Climate action across the Welsh public sector estate

Guidance on decarbonisation and climate resilience for public sector buildings and land

Final Version

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Foreword

Forward by Beverly Owen, Ystadau Cymru Board Chair and Chief Executive of Newport City Council

Wales faces a decisive moment. The accelerating impacts of climate change require every part of our public estate to become more resilient, adaptive, and aligned with our communities' long-term well-being. As stewards of public assets, we are responsible not only for reducing emissions, but also for preparing our buildings, land, and infrastructure for the future climate.

Ystadau Cymru was established to champion excellence in collaborative asset management across the Welsh public estate. Rooted in the Well-being of Future Generations (Wales) Act 2015, our mission is to support a stronger, greener and more sustainable Wales-one where decisions are made holistically, and where public assets actively contribute to national well-being goals. The Ystadau Cymru Sustainability Working Group plays a vital role in this mission, bringing together expertise from local authorities, health boards, national bodies, and the Office of the Future Generations Commissioner to drive progress across decarbonisation, nature recovery, and climate adaptation.

This strategic guidance on decarbonisation and climate change adaptation reflects that shared commitment. Developed by the Welsh Government's Energy Service in partnership with Ystadau Cymru, it draws on the insight and experience of practitioners from across Wales. Through a series of workshops held with colleagues throughout the country, we gathered views and ensured that the guidance responds to the real challenges faced by those managing and operating the public estate.

The result is practical, evidence-based guidance designed to support estate managers, decision-makers, and practitioners in taking action on climate change, embedding resilience into planning and investment, and ensuring that public assets remain safe, functional, and fit for purpose now and in the future. The guidance supports organisations across Wales to take more confident, coordinated steps toward a climate-ready public estate-one that protects people and services, supports nature recovery, and contributes to a thriving Wales.

Together, we can ensure that the public assets we manage today continue to serve future generations with integrity, resilience, and purpose.

1. Ystadau Cymru

Ystadau Cymru, established by the Welsh Government, supports excellence in estate management across the Welsh public sector. It brings together organisations from local government, health, education, emergency services, and Welsh Government to encourage strategic collaboration, holistic decision-making, and the sharing of best practice guidance. Ystadau Cymru is aligned with the Well-being of Future Generations (Wales) Act 2015 and works to ensure that public assets are managed in a way that improves social, cultural, environmental and economic well-being.

Ystadau Cymru follows a clear set of objectives through a delivery plan that prioritises reducing carbon emissions and promotes innovative, collaborative asset management. It supports strategies to maximise public value from buildings and land, ensuring these resources continue to benefit local communities and contribute to a greener, more sustainable Wales.

In 2024, Ystadau Cymru's commitment to sustainable asset management was further reinforced through the creation of a dedicated Sustainability Sub-Group. The group draws on expertise from across the public sector to champion environmentally responsible approaches as progress continues.

This guidance builds on the work Ystadau Cymru, and its stakeholders, have already undertaken and forms just one part of a longer-term journey toward a more resilient and future-focused Welsh public estate.

To find best practice case studies, newsletters, guides, and more about Ystadau Cymru, please visit: https://www.gov.wales/ystadau-cymru

2. Introduction

2.1. Report overview

The Welsh climate change policy landscape is broad, with numerous pieces of legislation and dozens of action plans and guidance documents influencing the public sector's approach to decarbonisation, climate resilience, sustainability and nature recovery.

The purpose of this report is to provide straightforward, actionable insights to help public bodies reduce the carbon emissions associated with their estates and adapt their assets and practices to a changing climate.

In this report, the term 'climate action' is used to cover climate mitigation and climate adaptation – both decarbonisation measures to reduce greenhouse gas emissions and interventions to increase resilience in response to a changing climate.

With different functions, priorities, geographies and progress on climate action, there is no 'one-size-fits-all' approach for public sector organisations. This report aims to address common challenges encountered by a range of public bodies in Wales, from large local authorities and health boards to small town and community councils. It suggests practical actions to bring about change across the following themes, with climate adaptation and resilience referenced within each theme:

- Carbon management
- Strategic estate planning and collaboration
- Project development and implementation
- Energy efficiency
- Controls and behaviour
- Low carbon heat
- Renewable energy
- Nature-based solutions to climate change

This report is not intended to be read from cover to cover. Rather, it is designed for public bodies to navigate to the section most relevant to the current stage of their climate action journey.

Given the wealth of information already available on climate action, relevant existing resources are signposted within the report and referenced in the bibliography.

2.2. Methodology

In spring 2025, Ystadau Cymru commissioned the Welsh Government Energy Service ('the Energy Service') to provide a report with advice for the public sector on decarbonisation and climate resilience across the public sector estate. To achieve this, the Energy Service carried out primary and secondary research by:

- Hosting three workshops over summer 2025, attended by 76 public sector representatives across health, local authorities, town and community councils, the Welsh Local Government Association and other public bodies.

- Attending two Ystadau Cymru Sustainability Steering Group sessions, one Ystadau Cymru Board meeting and regular meetings with Ystadau Cymru management for feedback on workshop results and guidance on the direction of the report.
- Undertaking a desk-based based literature review.

