costly retrofit in future and ensure household energy bills are no higher than needed.
- Develop a strategy for heat decarbonisation, including public engagement.
- Provide 'soft' support for building energy efficiency and low-carbon heat, for example by joining up and supporting the chain of decision-makers, and providing a list of local, trusted installers and 'one-stop shop' communication.
- Bring industry and other stakeholders together to find mutually beneficial solutions to using waste heat in industry.

Where are we now?

At 4.4 $MtCO_2e$, buildings accounted for 9% of Welsh emissions in 2016. The dominant source of emissions is from residential buildings, which make up 82% of the sector emissions and 7.5% of total Welsh emissions.

Graph: Buildings sector emissions in 2016 ($MtCO_2e$)[75]



[75] The emissions data is sourced from the Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2016 and aligned to the UKCCC sectors as described in Annex 3.

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

Source	% of total Welsh emissions
Residential buildings	7.5%
Business sector buildings	0.9%
Public sector buildings	0.7%

Opportunities and challenges

Housing stock

Wales has 1.4 million homes across a wide range of housing types, including a significant proportion of older buildings. New construction offers opportunities to incorporate new energy systems; and to implement much higher standards of energy efficiency. Therefore, despite national Building Regulations being introduced in 1965, with local standards in existence since the 1930s, we have some of the oldest and least thermally-efficient building stock in Europe.

Wales has a slightly higher proportion of solid-wall homes than the UK average, which means more of our housing stock is more expensive to insulate. Around 1 in 5 of our homes is not connected to the gas grid, higher than the UK as a whole.[76] This means more Welsh homes will require individual low-carbon heating solutions, which may cost more per household than any large-scale decarbonisation of the gas grid.

Improving health outcomes

Improving the energy efficiency of homes can deliver positive health benefits. Living in a cold home has a significant impact on health: excess winter deaths are almost three times higher in the coldest quarter of housing than in the warmest quarter.[77] The total cost to the UK National Health Service (NHS) of all illnesses likely to be caused by cold homes has been estimated to be £1.36 billion every year.[78] This is the single greatest cost to the NHS of any hazard identified in housing.

Motivating homeowners who can afford to pay for energy efficiency improvements

It may be difficult to create an environment where householders feel safe and motivated to carry out energy efficiency improvements to their homes. This is clear from previous attempts to encourage people to take such action, for example the Green Deal.[79]

Devolved powers

Powers relating to energy efficiency and low-carbon heat are mostly reserved. Significant exceptions include Buildings Regulations for new-builds and significant retrofits, and the encouragement of energy efficiency measures.

[76] Building a low-carbon economy in Wales: Setting Welsh carbon targets (UKCCC, 2017), p.32
[77] The Health Impacts of Cold Homes and Fuel Poverty (Friends of the Earth and the Marmot Review Team, 2011)
[78] https://www.ageuk.org.uk/Documents/EN-GB/Campaigns/The_cost_of_cold_2012.pdf?dtrk=true
[79] https://www.gov.uk/green-deal-energy-saving-measures

Business sector buildings

It is not cost effective to retrofit many business sector buildings as they generally have a shorter lifespan than residential buildings. Building Regulations reform will be the key driver to deliver low-carbon new business sector buildings. There will be opportunities for innovation in the sector, including alternative construction methods and use of different materials. There are also marketing opportunities, some companies are already deciding to occupy lower carbon, more environmentally friendly buildings as it aligns with their ethos.

Heating

The heating and cooling of all our buildings constitutes a major part of the decarbonisation challenge. The need for cooling is likely to increase as average temperatures increase and should also be considered as part of future energy demand.

Potential actions to 2030

The ideas for action on buildings focuses on raising standards around new builds, looking at a long-term retrofit programme for the existing housing stock and driving innovation using sustainable materials. We are also aiming to build our evidence base around harder to treat areas, such as buildings in the business sector and how we produce low-carbon heat.

Set higher energy efficiency standards for new builds through reviewing Building Regulations Part L (Conservation of Fuel and Power)

Current position

Part L of our Building Regulations concerning the Conservation of Fuel and Power was revised in 2012. It has helped achieve emissions reductions of 8% and 20% in residential buildings and all other buildings respectively. We have recently commenced a further review of Part L, which is intended to be the next step on our journey towards a low-carbon built environment.

Why we are considering this action

To improve the standard of new and refurbished or renovated buildings, including the use of renewable energy sources. To meet the requirements of an EU Directive to achieve ‘nearly zero energy’ buildings by 2020.

Develop a long-term, evidence-based residential retrofit programme

Current position

In 2016, we commissioned a new survey of housing quality and energy efficiency.[80] We have also commissioned research from Cardiff University to investigate best practice in mitigation measures. We also need to understand all options for scaling up energy efficiency retrofit activity, particularly how we motivate and stimulate those homeowners who are able to pay for energy efficiency measures to take action, and continue to support people on low incomes, including those in or at risk of fuel poverty, outside the scope of existing programmes.

[80] The Welsh Housing Conditions Survey 2017-18. The preliminary results will be published in November 2018.

This evidence will inform a programme of work to establish options and scope and analyse the potential demand for new interventions, and examine how services could be established, operated and funded, whilst also examining the economic impact and supply chain opportunities for the Welsh economy.

An industry-led advisory group has been formed to support the programme. The group will consider the evidence it receives and advise us on potential pathways of support for delivery and working with appropriate stakeholders to form a collaborative approach across industry, government and other organisations.

Why we are considering this action

It is very unlikely that the current rate of house building will make a significant impact on replacing older housing with newer, more energy efficient homes. Retrofitting existing housing is therefore critical to meeting our emissions reduction targets.[81] We want to use research to build an evidence base in support of a long-term programme that will simultaneously improve the quality of homes and address our emissions reduction targets.

Establish the baseline of energy use and associated emissions from business sector buildings

Current position

We do not have a picture of how much energy is used by business sector buildings, nor the amount of associated emissions.

Why we are considering this action

The main driver for improvements will be via Building Regulations. In time it is to be hoped that the business sector will view buildings of a higher environmental standard more favourably and thus they will achieve higher returns. In the longer term this will help drive change. The scope of this action is important in term of the type of property it covers. Initial thinking covers the following:

- Retail
- Offices
- Leisure/Hospitality/Tourism

Deliver buildings that are more sustainable by using innovative construction techniques to reduce and meet the energy demand within buildings and increase the use of sustainable materials, such as timber

Current position

Our Innovative Housing Programme (IHP) seeks to promote and demonstrate new approaches to the design and construction of new build housing, including energy efficiency and low-carbon objectives. Lessons learned from IHP may in due course be transferable and applicable to the residential retrofit programme.

[81] See Written Statement on 'Increasing the Scale and Rate of Residential Energy Efficiency Retrofit in Wales' (November 2017)

We have also been supporting the work of the SPECIFIC Innovation and Knowledge Centre.[82] The Centre is working with industry to develop new technologies and integration methods to support the concept that a building can generate, store and release its own energy. There are now several different "active building" demonstrators using different building methods and technology that could result in significant savings in energy consumption and the building generating and storing a majority of its energy demand. Most recently they have worked with POBL in Neath Port Talbot to design 18 active homes that has resulted in a successful application to the Innovative Housing Fund.

As well as looking at sustainable building design and techniques, sustainable building materials need to be used to reduce the embedded carbon footprint. For instance, the use of timber in construction can support domestic supply chains and reduce reliance on imported product. Currently around 80% of timber used in construction in the UK is imported. The demand for Welsh timber has previously been constrained by over-specification in design requirements, but these have largely been overcome therefore better education and awareness programmes need to be developed and also through the potential of clearer regulation and standard setting.

Why we are considering this action

To reduce emissions we need to think about how we design and make buildings. We need to drive innovative approaches such as offsite construction, design for adaptability, energy management and end of life. We need to understand the impact of projects such as the IHP and SPECIFIC demonstrators on decarbonising buildings and the potential to apply this learning to the retrofit programme. We also need to ensure that energy regulation responds to the potential for new ways to distribute and manage energy within the built environment and longer term how evolving areas such as vehicle grid affect this.

In addition, we need to consider using different, more sustainable materials in construction. To promote the increased use of timber, particularly Welsh timber where possible we could adopt a 'consider timber first' policy for certain construction projects. This would not mandate the use of timber over other materials, but would require an assessment to be made at the design stage on the possibility and feasibility of maximising its use in the project. It is intended that such a policy would be adopted via a sequential approach as set out below, with a review on its application, effect, impact and any consequences before its wider application.

1. Welsh Government direct building projects
2. Public Sector projects funded by Welsh Government (Schools, Hospitals, Registered Social Landlords via Social Housing Grant)
3. Private Sector projects funded by Welsh Government
4. Wider Public Sector projects
5. Possible Planning or Building Regulations guidance

[82] http://specific.eu.com/

Scope out the challenges and opportunities around low-carbon heat

Current position

Heating constitutes a major part of the decarbonisation challenge, as heat accounts for almost half of UK energy use and a third of UK carbon emissions. The need for cooling is predicted to increase and should also be considered as part of future energy demand. The Energy Generation in Wales survey estimates Wales produced 1,755 GWh of renewable heat in 2016.[83]

- There was 504 MW of renewable heat capacity in 2016.
- Renewable heat generation in 2016 (1,755 GWh) was the equivalent to 6% of gas consumption.
- Biomass made up 67% of 2016 renewable heat capacity.

There is considerable uncertainty about what the best options are for decarbonisation of heat (with the exception of some low regrets actions, such as injection of biogas into gas grids). Decisions regarding heat infrastructure, such as the potential for conversion of the gas network to hydrogen, and regulation are likely to be made at a UK level. However Wales is already hosting a number of pilots to help develop knowledge in this area, and is well placed to derive benefit from developing skills and economic opportunities in relation to heat.

Why we are considering this action

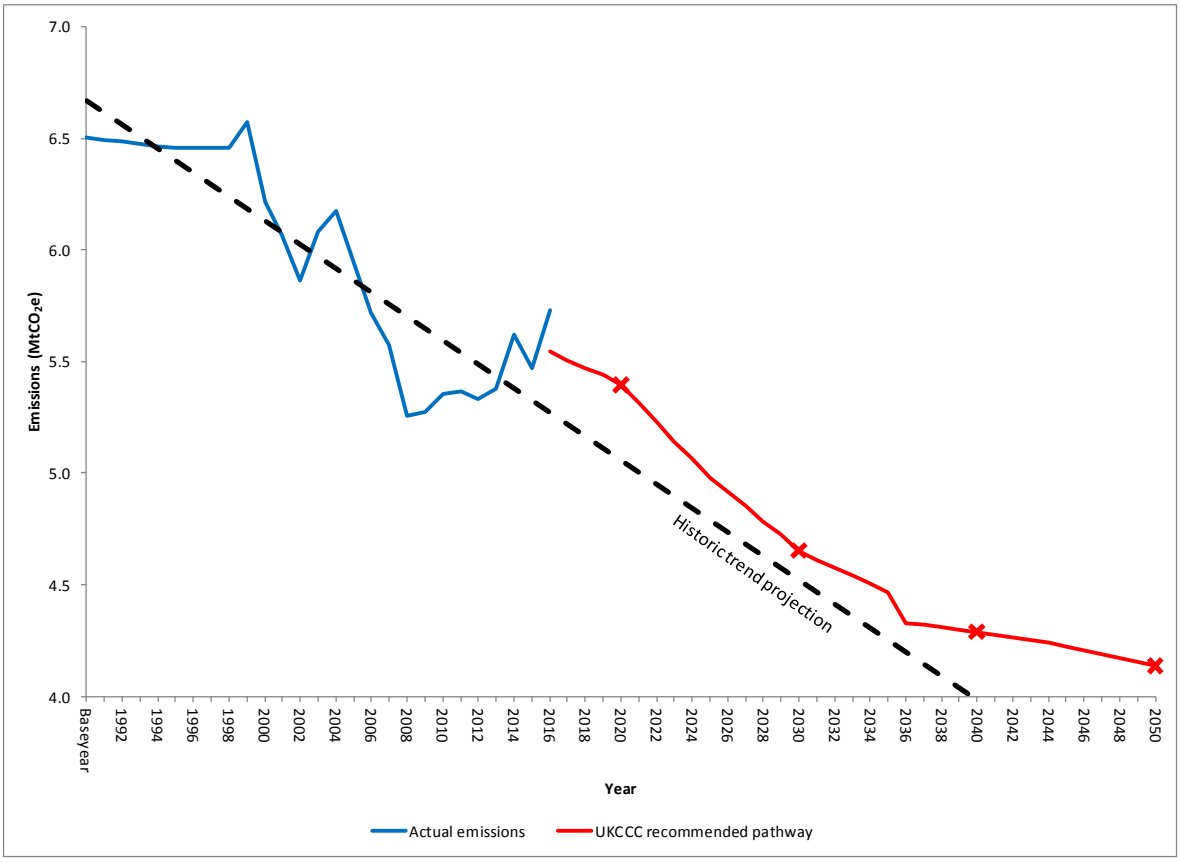
To set out Wales's approach to reducing emissions from heating domestic and business properties, whilst developing innovative approaches and potential new economic opportunities.

[83] https://gov.wales/topics/environmentcountryside/energy/renewable/energy-generation-in-wales

Agriculture

What changes in agriculture might we need to see by 2030?

Graph and table: UKCCC modelling to show a possible route for agriculture sector emissions reduction as a contribution to an 80% reduction in all Welsh emissions in 2050[84]



Reduction to date (1990-2016)	-12%
Modelled 2020 reduction	-17%
Modelled 2030 reduction	-28%
Modelled 2040 reduction	-34%
Modelled 2050 reduction	-36%

[84] Against the 1990 baseline. The UKCCC has illustrated how, in their view, the recommended interim targets could be achieved. We have not accepted the sector targets or policy measures. The advice is not intended to be policy prescriptive and illustrates just one possible route by which the targets could be achieved. However, it is recognised that there is limited flexibility in the options available given the high ambition set by the Environment (Wales) Act. Historic data from Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2016 and future projections from Building a low-carbon economy in Wales: Setting Welsh carbon targets (UKCCC, 2017).

Under the scenario the agriculture sector continues to reduce emissions at a steady rate to 2020. The target requires an increase in the rate of reduction in the 2020s and then emissions reductions continue at a reduced rate from 2030 to 2050.

The scenario is largely delivered by efficiencies in current farming systems, which are deemed to be overall cost-saving measures for the sector. However, post-2030 some additional contribution is assumed from diet change and waste reduction to deliver what is deemed a maximum scenario of 36% reduction by 2050.

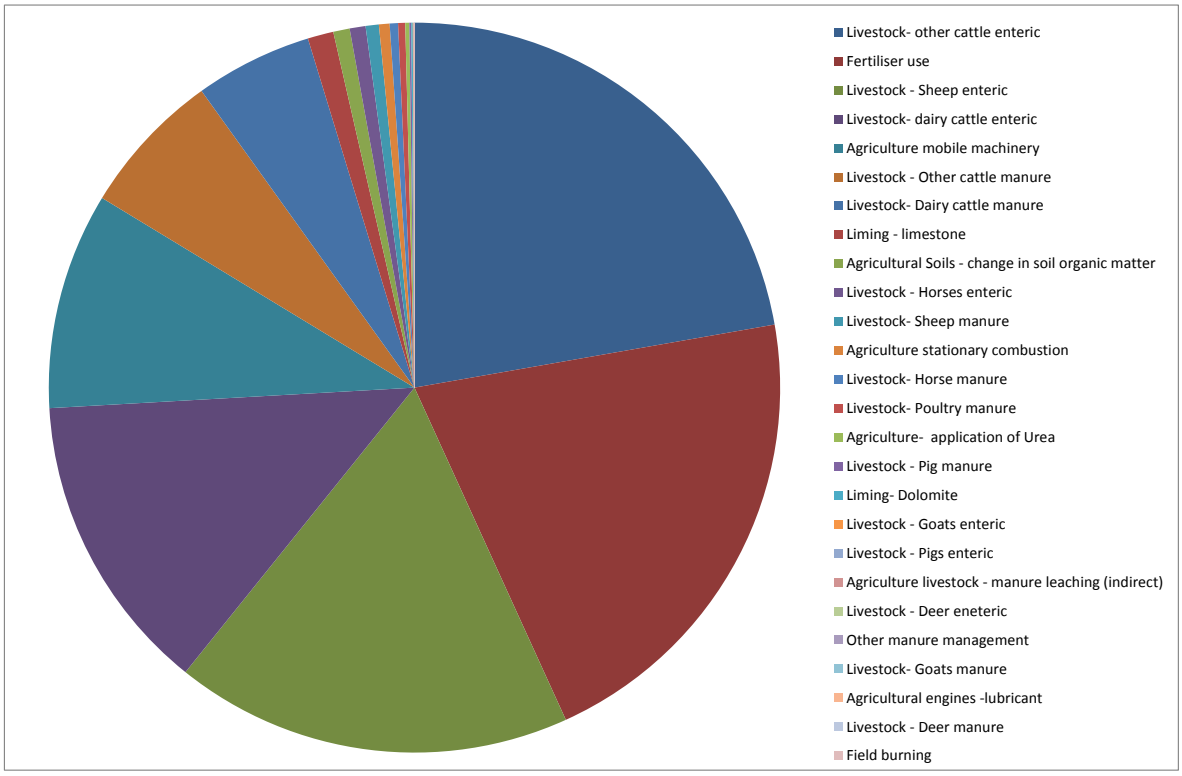
UKCCC recommendation

- Put in place farming policies to reduce emissions that move beyond the current voluntary approach and ensure that any replacement of the Common Agricultural Policy contains support for emissions reduction and removals.

Where are we now?

At 5.7 $MtCO_2e$, agriculture accounted for 12% of Welsh emissions in 2016. Agriculture emissions are dominated by emissions of methane (62%) and nitrous oxide (28%), with only 10% of sector emissions coming from carbon dioxide. This reflects the dominance of livestock enteric emissions (largely from sheep and cattle), which make up 54% of the sector's emissions in 2016. Fertiliser use for agricultural soils is another significant source of emissions, comprising 21% of agriculture emissions.

Graph: Agriculture sector emissions in 2016 ($MtCO_2e$)[85]



[85] The emissions data is sourced from the Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2016 and aligned to the UKCCC sectors as described in Annex 3.

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

Source	% of total Welsh emissions
Livestock- other cattle enteric	2.6%
Fertiliser use	2.5%
Livestock - sheep enteric	2.1%

Opportunities and challenges

Brexit

The combination of leaving the Common Agricultural Policy (CAP) and new trading arrangements provides both opportunities and challenges for agriculture. The great challenge of Brexit is to ensure its impact does not undermine the true value land management provides to Wales. The great opportunity is to put in place new policy over the 2020s to help agriculture adjust to future market forces, thrive in a global marketplace and tackle our greenhouse gas emissions.

Livestock numbers

Without transformational change, current farming systems have an estimated capacity for adapting to deliver only modest efficiencies in production. This would include action on aspects such as better management of crop nutrients, increased standards of husbandry and improved energy efficiency.

The most significant challenge remains emissions arising from enteric fermentation in livestock. Over time it is possible that genomic improvements may begin to address this issue. In the meantime, a greater focus on productivity (increasing the net margin per unit produced), rather than on overall increases in production (larger numbers of animals) may be a way forward.

Wider benefits of action to reduce emissions

Some of the actions to reduce emissions in agriculture are likely to bring a number of wider benefits, beyond reducing greenhouse gas emissions. For example, better management of nutrients and fertilisers would reduce input costs and also improve local air and water quality. Generating energy from renewable sources could provide businesses with another income stream and help to improve their resilience.

Make-up of the industry

Welsh agriculture consists of thousands of often small farms. This makes it challenging to encourage more sustainable farming practices and for the industry to gain recognition for reducing emissions due to the difficulty in measuring lots of small changes over a large area.

Potential actions to 2030

Provide post-Brexit support in the form of a land management programme that contains a public goods scheme and an economic resilience scheme, replacing the Common Agricultural Policy (CAP) with a framework that also links support to emissions reduction and removals

Current position

We have announced five core principles for reform to achieve this transition:[86]

1. We must keep farmers, foresters and other land managers on the land. To produce the maximum benefit to wider society, land must be actively managed by those who know it best.
2. Food production is vital for our nation and food remains an important product from our land. That means continuing to support the economic activities of farmers where it is sustainable and financially viable to do so.
3. We must do this in a way that builds a prosperous and resilient Welsh land management industry – especially agriculture and forestry.
4. Future support will encompass the provision of additional public goods from land.
5. All land managers should be eligible for new schemes; we will not restrict our support to current recipients of CAP funding.