In November 2025, Ystadau Cymru also partnered with the Future Generations Commissioner for Wales on its annual conference and awards "A Decade of Action: Aligning Estate Management with the Wales We Want". This report draws on the presentations and discussions at that event.

In collaboration with Ystadau Cymru, the Commissioner has published a complementary guide to sit alongside this report, which contains information on how to incorporate climate and nature resilience into land management ([available here](#)).

2.3. Policy context

The Welsh Government has set ambitious national targets on climate action, underpinned by key legislation:

- The **UK Climate Change Act** 2008[1] (amended in 2019):
  - Sets a net zero by 2050 target for the whole of the UK;
  - Introduced carbon budgets for 5-year periods, to create a pathway to net zero;
  - Applies across the whole of the UK, allowing devolved nations to enact their own climate polices;
  - Requires Wales and the rest of the UK to prepare for climate impacts, through climate change risk assessments (CCRA) every 5 years, and reporting on adaptation progress.

- The **Well-being of Future Generations (Wales) Act** 2015:
  - Places a legal duty on Welsh public bodies to improve the social, economic, environmental and cultural wellbeing of Wales;
  - Focuses on long-term impacts and preventing problems such as poverty, health inequalities and climate change;
  - Supports a resilient Wales that maintains and enhances the natural environment;
  - Requires public bodies to take a collaborative approach to service delivery;
  - The Act's statutory guidance[2] identifies asset management as one of the areas where change is needed within public bodies.

- The **Environment (Wales) Act** 2016[3]:
  - Focuses on the sustainable management of natural resources;
  - Includes goals to enhance the resilience of natural systems and deliver co-benefits for the environment, people, the economy and Welsh communities;
  - Places a duty on Welsh Ministers to set targets for reducing greenhouse gas emissions and create plans for enhancing biodiversity and resilience.

- The **Climate Change (Carbon Budgets) (Wales) Regulations** 2018, 2021[4] and 2025[5]:
  - Sets legally binding carbon budgets which cap the total greenhouse gas emissions allowed over a five-year period.

The Welsh Government has produced various supporting strategies, route maps and action plans to meet the requirements of these laws. These include:

- **Prosperity for All: A Low Carbon Wales (2019)**[6]: 100 policies and proposals to help meet the Welsh Government's first carbon budget and build the foundations for further emissions reductions.

- **Prosperity for All: A Climate Conscious Wales (2019)**[7]: a climate change adaptation plan addressing the most urgent risks identified in the Climate Change Committee's (CCC's) 2017 Climate Change Risk Assessment for Wales[8]: flooding, drought/water scarcity, land management, and ecosystem and agricultural business risks.

- **Net Zero Wales Carbon Budget 2 (2021-25) strategy**[9]: policies and proposals to meet Wales's second carbon budget and set the trajectory to net zero by 2050. The third carbon budget strategy is due to be published in 2026.

- **Future Wales: The National Plan 2040 (2021)**[10]: a framework for planning changes and development, considering land assets from a national perspective.

- **Net zero carbon status by 2030: A route map for decarbonisation across the Welsh public sector (2021)**[11]: an overview of the priority areas of action for the sector.

- **Wales Net Zero 2035 Report (2024)**[12]: a series of seven reports commissioned by Welsh Government and Plaid Cymru aiming to renew and accelerate Wales's approach to achieving net zero, prepared by a group of independent experts including representatives of the Welsh Youth Parliament.

- **Heat Strategy for Wales (2024)**[13]: lays out a pathway to net zero heat in Welsh buildings across all sectors by 2050.

- **Climate Adaptation Strategy for Wales (2024)**[14]: national-level strategy which sets out the policy approach and the actions the Welsh Government is taking across sectors to achieve climate resilience in Wales. This now supersedes the Prosperity for All plans.

- **Just Transition Framework (2025**[15]**):** Sets out the Welsh Government's approach to achieving a just transition to net zero by 2050.

Additionally, there are existing decarbonisation strategies and plans at regional, county, sector and organisational level across the Welsh public sector, for example:

- **Regional energy strategies and action plans** for North[16], Mid[17], South-West Wales[18] and the Cardiff Capital Region[19], demonstrating the types of initiatives, level of investment and economic opportunities associated with decarbonising power, heat and transport at regional level.

- **Local Area Energy Plans** in all 22 local authorities in Wales, providing data and evidence to map the current and future energy system at the county level.

- The **NHS Wales Decarbonisation Strategic Delivery Plan**[20], outlining how to reduce Welsh health sector emissions.

- **Organisational carbon footprints and decarbonisation strategies** for numerous individual public bodies in Wales.

To enable these ambitious targets and strategies, there are various grant and loan funding schemes available for the public sector. These schemes apply either to specific sub-sectors, or to specific decarbonisation themes. For example:

- Ystadau Cymru's **Assets Collaboration Programme,**[21] which funds collaborative projects to improve the sustainability of the Welsh public sector estate.

- The Welsh Government Energy Service's **Decarbonisation Project Design and Development Grant,**[22] which supports the costs of design and development of projects aimed at reducing public sector emissions.

- The **Wales Funding Programme,**[23] which provides loan funding for energy efficiency and decarbonisation projects for public sector bodies registered in Wales.

- The **Digarbon**[24] funding scheme aims to help higher and further education institutions to decarbonise.

- The **Zero Emission Vehicle and Electric Vehicle Charging Infrastructure Grant**[25] (ZEV and EVCI), which provides funding for the switch to zero emission vehicles and setting up charging infrastructure.

- The **Local Authority**[26] **and Public Sector Low Carbon Heat Grants**[27] aim to help public buildings improve their heat efficiency and electrify heat.

- The **Ynni Cymru**[28] grant supports **community-owned renewable energy and Smart Local Energy Systems** (SLES).

- The **Ymestyn**[29] grant is open to public sector and community enterprises to provide top-up funding for financially challenging, implementation-ready renewable energy projects.

Examples of adaptation publications and resources relevant to the Welsh public sector include:

- **UK Climate Risk: Climate Change Risk Assessment – Independent Assessment (CCRA3-IA)** (2021)[30]. The third CCRA is a technical report that examines the 61 identified climate risks and opportunities for the UK and provides a summary of the latest understanding of current and future climate changes in the UK. CCRA4-IA is due to be released in May 2026.

- **Public Services Board (PSB) climate risk assessments, adaptation strategies and wellbeing plans,** e.g. Pembrokeshire[31] (2022): local, multi-agency plans outlining climate risks and priority actions to strengthen community resilience, protect infrastructure, and support long-term wellbeing across each PSB area.

- **Natural Resources Wales: Climate Change Adaptation Plan** (2023-2027)[32]: a strategic programme setting out how NRW will prepare its land, water, forestry and regulatory functions for climate impacts, focusing on risk reduction, ecosystem resilience and service continuity.

- **Welsh Government: Health and social care climate adaptation toolkit** (2024)[33]: A practical resource to help health and social care organisations assess climate risks and embed adaptation into planning, estates, service delivery and emergency preparedness.

- **Welsh Government: Adaptation Accelerator in Wales** (2025-26)[34]: A structured programme designed to speed up climate adaptation planning and implementation, particularly in the health and social care sector.

- **National Infrastructure Commission for Wales: A Perfect Storm: Is Wales doing enough to coordinate action and engage communities in adapting our infrastructure to a changing climate?** (2025)[35]: An independent review examining whether Wales is sufficiently coordinating infrastructure adaptation, highlighting gaps in governance, investment and community engagement.

- **National Infrastructure Commission for Wales: Toolkit: Engaging diverse communities in climate adaptation conversations** (2025)[36]: A guidance toolkit offering methods, principles and practical tools to involve a wide range of communities in shaping climate-resilient infrastructure decisions.

- **Natural Resources Wales: State of Natural Resources Report 2025[37]**. Evidence base forming the assessment of Wales's sustainable management of natural resources: air, land, water, wildlife, plants and soil.

- **Maximising UK Adaptation to Climate Change (MACC) Hub[38]**. This online resource aims to address climate risks by examining the levers of change for adaptation in the UK and advancing transformative climate adaptation strategies.

2.4. Assessments of progress on climate action

There are various independent assessments of progress on climate action for the UK, Wales and specifically for the Welsh public sector, including:

- **Audit Wales:** Public Sector Readiness for Net Zero Carbon by 2030 (2022)[39]: acknowledges that Welsh public bodies have demonstrated commitment to decarbonisation but now need to 'ramp up activities, increase collaboration and place decarbonisation at the heart of their day-to-day operations and decisions'. The Auditor General set out five calls for action for public sector organisations:

  1. Strengthen your leadership and demonstrate your collective responsibility through effective collaboration.
  2. Clarify your strategic direction and increase your pace of implementation.
  3. Get to grips with the finances you need.
  4. Know your skills gaps and increase your capacity.
  5. Improve data quality and monitoring to support your decision making.

- **The Climate Change Committee: Progress Report: Reducing emissions in Wales (2023)**[40]: a report assessing progress in Wales towards its legislated emissions reduction targets. The report examines emissions reductions, policy, and cross-cutting actions such as governance and adaptation. Key messages included:

  - The first carbon budget for Wales (2016-2020) was achieved, with a 28% reduction in emissions below 1990 levels.

  - There has been insufficient progress in many decarbonisation indicators which are dependent on Welsh policy powers e.g. tree planting, peatland restoration and electric vehicle charging infrastructure.

  - There have been examples of positive policy progress (e.g. Skills Action Plan) but further policy action is needed across all sectors of the economy.

- **The Future Generations Commissioner for Wales: Future Generations Report (2025)[41]:** this statutory report, published on the tenth anniversary of the Well-being of Future Generations (Wales) Act included the following recommendations:

  - Public bodies must prioritise climate resilience, nature recovery, and decarbonisation in how they manage their estates, including their buildings, tenant farms, parks, roadside verges and other land assets.

  - Public sector organisations should increase their collaboration with local energy projects by releasing land for joint ventures and committing to purchasing the electricity.

  - Climate resilience and adaptation must become a core priority.

The public sector in Wales has a clear ambition to be Net Zero by 2030, set out in Net zero carbon status by 2030: public sector route map (2021). This ambition is designed to galvanise and accelerate action, whilst Wales's statutory commitment to Net Zero is in line with the wider UK commitment of achieving Net Zero by 2050.