These principles flow from the focus in the Economic Action Plan to spend money in a different, more accountable way to improve economic, social and environmental outcomes and well-being goals.

Why we are considering this action

The programme, which is out for consultation, will support our farms and rural businesses to improve their economic viability and realise the benefits of the transition to a low-carbon economy.[87] At the same time, the system of incentives for public goods will improve our natural environment and benefit our communities. This includes linking future policies to both emission reduction and removal.

Ensure that emissions reduction is considered in any regulatory reform proposals arising from the land management programme consultation

Current position

Land managers are regulated through a tapestry of regulation, much of it emanating from EU policy. Brexit provides the opportunity to build on the Environment (Wales) Act 2016 to put in place a new, coherent, principles-based, outcome-focussed and adaptive regulatory floor for land management. Current legislation is either already part of UK statute or will become domestic law through the UK Government's EU Withdrawal Bill. This will perpetuate the current system, albeit on a different legal basis.

[86] See Written Statement on Future of agriculture and land management (March 2018)
[87] https://gov.wales/consultations

Why we are considering this action

Building on the *Taking Forward Wales' Sustainable Management of Natural Resources* consultation, we will begin to explore with stakeholders how best to support the opportunity to bring about a simpler and more coherent set of regulations.[88]

The Environment Act (Wales) 2016 clearly outlines the principles of sustainable management of natural resources which the Welsh Government and Natural Resources Wales must seek to deliver through their functions. The principles outline an evidence-based approach to address short-, medium- and long-term issues to enhance resilience in ecosystems and the services that derive from them, designed and delivered through a collaborative approach.

One option for achieving this is the introduction of basic measures. These would consist of a set of basic standards developed and agreed with stakeholders which represent the envelope of responsible land management. These standards could be derived from appropriate elements of existing codes and regulations where they exist.

We consider that if they are appropriately designed, basic measures for water, soil and air quality objectives (including emissions reduction) would have the merits of applying equally to all land managers, simplifying and clarifying the current regulatory regime and addressing gaps, inconsistencies and conflicts that may presently exist.

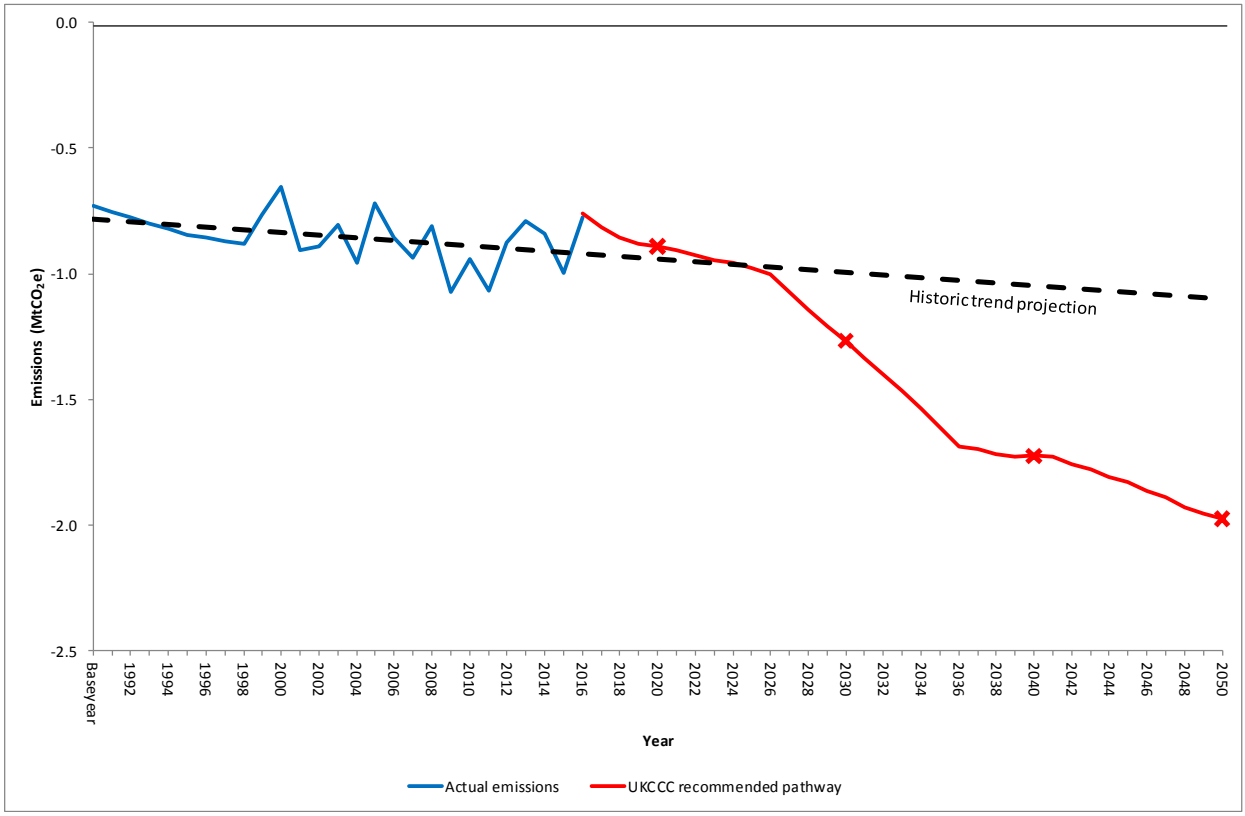
[88] https://beta.gov.wales/taking-forward-wales-sustainable-management-natural-resources

Land use and forestry

What changes in land use and forestry might we need to see by 2030?

The land use and forestry sector covers emissions from our forests and the way we manage our land.

Graph and table: UKCCC modelling to show a possible route for land use and forestry sector emissions reduction as a contribution to an 80% reduction in all Welsh emissions in2050[89]



Sink in 2016	-0.77 $MtCO_2e$
Modelled sink in 2020	-0.89 $MtCO_2e$
Modelled sink in 2030	-1.27 $MtCO_2e$
Modelled sink in 2040	-1.73 $MtCO_2e$
Modelled sink in 2050	-1.98 $MtCO_2e$

[89] Against the 1990 baseline. The UKCCC has illustrated how, in their view, the recommended interim targets could be achieved. We have not accepted the sector targets or policy measures. The advice is not intended to be policy prescriptive and illustrates just one possible route by which the targets could be achieved. However, it is recognised that there is limited flexibility in the options available given the high ambition set by the Environment (Wales) Act. Historic data from Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2016 and future projections from Building a low-carbon economy in Wales: Setting Welsh carbon targets (UKCCC, 2017).

Between 2016 and 2050 the size of the sink is required to grow steadily, more than doubling the emissions sink from the sector compared to the sink achieved in 2016.

The UKCCC proposes that their scenario can be delivered largely through afforestation (~90%) with some contribution from agro-forestry (~10%). They suggest that afforestation will need to approach 66,000 ha by 2050, which is below our current 100,000 ha target but significantly above the current rate of planting that is being achieved.

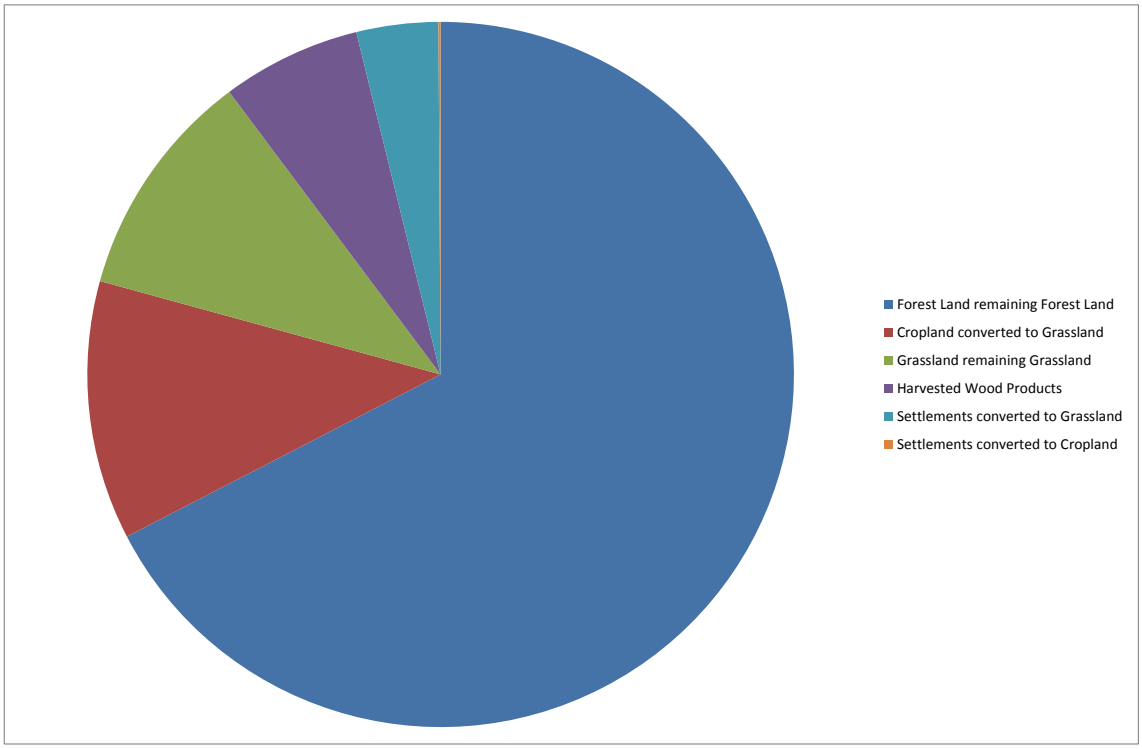
UKCCC recommendation

- Simplify and streamline the process for supporting tree planting, in order to reduce the barriers to action.

Where are we now?

At -0.77 $MtCO_2e$, Land use, Land use change and Forestry provided a net reduction in Welsh emissions in 2016. 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 2016, the largest sinks are existing forest land (67%), cropland conversion to grassland (12%) and existing grassland (11%). The largest emission sources in the sector arise from grassland conversion to cropland (30%), existing cropland (23%), grassland conversion to settlements (21%) and existing settlements (16%).

Graph: Land use and forestry sector emission sinks in 2016 ($MtCO_2e$)[90]



[90] The emissions data is sourced from the Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2016 and aligned to the UKCCC sectors as described in Annex 3.

Graph: Land use and forestry sector emission sources in 2016 ($MtCO_2e$)[91]

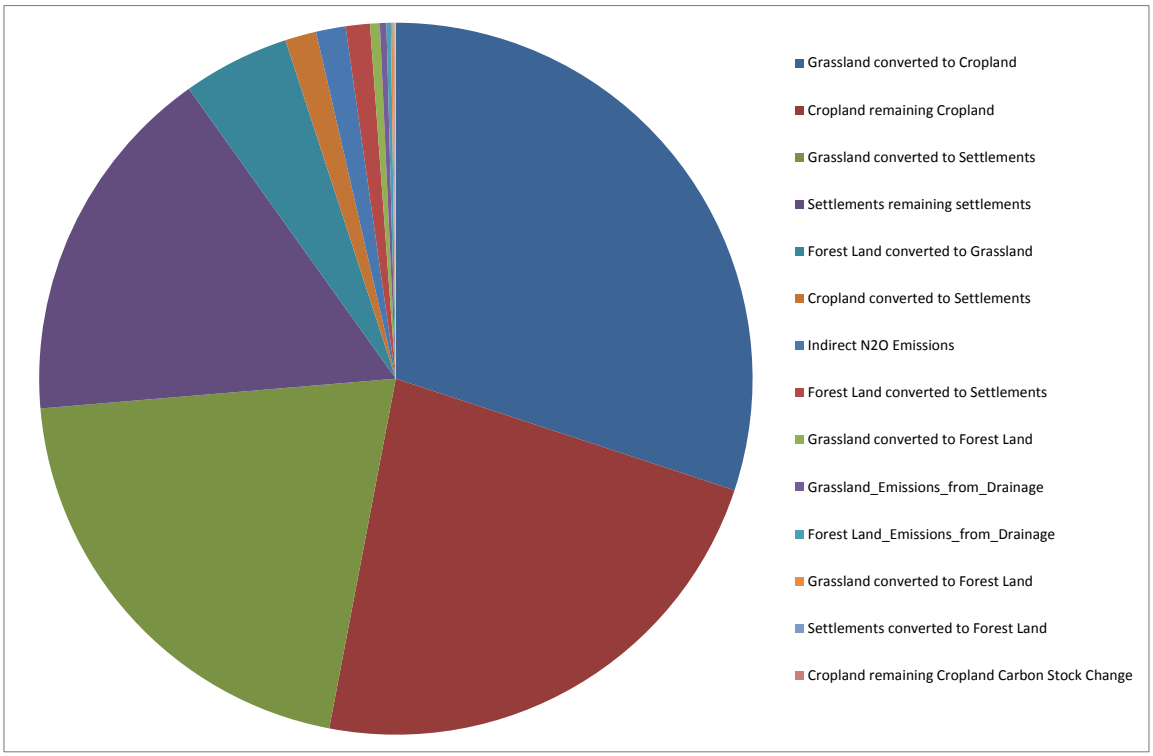


Table: How the biggest emissions in the land use and forestry sector contribute to the Welsh total

Source	% of total Welsh emissions
Grassland converted to cropland	1.1%
Cropland remaining cropland	0.8%
Grassland converted to settlements	0.8%

Opportunities and challenges

Business opportunities

The most recent data indicates that the total Gross Value Added of the forestry sector is £576 million and this represents a 45% increase since 2005, compared with a 15% increase for the UK as a whole.[92] As Wales makes the transition towards a circular economy, making less use of plastics for example, paper and wood products have potential as more sustainable substitutes. Products which are derived from fibre grown in Wales, within forests and on farms, have a role in the new supply chains we will need to meet future demand while having less impact on the environment. We also need to ensure that these products are designed with the circular economy in mind, enabling disassembly and end of life re-use and recycling, minimising waste.

[91] The emissions data is sourced from the Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2016 and aligned to the UKCCC sectors as described in Annex 3.

[92] Nominal and real regional gross value added (balanced) by industry (ONS, 2016). The forestry sector is defined here as Forestry and logging (£32m), Manufacture of wood products, except furniture (£180m) and Manufacture of paper products (£364m).

Multiple benefits

The use of trees in land management can provide a number of benefits. More integration of trees and shrubs within arable and livestock systems of land use can help increase soil carbon stocks and reduce emissions from fertiliser use while also contributing to wider sustainable management objectives of improving water quality and soil fertility. Increasing woodland diversity and management is also needed to improve the biodiversity and visual appeal of our wooded landscapes, and to make sure they are resilient and can continue to provide us with products and services that future generations will need. Woodland and trees are key components of a sustainable built environment, providing shade for buildings, contributing to a sense of place and ensuring that space for people is designed in alongside space for trees, their associated habitats and other green infrastructure.

Wood in construction

As our forests mature their ability to lock up more carbon begins to reduce. However there are opportunities to store and lock away carbon in wood products that have a relatively long life such as timber used in buildings or in furnishings. These products can be used in innovative building techniques but also have a displacement effect as wood products are used more instead of those based on fossil fuels.

Sequestration

The land use and forestry sector has helped to reduce emissions by acting as a sink through the removal of emissions. The land use and forestry sector is the only sector that can store carbon naturally and help to reduce overall emissions.

Procurement

When the public sector buys goods and services, the climate impact of those purchases should be fully considered. Policies and advice to officials across the public sector should reflect best practice in ensuring that procurement activity supports and does not undermine decarbonisation goals. Innovative approaches such as encouragement for use of timber and other sustainable materials, elimination of waste and good design for end of life recycling are areas that can help us deliver our decarbonisation goals.

Balancing demands

Land management shapes our landscapes and provides vital resources. There is a challenge about the how we balance and support our land uses, enabling positive change whilst protecting our unique natural resources. Landowners need a regulatory and policy framework that is consistent, transparent and proportionate, and provides decisions about their proposals and projects in a timely way. We need to be clear about the outcomes we want and enable positive changes to take place in the right places. We need to be clear about the kind of trees we want to see and about the places where they will deliver the greatest benefits.

We will sometimes want to support woodland creation financially, especially where this provides significant public goods. We also want to enable landowners to create woodland that delivers private benefits and which they fund themselves. In these cases we expect that the woodland will comply with the UK Forestry Standard and

so at least a quarter of the area will be devoted solely to the provision of public goods and all of the area will contribute to our decarbonisation goals .

Planting trees at the scale required

The UKCCC has recommended tree planting of at least 2,000ha each year. While we have not accepted the overall recommendations for land use, we are incorporating this advice into our Woodland Strategy Woodlands for Wales.[93] To date woodland creation has not kept pace with our ambitions and we know that we need to do more. We expect that planting will take place at a range of scales but it will generally take place on farms and will be part of the mix of land uses that we will see after the UK leaves the EU in 2019. There are opportunities to integrate woodland more into farming enterprises and we know that new funding arrangements that will be needed to replace the Common Agricultural Policy must take account of woodland's place in the Welsh landscape.

Potential actions to 2030

Revise our regulatory and support regimes to increase tree planting to at least 2,000 hectares per year, aiming to increase this to 4,000 hectares

Current position

In the past we adopted a target of planting 100,000 ha of trees between 2010 and 2030. Planting rates in the first 7 years of this period have only been a fraction of the required 5,000 ha per year. The recently published Woodland Strategy updates this target in line with the UKCCC's advice. This requires developing new approaches to incentivising and helping landowners overcome barriers to planting, both real and perceived.[94]

Why we are considering this action

To ensure that our woodland creation activity is sufficient to be compatible with our statutory obligation to reduce carbon emissions by 80%. Woodland creation is also essential to enable increases in resilience in existing woodland, diversification of tree species and restoration of open habitats, while at the same time maintaining supply of renewable products, including timber and wood fibre to meet the future needs of Welsh society.

Identify preferred areas for tree planting, including commercial woodlands and planting at medium and large scale

Current position

We have published a woodland creation opportunities map on our Lle web portal.[95] This map shows the areas where we know that there are significant public benefits from planting trees. We use this map to help prioritise applications for funding for tree planting. The map provides guidance to those planning tree planting about the issues that may influence their decisions, and help them produce a design that complies with the UK Forestry Standard. However the regulatory process is the

[93] https://beta.gov.wales/woodlands-wales-strategy
[94] As set out in our current 'Brexit and our Land' consultation.
[95] http://lle.gov.wales/apps/woodlandopportunities/

same for applications that will generate significant public benefits, as for those that will not.

Applicants have told us that they face particular challenges in getting larger schemes approved, that landowners lack the confidence to develop proposals because they cannot tell whether their proposal will be approved even if it is in the green area on the map.

Why we are considering this action

We need to give those who want to plant trees a transparent and predictable process for getting permission to do so and enable proposals that will provide significant public benefits to access support. Landowners who want to plant trees to improve the resilience of their businesses will also generate significant public benefits if they do so in the right areas, and their proposals are well designed and meet the right standards. The UK Forestry Standard requires at least a quarter of all planting to be devoted mainly to public goods.

We intend to refine the woodland opportunities map so that it shows both the areas where public benefit is greatest, and is clearer about the kind of planting and the scale of planting that is appropriate in each. We will revise regulations to ensure that in these areas, tree planting proposals have a timely, transparent, predictable and proportionate way to proceed.

Ensure that all peatlands supporting semi natural habitats are under active management by 2030 by supporting, enabling and co-ordinating the restoration and sustainable management of peatland, as well as utilising and maximising associated funding opportunities

Current position

Peat is found throughout Wales and covers around 4% of the country. Degraded peat currently releases approximately 550,000 tonnes of carbon into the atmosphere every year which was a key driver in setting our ambitious peatland targets for 2020. The coordination of effort and securing funding through mechanisms such as Glastir, the Sustainable Management Scheme, and EU LIFE play a crucial role in enabling peatland restoration.