3. Decarbonisation and climate resilience: the joint challenge

3.1. Welsh public sector carbon reporting

The public sector in Wales is made up of large organisations such as the Welsh Government, the National Health Service (NHS) Cymru and 22 local authorities, as well as hundreds of town and community councils and other public bodies, including universities and colleges. In total, these **public organisations are responsible for around 4,600 buildings in Wales** and thousands of hectares of land, each with their own unique requirements when it comes to decarbonisation and climate resilience.

Welsh public bodies have been reporting on their carbon emissions since 2020, in accordance with the Welsh Public Sector Net Zero Carbon Reporting Guide[42]. This guidance standardises emissions reporting and encourages public bodies to track renewable energy generation and account for supply chain emissions. The results of this reporting are available in an interactive dashboard hosted on the Welsh Government website[43].

There are important caveats to consider when viewing the Welsh public sector carbon reporting results. Firstly, the reporting is continually evolving; every year, more organisations report their emissions, reporting requires increasingly granular data and data collection tends to become more accurate over time. Secondly, public bodies are not always directly comparable due to the variation in the types of services they provide, their scale, geographical location and differing priorities.

In the most recent reporting period (2023/24), the following public bodies reported on their carbon emissions[44]:

- Welsh Government
- All 22 local authorities
- All 13 NHS Wales organisations
- All 8 universities
- All 3 Fire and Rescue Services
- All 3 National Park Authorities
- 10 colleges
- 18 other public sector bodies (such as national museums and libraries)

Figure 1 shows that local authorities represented the largest proportion of the public sector footprint by organisation type, contributing 43% of reported emissions. NHS bodies were the second highest emitting organisation type, contributing roughly 33% of the total footprint.

Figure 2 shows that **buildings represented 15% of Welsh public sector emissions** (of which 70% was from heating[45]), making it the second largest source of emissions, behind the supply chain, representing 72% of total emissions.
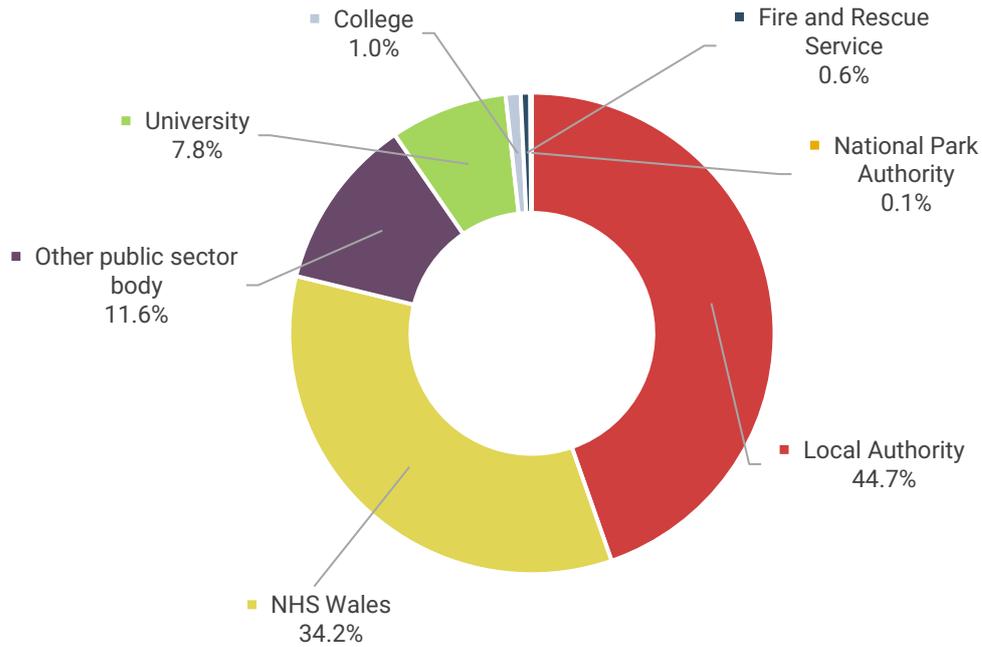
Figure 1: Welsh public sector carbon emissions by organisation type (%), 2023/24[46]
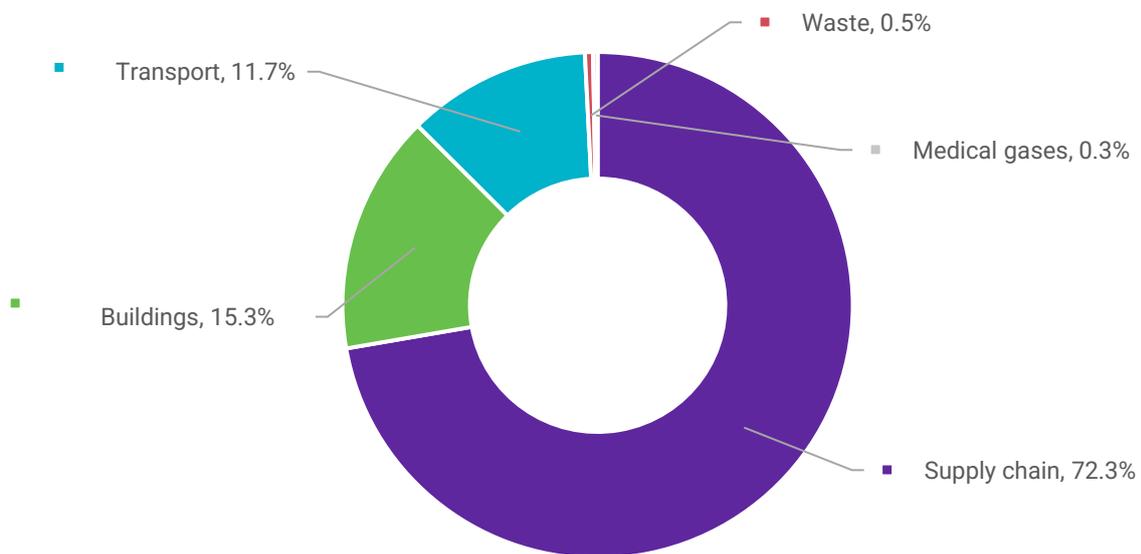
Figure 2: Welsh public sector carbon emissions by category (%), 2023/24[47]