Why we are considering this action

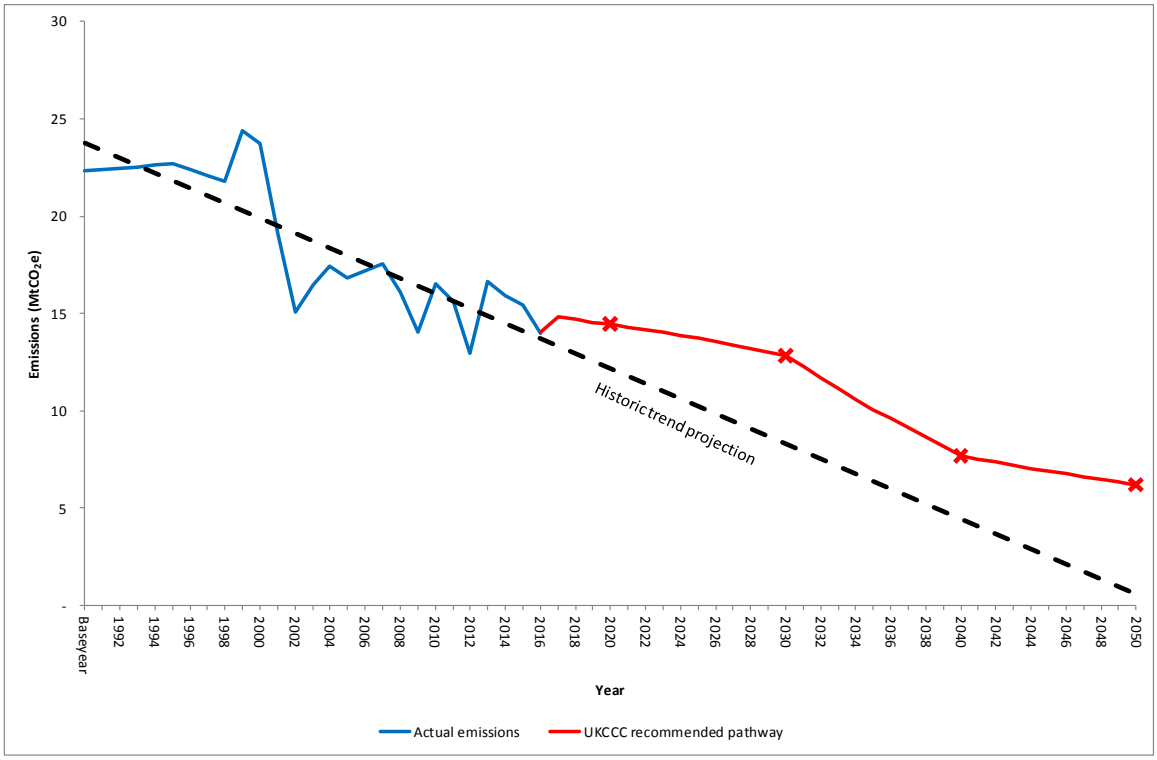
To continue to ensure that all peatlands supporting semi-natural habitat will be managed sustainably. To increase the total area of semi-natural habitats on peat. To drive action that ensures Wales is leading the way in contributing to and achieving the vision and goals set out in the UK Peatland Strategy (2040).

Industry

What changes in industry might we need to see by 2030?

The industry sector covers emissions from business (apart from buildings and electricity generators), energy production (apart from public electricity and heat production) and industrial processes. The sector includes the emissions from processes such as chemical and metal production, refineries, manufacturing and construction, cement production, operation of machinery, food processing, and oil and gas extraction.

Graph and table: UKCCC modelling to show a possible route for industry sector emissions reduction as a contribution to an 80% reduction in all Welsh emissions in 2050[96]



Reduction to date (1990-2016)	-37%
Modelled 2020 reduction	-35%
Modelled 2030 reduction	-43%
Modelled 2040 reduction	-66%
Modelled 2050 reduction	-72%

[96] Against the 1990 baseline. The UKCCC has illustrated how, in their view, the recommended interim targets could be achieved. We have not accepted the sector targets or policy measures. The advice is not intended to be policy prescriptive and illustrates just one possible route by which the targets could be achieved. However, it is recognised that there is limited flexibility in the options available given the high ambition set by the Environment (Wales) Act. Historic data from Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2016 and future projections from Building a low-carbon economy in Wales: Setting Welsh carbon targets (UKCCC, 2017).

Wales has a higher share of emissions from 'hard to reduce' sectors than the rest of the UK, including industry for which paths to very low emissions by 2050 have yet to be identified. The modelling projects industry emissions to fall marginally to the mid-2030s through incremental improvements to energy efficiency, alongside switching to bioenergy and electrification of heat. Post-2030 the scenario includes a significant role for Carbon Capture Use and Storage (CCUS) in industry to deliver an increase in the rate of emissions reductions between 2030 and 2040.

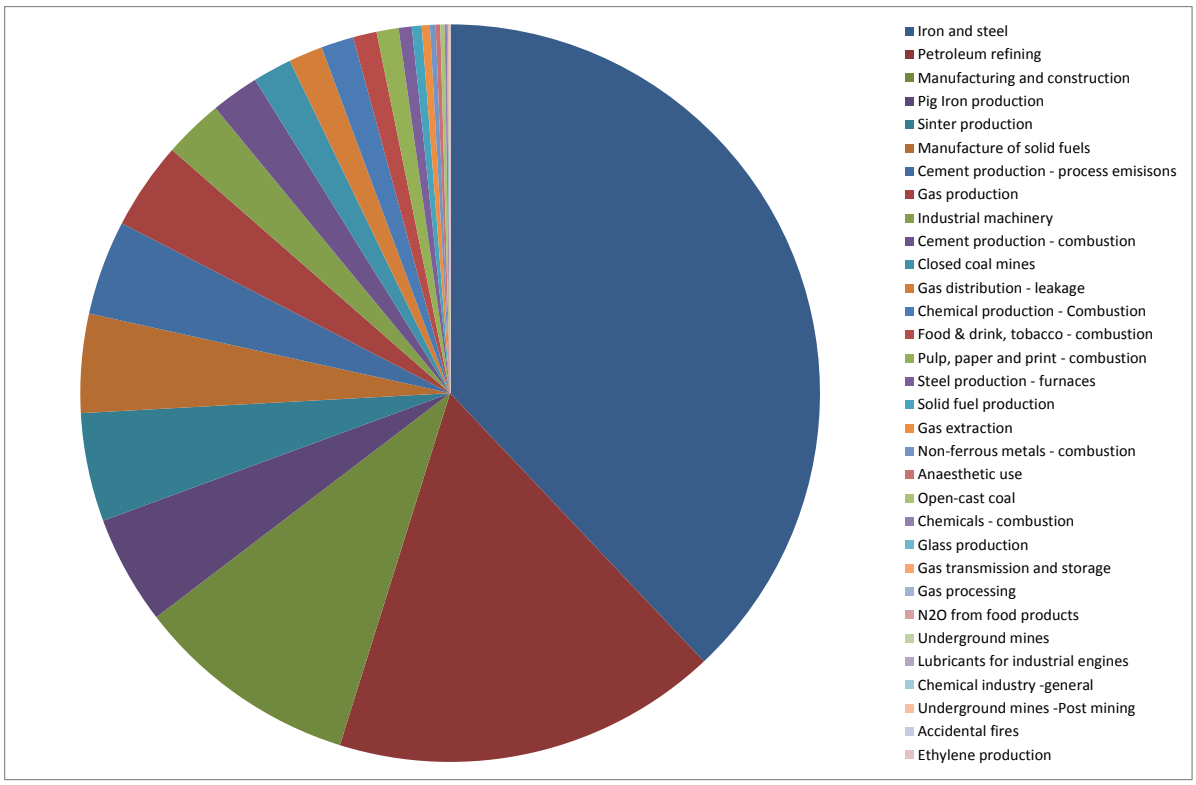
UKCCC recommendation

- Where heat is recoverable it represents an important opportunity for decarbonisation via heat networks. Welsh Government has a key potential role to use its ability to bring community and industry stakeholders together to find mutually beneficial solutions.

Where are we now?

At 14.0 $MtCO_2e$, the industry sector accounted for 29% of Welsh emissions in 2016. Industrial emissions 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, , food and drink, , and paper and pulp also account for a significant proportion of emissions. Industrial emissions are largely comprised of emissions of carbon dioxide (96%), with smaller amounts of methane (4%) and nitrous oxide (1%).

Graph: Industry sector emissions in 2016 ($MtCO_2e$)[97]



[97] The emissions data is sourced from the Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2016 and aligned to the UKCCC sectors as described in Annex 3.

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

Source	% of total Welsh emissions
Iron and Steel	11.0%
Petroleum refining	4.9%
Manufacturing and construction	2.8%

Opportunities and challenges

Technology

Industrial sectors have undertaken significant activity over recent years to cut their emissions. For example, the steel sector has achieved a 40% reduction in energy consumption per tonne of steel produced over the last 40 years. Many of the relatively easy gains have been secured and further large-scale energy efficiencies will require significant technological developments.

Industrial sectors have developed decarbonisation and energy efficiency pathways in conjunction with the UK Government.[98] They identify technically achievable scenarios for further industrial decarbonisation and energy efficiency improvements over the short-term to 2030 and the medium/long-term (to 2050 and beyond). These pathways conclude that further incremental carbon reductions can be achieved by continued focus on energy efficiency technologies, material efficiencies across the sectors and, indirectly, through electricity grid decarbonisation.

Carbon capture use and storage (CCUS)

The UKCCC considers that we "will be unable to achieve the legislated emissions reduction of at least 80% by 2050 without a significant contribution from carbon capture utilisation and storage."[99] However, the current technology is largely unproven at industrial scale and will be extremely expensive to deploy. Whilst North Wales has access to potential offshore carbon storage, industrial clusters in South Wales are disadvantaged by not being located close to CO_2 storage facilities.

Transporting the CO_2 from South Wales by ship would add cost, which the UK CCC estimates at £20/tonne but the UKCCC concludes this could still be worth undertaking as the additional costs are below the value of carbon saving.[100] A cross-sector group brought together by the UK Carbon Capture and Storage Research Centre (UKCCSRC) reached a similar conclusion in 2016.[101]

Large point-sources

We have a greater proportion of emissions from large point-sources than the UK. This means that performance against our targets is more volatile and vulnerable as

[98] https://www.gov.uk/government/publications/industrial-decarbonisation-and-energy-efficiency-roadmaps-to-2050

[99] Building a low-carbon economy in Wales (UKCCC 2017), p.34

[100] Building a low-carbon economy in Wales (UKCCC 2017), p.39

[101] Conclusion 4.13, Delivering Cost Effective CCS in the 2020s: an overview of possible developments in Wales and areas linked to Welsh CCS activities via shipping (UKCCSRC 2016)

any change in output at a single site such as our major steelworks, for example, will be visible in our national emissions inventory. The Port Talbot site represented ~48% of industry sector emissions and 14% of total Welsh emissions in 2016.[102]

Heat

Industrial heat recovery has the potential to realise significant energy bill and carbon savings for industry through a reduction in primary fuel use. The UK Government plans to introduce a support programme to increase industry confidence in identifying and investing in opportunities for recovering and reusing waste heat from industrial processes and increase the deployment of recoverable heat technologies in industry. This will allow industry to re-use heat on-site or sell it to a third party, leading to the more efficient and productive use of energy, lower fuel bills or a new revenue stream for industry, and a reduction in carbon emissions.

There is wider work being undertaken by organisations across Wales, particularly local authorities, on the potential for heat networks that consider industrial heat within a wider context such as supporting local communities. However, the co-location of heavy industry and heat demand sufficient to make networks commercially possible is limited, and the use of heat for commercial applications is more likely.

Devolved powers

Although we have some powers in relation to encouraging low-carbon heating and cooling and heat networks, the relevant powers for decarbonisation policies for industry are largely reserved to the UK Government. In addition, the technological advances necessary for significant further decarbonisation is of a scale and importance that requires Research and Development action and investment at a UK level. Many of the individual high emitters in Wales play an important role within the wider UK, European and Global economy, for example through manufacturing supply chains.

Remaining competitive

It may not be economically viable for certain industries to invest in carbon reducing technologies if the scale and pace of decarbonisation is not matched in lower-cost producer countries. This could lead to de-industrialisation and carbon leakage from Wales, where companies move production to countries with less ambitious climate measures, which does nothing to address global greenhouse gas emissions. In addition it will be key to ensure that businesses in those sectors continue to have the ability to compete internationally and that policies do not lead to de-industrialisation.

Decarbonising electricity

Decarbonising the grid will have a significant role in reducing greenhouse gas emissions from Industry. However, there is a risk of carbon leakage if those industrial sectors exposed to high UK industrial electricity costs were to stop receiving the relevant exemptions and compensation measures from the UK Government.

[102] EU-Emissions trading System (EU-ETS) data: http://ec.europa.eu/environment/ets/oha.do?languageCode=en

Potential actions to 2030

The ideas around industry focus on building our evidence base and collaborating with industries to understand the challenges and opportunities from decarbonisation. We are also looking to use our available levers to drive efficiency and review the potential use of waste heat.

Commission an independent economic and technical feasibility study on carbon capture use and storage (CCUS)

Why we are considering this action

To build on the UKCCSRC 2016 report 'Delivering Cost Effective CCS in the 2020s: an overview of possible developments in Wales and areas linked to Welsh CCS activities via shipping'[103] and the UKCCC advice which found that we will be unable to achieve the legislated emissions reduction of at least 80% by 2050 without a significant contribution from CCUS.

We need a more detailed and Wales-specific study. The objective is to better understand the options for delivering CCUS projects and the balance between capturing at source, transporting to depositories, offsetting strategies, or whether it makes more strategic and economic sense to focus activity as close to the potential locations for storage as possible (e.g. North Wales access to potential storage sites in the Irish Sea). In addition, to explore the potential to collaborate cross-border between North Wales and North-West England.

Consider the further development of our Environment Protection Scheme (EPS)[104] beyond 2020 to support the most carbon-intensive industries

Current position

Following publication of the Economic Action Plan, the Environmental Protection Scheme (EPS) was one of a number of schemes consolidated into the Economy Future Fund (EFF) to support the new operating model for direct financial support launched by the Cabinet Secretary for Economy and Transport in May 2018.

To unlock financial support from the EFF, a business must demonstrate its commitment to the Economic Contract and come forward with a viable investment proposal that aligns with at least one of five Calls to Action, including Decarbonisation.

The EPS component of the EFF provides a mechanism to stimulate and bring forward investments and the installation of technologies that deliver environmental benefits above and beyond the minimum legal standard required through a package of financial inducements. The scheme addresses environmental protection measures. This includes emissions reduction directly through abatement and energy efficiency measures and indirectly by supporting investment in lower emission on-site power generation.

[103] Delivering Cost Effective CCS in the 2020s: an overview of possible developments in Wales and areas linked to Welsh CCS activities via shipping (UKCCSRC 2016)
[104] http://gov.wales/funding/state-aid/gber/schemes/environment-protection-scheme

Why we are considering this action

The current EPS will expire at the end of 2020. It is recognised that industrial sectors most challenged by climate change will be able to achieve significant improvements by 2030 by adopting best available current technologies. Beyond 2030 the challenge to decarbonise will require more radical action. Therefore the extension of the EPS would continue to support industry on the 2030 pathway and to encourage early adoption by the private sector of available technologies that accelerate reduction in emissions from our most intensive industrial emitters. This will also help position manufacturers in the market place as offering lower-carbon products, underpin existing manufacturing employment and lower the risk of carbon leakage. The action would also directly meet the objectives as laid out in the Economic Action Plan, with particular focus on the Call to Action that encourages decarbonisation and reducing the carbon footprint of our industrial base.

Consider waste heat recovery and use as part of the approach to heat policy

Current position

There is considerable uncertainty about what the best options are for decarbonisation of heat, with the exception of some low regret actions. The use of waste heat from industry where practicable is one such area, which we will consider during the development of our overall approach to heat. We are supporting the development of a number of heat networks, including a proposed network in Cardiff utilising waste heat from Viridor's Energy from Waste Plant. Cardiff City Council cabinet approved the Outline Business Case in April 2018.

We are already supporting local authorities to develop district heating projects through our Green Growth service,[105] and are supporting them to access the UK Government's Heat Networks Investment programme funding. We will work with industry to consider what support might be needed to increase the level of heat recovery schemes.

We are also developing an Energy Atlas for Wales. This will establish the level of renewable energy resources across a range of technologies, and could include existing mapping on heat source opportunities. It will also look to connect the resource opportunities with current and future demand, helping to maximise local resource use and provide greater local understanding of potential pathways, their costs and benefits. This links to the potential action to stimulate local or regional energy planning, as solutions to decarbonising heat are likely to be variable and place-specific.

Why we are considering this action

To set out Wales' approach to reducing emissions by using waste heat whilst developing innovative approaches and potential new economic opportunities.

[105] https://gov.wales/topics/businessandeconomy/creating-a-sustainable-economy/green-growth-wales

Establish an industry-led working group on decarbonisation

Current position

There is no dedicated group to address the issue of decarbonising Welsh industry; the issue is addressed primarily at a company or sector level.

Why we are considering this action

To form an industry led working group with government representation to consider how best to meet the challenge of emissions. Initial thoughts are this should mainly be comprised of those seven industry sectors most challenged by the need to decarbonise as identified by the UKCCC. The outcomes of the group would also help to strengthen and add credibility to Welsh Government's representations to UK Ministers to ensure the scale and nature of the challenge in Wales is recognised and adequately supported by the UK Government.

Public Sector

What changes in the Public Sector might we need to see by 2030?

The Public Sector is defined as emissions from Public Sector buildings. Under the UKCCC scenarios, the Public Sector is combined with the buildings sector and does not have its own long-term scenario. Although Public Sector buildings only directly account for a small amount of Welsh emissions, the sector is uniquely placed to demonstrate leadership through our carbon neutral 2030 ambition and stimulate action across a number of other sectors such as transport, buildings and power.

UKCCC recommendation

- The public sector can use procurement rules positively to help drive emissions reductions in a number of areas (e.g. uptake of ultra-low-emission vehicles, low-carbon products). The Welsh Government should develop a strategy to ensure that climate change is fully reflected in public procurement.

Where are we now?

Emissions from Public Sector buildings are accounted for in the Buildings chapter and represented less than 1% of Welsh emissions in 2016. Since 1990, we have reduced emissions by 56% through more efficient use of fuels and a switch to gas-fired heating for many Public Sector buildings.

Opportunities and challenges

Leading by example

The Public Sector can not only ensure their buildings and fleets are efficient, but also influence emissions more widely through the delivery of their services, procurement of goods and influencing action through our local communities.

The ambition for the Public Sector to be carbon neutral by 2030 was announced in a Welsh Government-led debate in June 2017 and subsequently, a call for evidence was issued, which ran over the summer months last year. The call attracted thirty three responses. The responses clearly outlined areas of difficulty. For example, the scale and rate of change indicated by the ambition is significant. Also, whilst there is significant appetite to decarbonise within the public sector, decision making, including financial decision making, does not adequately take account of carbon. There is also complexity in understanding how our decision-making influences and induces carbon production or saving. However, the call for evidence responses were overwhelmingly supportive of the ambition and welcomed strengthening existing approaches to progressively increase the range of decarbonisation measures.

UK government fiscal policy

In this challenging economic climate, developing a proactive approach to decarbonisation will determine the ability of the Public Sector to continue to deliver services and support our collective future. Decisions made today will either usher in a new era of collaboration and efficiency, or lock us into outdated and ultimately more carbon expensive pathway, threatening delivery of key services.

Procurement

The opportunities from procurement alone are significant. The public sector procurement spend is approximately £6bn annually. Being clear about what we expect, in terms of decarbonisation from the goods and services we procure, will send important signals and enable the Welsh supply chain to develop lower carbon goods and services.

Land use

The Public Sector also owns or manages large areas of land. How the land is used has the ability to stimulate economic, social, environmental and cultural benefit. In considering land uses, decarbonisation has the opportunity to play a significant part.

Potential actions to 2030

Support the public sector to baseline, monitor and report progress towards carbon neutrality

Current position

The Cabinet Secretary for Energy, Planning and Rural Affairs has set out her ambition for the public sector to be carbon neutral by 2030.A call for evidence was published in the summer of 2017, resulting in broad support for the ambition. There were however calls for Welsh Government to be clear about the scope and scale of ambition and to support the public sector to develop the framework for baselining, monitoring and also achieving the aim.

We have funded Natural Resources Wales (NRW) to develop their Carbon Positive Project.[106] Several communication activities have been undertaken and interest to replicate has been generated.

Why we are considering this action

Welsh Government will work with NRW to make a toolkit available for others to follow and develop further steps, to include defining the elements of scope 3 emissions to be included. Support will be delivered through a number of routes, including the new Welsh Government Energy Service that will replace Green Growth Wales in 2018. Whilst a number of public bodies currently report some emissions through the Carbon Reduction Commitment (CRC), this requirement will end in 2019 as the UK Government changes the approach.[107] Any new framework for assessing public sector progress towards carbon neutrality will replace the CRC.