Despite an increasing number of organisations reporting their emissions every year (47 organisations in 2019/2020, up to 79 in 2023/2024), emissions from public sector buildings has dropped. Comparing emissions from 2019/20 and 2023/24:

- Emissions from public sector buildings in Wales decreased by 7%, dropping from 583 to 541 tCO$_2$e. This is most likely due to national electricity grid decarbonisation alongside a general reduction in gas consumption – although it is not clear what

has driven this gas reduction, for example whether this is due to increased energy efficiency, the electrification of heat, or demand reduction.

- Emissions from transport have increased, climbing 15% from 358 to 413 ktCO2e – this is likely due to increases in business travel and commuting post-lockdown.

Note on land use, land use change and forestry (LULUCF) emissions: *Although public sector organisations in Wales do report on their land use and carbon sequestration, this is not currently included in their Scope 1, 2 or 3 emissions reporting, nor in the overall Welsh public sector footprint.*

To reach net zero by 2030, the Welsh public sector has a huge challenge which requires collective effort across all public bodies. With buildings representing a significant proportion of public sector emissions, decarbonising the built estate – and its associated supply chain – is a crucial part of the pathway to net zero. Land assets also represent a significant proportion of possible mitigation and sequestration opportunities, so understanding their opportunities and the priorities for action is also crucial.

3.2. Climate adaptation in the Welsh public sector

In 2023, the Climate Change Committee published a report on climate adaptation progress in Wales[48], observing that:

- Although adaptation planning is becoming more commonplace, it is inconsistent across sectors, and monitoring and evaluation are limited, making it difficult to assess progress against adaptation goals.

- There is a lack of clarity in responsibilities for responding to climate risks across the public sector.

- There are updated building regulations to address overheating in some new buildings, but there is not yet anything similar for existing buildings, and there are no policies or financial instruments to support adaptation of the existing building stock.

- Adaptation planning for flood risk management has seen significant progress, despite some persisting data gaps e.g. policies to manage urban drainage.

- Both Cardiff Airport and the rail network have a good base level of planning in place for adaptation, however, more work is recommended to be done on local road networks. Key infrastructure such as bridges are likely to need improvements.

- Extensive emergency response structures and procedures have been put in place for some extreme weather events, most notably flooding.

- Various public sector organisations, such as the Welsh Local Government Association (WLGA), Natural Resources Wales (NRW), the Future Generations Commission for Wales (FGC), and Cadw are working to progress planning, strategy and action on climate adaptation.

3.2.1. Current climate impacts in Wales

Wales is already facing major public health and safety risks from climate hazards, for example:

- **Storms and flooding are common and widespread**. Natural Resources Wales (NRW) has estimated that 275,000 buildings in Wales are at risk of flooding, equivalent to one in seven properties[49]. In 2024, Storms Bert and Darragh caused severe wind and rain, widespread flooding, and landslides.

- **Some Welsh coastal areas are particularly exposed to climate risks**. Fairbourne in Gwynedd has been identified as one of the UK's most vulnerable locations in relation to climate hazards and is projected to be uninhabitable by 2100 due to flooding[50]. This is already having serious implications for the local community[51], including property and land-owners and residents, as property values have decreased, access to mortgages is limited and relocation is being considered.

- **Rising temperatures**, with Flintshire recording the highest-ever temperature in Wales (37.1°C) in the 2022 heatwave[52].

- Between 2022 and 2023, Wales experienced its first official **drought** since 2006[53], leading to **wildfires**, such as those seen on heathlands in 2023, 2024 and 2025, and **water shortages**. Droughts were also declared in North and South-East Wales in August 2025, with North Wales experiencing its driest six month period since 1976[54].

3.2.2. Expected climate impacts in Wales

Climate change impacts are expected to continue to intensify in Wales in the future. The extent of the impact of climate change will depend on the success of climate mitigation efforts globally.

In the UK, the Met Office publishes evidence for climate projections for a range of emissions scenarios and for a range of time periods, through the UK Climate Projections datasets and reports[55]. Future Wales[56] references these projections (UKCP18), using a baseline period of 1981-2000 at the 50th percentile, meaning the outcome is equally likely as unlikely to occur, and a high emissions scenario*. Figure 3 outlines the expected changes in Wales by 2050 and 2080: higher average summer temperatures, increased winter precipitation, decreased summer precipitation and rising sea levels.