Public Sector buildings are supplied with renewable electricity by 2020 and, where practicably possible, are supplied with low-carbon heat by 2030

Current position

From April 2017, the National Procurement Service has secured 100% renewable electricity for existing public sector partners. This approach is at little additional cost

[106] https://naturalresources.wales/about-us/corporate-information/carbon-positive-project
[107] https://www.gov.uk/government/collections/crc-energy-efficiency-scheme

to the consumer, but must continue and be adopted by all public sector bodies. Low-carbon heat is more difficult to achieve, however technologies do exist to support the move to low-carbon heat and a green gas market is emerging.

Why we are considering this action

Heat is one of the more challenging areas to decarbonise. The public sector however must show leadership by finding the most suitable approaches to decarbonise its own heat requirements. There must therefore be an exploration of four elements:

1. The ability of public sector bodies to adopt low-carbon heat systems, such as those supported through the Non-Domestic Renewable Heat Incentive
2. Further develop low-carbon district heating systems as currently being supported by Welsh Government
3. Identify and implement more innovative solutions, particularly on new build, for example, solutions being developed by SPECIFIC[108]
4. Support the development of the market for renewable gas. Exploration is required of the opportunity for the Welsh Public Sector to adopt a 100% renewable gas buying approach, in line with electricity

All new cars and light goods vehicles in the Public Sector fleet are ultra low emission by 2025 and where practicably possible, all heavy goods are ultra low emission by 2030

Current position

Penetration of ULEVs in the Public Sector is low and patchy, but increasing. The low take-up is due to a combination of:

1. Cost
2. Lack of available charging infrastructure – the UKCCC has estimated nearly 29,000 charging points are required across Great Britain to meet 2030 charging needs[109]
3. Lack of a technological solution for certain applications

However, the cost of ULEVs in the small vehicle sector is reducing and whole-life costs for electric vehicle fleets are currently comparable to or approaching that of internal combustion engines.

NRW conducted a strategic fleet carbon review, which identified opportunities to reduce diesel reliance and associated emissions, whilst providing value for money. The review concluded NRW could save up to 27% emissions from their fleet and deliver a 5% cost saving through the use of existing low emission technologies. Whilst not all of NRW's fleet use is suitable for current ULEV use, they calculated that replacing 56% of it with electric vehicles could save £136,000 and 413 tonnes of CO_2e per year.

[108] http://specific.eu.com/

[109] https://www.theccc.org.uk/wp-content/uploads/2018/01/Plugging-the-gap-Assessment-of-future-demand-for-Britains-EV-public-charging-network.pdf

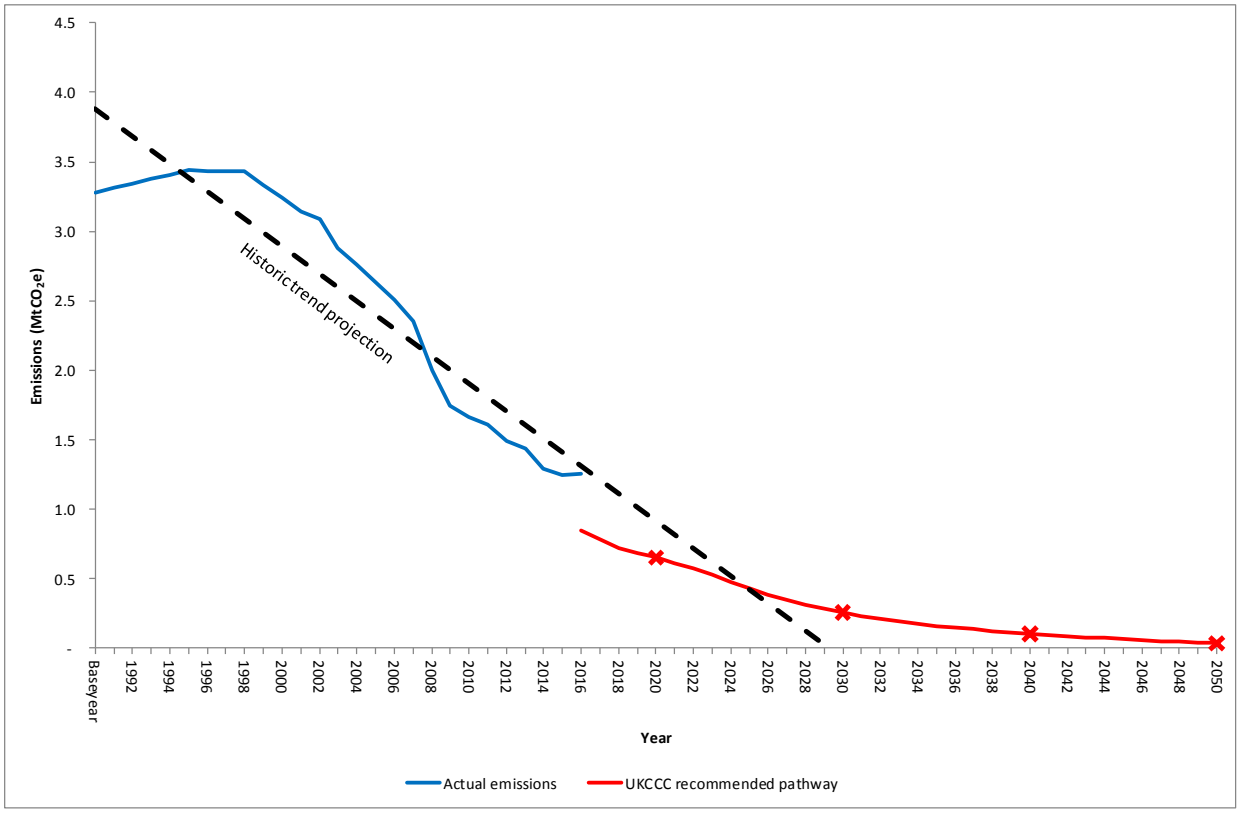
Why we are considering this action

We need the public sector to take a proactive approach to considering and implementing opportunities to reduce emissions from their transport activities. This action would focus on scope 1 emissions (vehicles owned by the public sector body).

Waste

What changes in Waste might we need to see by 2030?

Graph and table: UKCCC modelling to show a possible route for waste sector emissions reduction as a contribution to an 80% reduction in all Welsh emissions in 2050[110]



Reduction to date (1990-2016)	-62%
Modelled 2020 reduction	-80%
Modelled 2030 reduction	-92%
Modelled 2040 reduction	-97%
Modelled 2050 reduction	-99%

[110] Against the 1990 baseline. The UKCCC has illustrated how, in their view, the recommended interim targets could be achieved. We have not accepted the sector targets or policy measures. The advice is not intended to be policy prescriptive and illustrates just one possible route by which the targets could be achieved. However, it is recognised that there is limited flexibility in the options available given the high ambition set by the Environment (Wales) Act. Historic data from Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2016 and future projections from Building a low-carbon economy in Wales: Setting Welsh carbon targets (UKCCC, 2017)

The UKCCC scenario modelled for the waste sector requires a continued increase in emissions reduction from 2016 to make the sector essentially emissions-free in 2050 (99% reduction on 1990 levels). The scenario is based on the introduction of a ban on biodegradable waste to landfill from 2025.

UKCCC recommendations

The UKCCC does not make any specific policy recommendations for the waste sector within their advice.

Where are we now?

At 1.26 $MtCO_2e$, waste accounted for 3% of Welsh emissions in 2016. Waste emissions are dominated by emissions of methane at 94% of the sector, followed by nitrous oxide (5%) and carbon dioxide (0.6%). The dominant source of emissions is landfill, which makes up 77% of the sector's emissions. Collectively wastewater treatment makes up the second most significant source, at 19% of the sector.

Graph: Waste sector emissions in 2016 ($MtCO_2e$)[111]

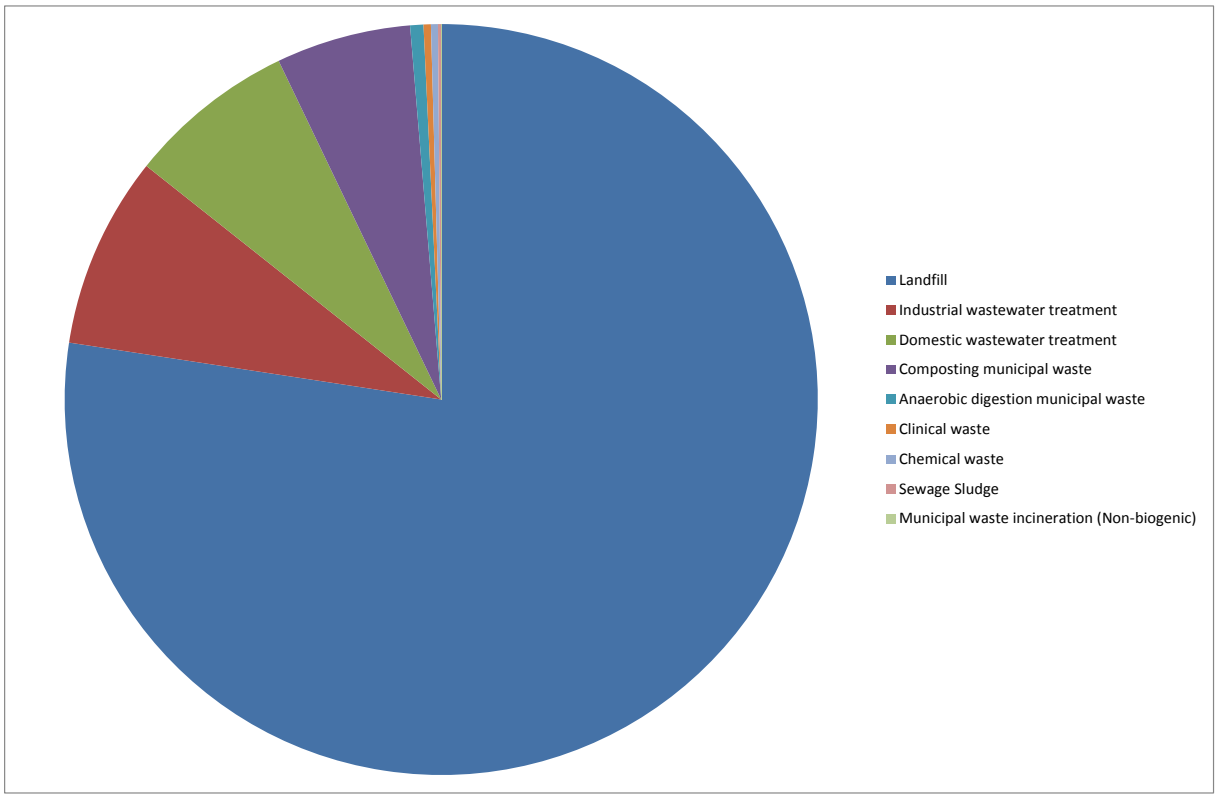


Table: How the biggest emissions sources in the waste sector contribute to the Welsh total

Source	% of total Welsh emissions
Landfill	2.0%

[111] The emissions data is sourced from the Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2016 and aligned to the UKCCC sectors as described in Annex 3.