*The high emissions scenario is Representative Concentration Pathway (RCP) 6.0. Sea level rise projections are taken from a medium-high emissions scenario (RCP 4.5).

Climate change projections for Wales

	2050	2080
Summer average temperatures in Wales are projected to increase by	**1.34°C**	**3.03°C**
Winter precipitation in Wales is projected to increase by	**5%**	**9%**
Summer precipitation in Wales is projected to decrease by	**16%**	**23%**

Sea levels are predicted to rise across the country*

For example in:

	2050	2080
North Wales (Llandudno), by	**19cm**	**34cm**
Mid Wales (Aberystwyth), by	**22cm**	**38cm**
South Wales (Cardiff), by	**24cm**	**42cm**

All projections are taken from a 1981-2000 baseline, at the 50th percentile, meaning they represent an outcome which is as likely as it is unlikely to occur.

* SLR projections are taken from RCP 4.5 (medium-high) emissions scenario. All other projections from RCP 6.0 (high) emissions scenario.

Figure 3: Climate change projections for Wales (source: Future Wales: the national plan 2040[57], based on data from the Met Office's UK Climate Projections (UKCP18)[58])

3.2.3. Buildings and land in a changing climate

A changing climate and landscape of climate hazards brings with it a range of risks and opportunities for the built environment and land assets:

- Buildings in many parts of Wales need to improve their resilience to flooding and heavy rainfall to prevent communities from facing heavy damages and costs, especially in areas likely to flood regularly.

- An increased frequency of extreme weather events can increase the risk of power cuts and damage to buildings and land assets.

- As temperatures rise, so will overheating risks. Buildings will need cooling capabilities, whether that means improved ventilation, shading or some form of low-carbon cooling. Measures will be required to both indoor and outdoor spaces.

- Milder winters could lower heat demand and thus reduce energy consumption and costs. However, warmer summers may increase energy consumption and costs for additional cooling requirements.

- Infrastructure will be put under more pressure by increased flood risk and higher temperatures. For example, during periods of extreme heat, railway tracks are at risk of buckling, and power lines are likely to sag, reducing the efficiency of electricity distribution. Similarly, many railways and roads are at risk of flooding during storms and heavy rain.

- Coastal flooding and erosion present a significant risk to building stock in coastal communities. Roughly 60% of the Welsh population lives in coastal areas[59], and there are numerous communities living below the high tideline, such as Aberaeron and Borth.

- Land and food: as climate conditions shift, new opportunities regarding crop suitability are likely to come up, as well as new risks regarding pests, diseases and invasive species. An increase in weather unpredictability (e.g. heat waves, droughts, storms, flooding) will also make agricultural planning more difficult[60].

- The trend in increasing sunshine hours in Wales[61] may create an opportunity for greater energy generation from solar PV.

- The scale and breadth of risks that are likely to emerge in the post-industrial landscape is affected by climate change including vulnerabilities to land subsidence, mine water, slope stability, and dispersed pollution from contaminated land.

4. Progressing public sector decarbonisation and climate resilience

This chapter presents actions for addressing some of the key challenges that public bodies face in reducing carbon emissions from their buildings and land and making their estates more resilient to the current and future changes in climate. Actions and case studies are presented against the following themes and sub-themes, with climate adaptation and resilience considered within each theme:

1. **Carbon management**
   - Governance
   - Data collection
   - Supply chain

2. **Strategic estate planning**
   - Understanding building stock and land assets
   - Land use for climate action
   - Holistic planning
   - Collaboration

3. **Project development**
   - Skills
   - Project funding
   - Climate change adaptation in project development
   - Engaging with the Distribution Network Operator (DNO)

4. **Energy efficiency**
   - 'Low hanging fruit'
   - Building fabric
   - Building systems

5. **Controls and behaviour**
   - Energy management knowledge gap
   - Building controls
   - Behaviour change

6. **Low carbon heat**
   - Low temperature heating fundamentals
   - Heat pump deployment
   - Heat networks

7. **Renewable energy**
   - Identifying sites for renewable energy
   - Grid connection
   - Internal resource and funding
   - Monitoring and optimising renewable energy installations
   - Climate resilience and renewables

8. **Nature-based solutions**

- Carbon sequestration (mitigation)
- Natural flood management
- Urban green infrastructure
- Net benefit for biodiversity

4.1. Carbon management

4.1.1. Introduction

To reduce carbon emissions from the built estate, organisations first need a solid understanding of their carbon emissions. Carbon management practices, including emissions reduction measures for buildings, energy management and carbon reporting, are generally well understood across the Welsh public sector, particularly within energy, sustainability and estates teams. The next stage is for carbon management to become embedded more broadly and deeply across organisational practices, from procurement to operations. It is also important that climate adaptation and resilience efforts to climate change-related risks become integrated into decarbonisation activity. This section highlights actions for overcoming some of the common challenges for effective carbon management in the public sector, linked to governance, data collection and supply chains.

4.1.2. Governance

The challenge: Poor governance, limited collaboration and lack of clarity around roles and responsibilities can be a barrier to effective carbon management practices. Climate resilience tends to be considered separately from carbon management.

The need: To create a clear vision for climate action, bringing together decarbonisation and climate resilience. Effectively communicating this vision so that each team and individual knows their respective responsibilities and is empowered to act.

Actions:

1. **Review existing carbon management policies, processes and governance structures.** Are climate risks and resilience measures adequately reflected and resourced alongside carbon management? Does responsibility for climate action sit with a particular team or individual? How could climate action responsibilities flow across the wider organisation? How is progress tracked?
2. **Support internal collaboration.** Cross-team working (i.e. estates, sustainability, procurement, operations etc.) is required alongside buy-in from the top down e.g. establish a cross-departmental taskforce on climate action.
3. **Support estate teams to manage conflicting priorities,** such as resources for climate action projects versus routine maintenance. Identify and prioritise 'win-win'

actions – those which bring multiple benefits across different priority areas. E.g. recognising that effective, proactive building maintenance can save energy, carbon and costs as well as increase climate resilience.

4.1.3. Data collection

The challenge: Incomplete and/or poor quality data can prevent organisations from understanding and managing energy, emissions and climate risks effectively. This can make it harder to know where to direct resources and can reduce the impact of climate action measures.

The need: Standardised, granular data to enable effective management and to provide a robust evidence base for decision making on climate action. This includes data on energy use and generation (e.g. from renewable energy assets), carbon emissions, and climate risks and issues.

Actions:

1. **Review existing data and collection processes.** Identify any gaps in data compared to the requirements of the Welsh public sector carbon reporting, e.g. which figures are actual versus estimates, are there opportunities for automating or streamlining data collection processes?
2. **Implement a formal, standardised framework for climate data collection processes.** Write down and communicate roles, responsibilities and processes for data collection. Include contingency plans, especially where responsibility for data collection sits with one individual.
3. **Install half-hourly metering and sub-metering** to increase the resolution and quality of the energy data collected. Link this data to a centralised energy management system where possible.
4. **Move from organisation- to site-level monitoring and reporting.**
5. **Collect time-of-use carbon data** when procuring electricity through green tariffs, if possible – this supports accurate market-based carbon reporting.
6. **Record energy generation and installed capacity of solar panels and other renewable energy assets.** This is now required for public sector emissions reporting in Wales.
7. **Obtain REGO certificates** (Renewable Energy Guarantee of Origin) for electricity procurement. This ensures electricity is certified as low carbon and supports transparency in market-based carbon accounting methodologies.
8. **Calculate embodied carbon for new developments** following standardised guidance from organisations such as UKGBC[62], LETI[63], and CIBSE[64].
9. **Communicate insights from data collection**. Firstly, ensure relevant teams are aware of what data is being collected, know where it is stored, and can access the data. This can improve holistic planning and strengthen the impact of decarbonisation initiatives. Sharing evidence-based insights also creates an opportunity for engaging and inspiring staff and service users, e.g. 'this year, we reduced our emissions by X'; 'solar energy provided X% of our electricity use'; 'spotting this spike in our energy use helped us fix the problem and saved us £X' etc.

4.1.4. Supply chain

The challenge: Supply chain emissions are normally the highest source of emissions for public sector organisations in Wales. In 2024, they represented 72% of the total Welsh public sector footprint. Complex procurement processes and a lack of resources to engage the supply chain can lead to a poor understanding of these emissions, limiting the public sector's ability to influence suppliers and reduce climate impacts.

The need: Procurement and accounting processes that enable the collection of detailed supply chain data. Engagement with the supply chain is also needed to identify emission reduction opportunities, support collaboration and enable joint action on climate change.

Actions:

1. **Build internal expertise** on supply chain emissions. Identify responsibilities and ways of working for supply chain engagement and data capture, noting that this may span several teams, e.g. carbon management, procurement, finance, operations etc.
2. **Report supply chain emissions** and streamline data collection in line with Welsh Government public sector carbon reporting requirements[65].
3. **Move away from spend-based emissions reporting** to supplier-specific emissions where possible, to improve data accuracy.
4. **Engage the supply chain** to further understand supplier emissions and support collaborative action on emission reductions. Support suppliers where they don't have the knowledge or capacity to address carbon management, particularly SMEs, acknowledging this can take time. Signpost to existing initiatives, such as the free resources available via the Supply Chain Sustainability School.
5. **Prioritise key suppliers** (by value or emissions) where resources for supplier engagement are limited.
6. **Review procurement processes** and specify carbon reporting requirements in relevant contracts, e.g. above a certain monetary value.
7. **Collaborate across the public sector** to standardise requests for information from suppliers and share data, where appropriate.

Resources:

- **Carbon emission reporting guidance**: Welsh Public Sector Net Zero Carbon Reporting Guide
- **Green House gas Protocol carbon accounting methodology**: Standards & Guidance | GHG Protocol
- **Scope 3 (supply chain) emissions**: Corporate Value Chain (Scope 3) Standard | GHG Protocol and Home - Supply Chain Sustainability School
- **CIBSE TM39 guide to metering:** TM39: Building energy metering | CIBSE
- **Welsh Government sustainable procurement policies**: Procurement policy notes
- **Local Authority Sustainable Procurement Toolkit:** Resources – Procurement
- **Net Zero Scenario Planner:** Net Zero Scenario Planner - WLGA

Case study: Aberystwyth University - campus wide energy upgrades

The challenge

Aberystwyth University (AU) has an ambition to reach net zero by 2030 on time and cost-effectively. AU has been contributing to the Welsh Public Sector Net Zero Reporting since 2019, and in 2023, it published its 'Towards Net Zero Carbon by 2030 Strategy'[66], based on the previous three years of emissions reporting.