Opportunities and challenges

Grow the circular economy

We can decarbonise the products we manufacture by moving towards a more circular economy and applying eco-design principles. This means using fewer raw materials in production processes and the lifespan of products, designing for longevity and increasing the use of waste materials in place of raw material. This reduces the energy used and associated emissions in the manufacture and use of products.

Studies by the Waste and Resources Action Programme (WRAP) and the Green Alliance suggest that improving resource efficiency can significantly help the labour market – suggesting that by 2030 Wales has the potential for twice the growth in new jobs as London, and three times as many as Scotland (as a percentage of the labour force).[112]

For products imported into Wales that are procured by the public sector, we can require these products to have a lower carbon footprint, which could be achieved, for example by having a higher recycled content. This not only helps to reduce our emissions but maximises action to support "a globally responsible Wales" under the Well-being of Future Generations Act through changing our consumption behaviour.

Strong policy framework

Wales has a suite of policies that tackle emissions from waste. Policies include statutory recycling targets for local authorities, the Landfill Allowances Scheme that sets targets to reduce the landfilling of biodegradable municipal waste, landfill bans, and the requirement for recycling set under regulations under the Environment Act. Alongside this we have a number of programmes driving action such as increase landfill gas capture and utilisation. The long standing legislative framework in the sector provides clarity and certainty for investment.

Build on public support

We have one of the best recycling records in the world. Whilst we have provided the framework, the public's support in recycling has been important in achieving this change. There is an opportunity to build on this goodwill to drive further behaviour change and commitment to developing the wider circular economy, notably through the household contribution towards our aim to halve food waste by 2025 and to increase food waste recycling, both of which will further reduce levels of methane at landfill sites.

[112] Employment and the circular economy (WRAP and the Green Alliance, 2015)

Potential action to 2030

Wales has an excellent track record on waste recycling and we already have long-term commitments in place. This potential action looks at the wider opportunities to develop and create economic opportunities through resource efficiency.

Create new opportunities for resource efficient manufacturing through embedding resource efficiency within our programme of innovation support to SMEs and using public sector procurement to stimulate the market

Current position

We fund WRAP Cymru to support key business sectors to become more resource efficient and increase the scale of resource efficient public procurement. It is not possible currently to say how resource efficient our manufacturing businesses are. The metrics have yet to be agreed, and the mechanism to monitor them will be a considerable challenge.

Why we are considering this action

To maximise the innovation opportunities presented by moving towards a more a circular economy. To raise awareness of the opportunities and share examples of innovative practice.

Annex A: List of consultation questions

1. Are you responding as an individual or on behalf of an organisation? If you're responding on behalf of an organisation, please provide the organisation's name.

☐ Individual ☐ Organisation

Name of organisation:

We've identified some potential actions to reduce emissions between now and 2030 but want to know how you think we should take these ideas forward and what else could be done. We also want to understand where to focus efforts in the short-term and understand how we might enhance the relationships between sectors to reduce emissions.

When we talk about sectors we mean the emission reduction sectors (such as Transport, Power, Waste, Industry, Agriculture, Land use and Forestry, Buildings and Public sector) and cross-cutting areas (such as Innovation, Skills, Planning, Procurement and wider enabling mechanisms).

2. Overall, to what extent do you agree with the potential actions for reducing emissions set out in this document? (1=completely agree, 5=completely disagree)

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

Please explain the reasons for your answer:

3. Please tell us if you have any ideas for how we should deliver the potential actions for reducing emissions.

4. What other ideas do you have for reducing emissions between now and 2030?

5. Considering the opportunities and challenges in each sector, what are your views on whether action should be prioritised in some sectors over others?

6. How could we encourage more collaboration and innovation between sectors?

Through our actions to reduce emissions, we want to maximise the wider benefits and minimise adverse effects for the people of Wales, both now and in the future.

When we talk about potential actions we mean the ideas in this document and any other ideas you have mentioned in Question 3.

7. How do you think the potential actions to reduce emissions might affect you or the organisation you work for?

8. How do you think the potential actions to reduce emissions might affect the following?
    - Public health
    - Communities
    - The Welsh language
    - Equality
    - Children's rights

9. How do you think the potential actions to reduce emissions might contribute to achieving the national well-being goals? You can read descriptions of the goals at https://futuregenerations.wales/about-us/future-generations-act.

10. Do you have any other comments about this consultation?

Annex B: List of potential actions to 2030

1. Collaborate with business to further decarbonise their activities whilst at the same time improving their competitiveness and productivity to take advantage of the opportunities arising from the transition to a low-carbon economy
2. Work with Regional Skills Partnerships to anticipate future skills needs, focusing on priority growth sectors identified within regions
3. Review all current skills and work-based learning programmes to explore whether they can respond more flexibly to emerging requirements such as those represented by decarbonisation, working closely with employers
4. Conduct a gap analysis of options where innovation can support the decarbonisation agenda and maximise the opportunities
5. Collaborate with organisations across all levels of society and involve citizens in achieving our low-carbon pathway
6. Provide fruit, shade and fuel trees for the entire Mount Elgon region, Uganda by 2030

Power

7. Support the development of regional and local energy planning to address the supply, distribution, and use of energy
8. Support innovation and commercialisation of new products, processes and services in the energy system
9. Develop and implement Wales's policy position around the extraction and combustion of fossil fuels in power generation
10. Accelerate the deployment of renewable generation whilst encouraging local ownership

Transport

11. Develop a charging network that encourages early take-up of electric vehicles (EVs) and explore the merits of other measures, including access to bus lanes and free municipal parking
12. Reduce the carbon footprint of taxis and buses to zero within 10 years to achieve the aim in the Economic Action Plan
13. Double the percentage of adults making cycling journeys at least once a week and increase the percentage of people making walking journeys at least once a week by 25% from the 2016 baseline
14. Explore the relationship between speed limits and greenhouse gas emissions, with a view to considering environmental factors in speed limit reviews

Buildings

15. Set higher energy efficiency standards for new builds through reviewing Building Regulations Part L (Conservation of Fuel and Power)
16. Develop a long-term residential retrofit programme based on evidence
17. Establish the baseline of energy use and associated emissions from business sector buildings
18. Deliver buildings that are more sustainable by using innovative construction techniques to reduce and meet the energy demand within buildings and increase the use of sustainable materials, such as timber
19. Scope out the challenges and opportunities around low-carbon heat

Agriculture

20. Provide post-Brexit support in the form of a land management programme that contains a public goods scheme and an economic resilience scheme, replacing the Common Agricultural Policy (CAP) with a framework that also links support to emissions reduction and removals
21. Ensure that emissions reduction is considered in any regulatory reform proposals arising from the land management programme consultation

Land use and forestry

22. Revise our regulatory and support regimes to increase tree planting to at least 2,000 hectares per year, aiming to increase this to 4,000 hectares
23. Identify preferred areas for tree planting, including commercial woodlands and planting at medium and large scale
24. Ensure that all peatlands supporting semi natural habitats are under active management by 2030 by supporting, enabling and co-ordinating the restoration and sustainable management of peatland, as well as utilising and maximising associated funding opportunities

Industry

25. Commission an independent economic and technical feasibility study on carbon capture use and storage (CCUS)
26. Consider the further development of our Environment Protection Scheme (EPS) beyond 2020 to support the most carbon-intensive industries
27. Consider waste heat recovery and use as part of the approach to heat policy
28. Establish an industry-led working group on decarbonisation

Public sector

29. Support the public sector to baseline, monitor and report progress towards carbon neutrality
30. Public sector buildings are supplied with renewable electricity by 2020 and, where practicably possible, are supplied with low-carbon heat by 2030
31. All new cars and light goods vehicles in the public sector fleet are ultra low emission by 2025 and where practicably possible, all heavy goods are ultra low emission by 2030

Waste

32. Create new opportunities for resource efficient manufacturing through embedding resource efficiency within our programme of innovation support to SMEs and using public sector procurement to stimulate the market

Annex C: Sector definitions

The emissions data in the consultation are structured according to the approach taken by the UKCCC in their advice to Welsh Government on setting targets and budgets. The UKCCC use the following categorisation to link between the DA Greenhouse gas Inventory and the sector headings:

CCC SECTOR	NC FORMAT	IPCC CATEGORY
POWER	Energy Supply	Public_Electricity&Heat_Production (1A1ai) Electricity generators at Welsh businesses - Public_Electricity&Heat_Production (1A1ai_)
RESIDENTIAL BUILDINGS	Residential	Residential_stationary (1A4bi) Residential:Off-road (1A4bii) Non-energy_products_from_fuels_and_solvent_use: Paraffin_wax_use (2D2) Metered_dose_inhalers (2F4a) Aerosols:Other (2F4b) Composting_municipal_solid_waste (5B1a) Non-biogenic:Other (5C2.2b) Non-biogenic:Other_Accidental fires (vehicles) (5C2.2b)
(NON-RESIDENTIAL BUILDINGS)	Public	Commercial/Institutional buildings(1A4ai)
	Business	Commercial/Institutional buildings (1A4ai)
INDUSTRY	Industrial Process	all
	Business	all except Commercial / Institutional buildings (1A4a) and Business Generators -Public_Electricity&Heat_Production (1A1ai_)
	Energy Supply	all except Power (1A1ai)
TRANSPORT	Transport	All but Domestic_aviation (1A3a), Domestic_navigation (1A3d) and Fishing (1A4ciii)
AGRICULTURE	Agriculture	all
LAND USE, LAND USE CHANGE, AND FORESTRY	Land use change	all
WASTE	Waste management	all
INTERNATIONAL AVIATION AND SHIPPING	Exports	Aviation_Bunkers Marine_Bunkers
	Transport	Domestic_aviation (1A3a) Domestic_navigation (1A3d) Fishing (1A4ciii)
F-GASES	All F-gases, independent of sector	