The project

To support their net zero ambition, the university launched a multi-phase carbon management and energy efficiency programme (2021-22)[67] with the goal of delivering carbon and cost savings through improving energy efficiency, updating building controls, and installing renewable energy generation.

Lessons learnt

- **Tap into support services:** The university was able to get feasibility and preparatory design support in this programme from the Welsh Government Energy Service and used the RE:FIT Cymru framework to deliver the work. Of the total investment of £3.2 million, £1.8 million of loan funding came from Salix and £1.1 million from a Higher Education Funding Council for Wales (HEFCW – now Medr) decarbonisation grant.
- **Energy efficiency upgrades can deliver significant cost savings:** The total investment for the project was £3.2 million, which was largely paid via loan funding. The initiatives are expected to deliver £4.2 million in lifetime cost savings, some of which will be used to repay the loans from Salix, making the investment cost-neutral for the university.
- **Simple substitutions can have impact:** AU carried out a number of simple substitutions and upgrades, such as LED lighting upgrades across 14 buildings, improvements to pipework insulation; installing newer, more efficient freezers and plant growth cabinets; upgrading air handling units; and optimising the Building Energy Management System (BEMS) throughout the campus. These efforts, along with the solar development, have saved ~900 tonnes of CO_2e per year. The full project is projected to save ~12,000 tonnes of CO_2e over its lifetime.
- **Repurpose unused land for renewables:** As part of this work, AU developed an on-site solar array at Fferm Penglais. The university already owned this land but wasn't actively using it; this shows how land use change can positively impact emissions.
- **Renewable energy generation**: The solar array at Fferm Penglais is sized to supply up to 25% of the campus's annual electricity demand, enhancing energy resilience and reducing reliance on fossil fuels. This is expected to reduce energy-related emissions by 8% annually.
- **Projects such as this can deliver social value and local economic impact**: The majority of the work was delivered by local contractors, supporting the local economy.

4.2. Strategic estate planning

Having detailed knowledge of an organisation's built estate and land assets is central to strategic decision making on decarbonisation and adaptation measures. This section provides guidance on building a greater understanding of building stock and land assets, land use for climate action, holistic planning and collaboration.

4.2.1. Understanding building stock and land assets

The challenge: Public bodies do not always have a clear understanding of the built estate or land assets under their operational control. This can result in missed opportunities, reduced potential for cost-effective strategic decision making and slow down the implementation of carbon reduction and adaptation initiatives.

The need: For organisations to fully understand the potential of their estate and land assets in supporting their ambitions to address climate change.

Actions:

1. **Review existing building stock and asset register data**. Ensure the database includes up to date information, e.g. from recent building and stock condition surveys, as well as basic information to inform decision making, such as floor area, Energy Performance Certificate or Display Energy Certificate (EPC/DEC) performance, age, building type, building restrictions (e.g. conservation areas, listed or heritage status) and any buildings identified for estate rationalisation. Link asset registers to building stock data and include maintenance status, boiler service records, TM44 reports on air conditioning compliance etc.
2. **Review existing climate risk data** and include this data alongside other building stock and land asset data. Cover key risks such as flooding, overheating, storm and wind exposure, moisture ingress, coastal erosion, sea level rise and drought. Use climate risk data as evidence to inform decisions on future investments in property upgrades and retention.
3. **Review building ownership structures** and understand who has responsibility for implementation. Collaborate with other parties to ensure complexities in ownership do not prevent progress.
4. **Carry out feasibility studies** on decarbonisation and adaptation initiatives to help guide costs, timeframes and identify the potential impact of different measures. Use carbon reporting results to identify the highest priority sites for feasibility studies, e.g. those with the greatest energy consumption/carbon emissions overall or those with the highest energy/carbon use per square meter etc. The Welsh Government Energy Service can support public bodies with these activities (see resources).
5. **Counter competing priorities by embedding decarbonisation and adaptation within ongoing maintenance and repair programmes.** This can reduce conflict, save costs and increase action. Identify and communicate the opportunities for effective building maintenance to support wider climate initiatives, e.g. regularly clearing gutters and drains helps keep buildings dry (dry buildings need less energy to heat than damp buildings) and reduces the likelihood of flooding and damp.

6. **Prioritise a whole building approach to decarbonisation** where possible. Follow the principles of the energy hierarchy by first reducing energy demand and using energy efficiently, then introducing lower carbon energy sources.
7. **Consider airtightness testing** as this can be a cost-effective way to make sure decarbonisation measures are designed accurately and cost-effectively, i.e. test results may reveal that a building is more or less 'leaky' than assumed.
8. **Understand enabling works required** to implement carbon reduction measures (e.g. rewiring, groundworks, access routes etc.) and factor these costs and timescales into decarbonisation and adaptation action plans.
9. **Work with the Distribution Network Operator (DNO)** to understand and plan cost-effective, strategic network upgrades and review potential grid constraints, e.g. when installing heat pumps or electric vehicle charging infrastructure (see section 4.3.5).
10. **Treat asset disposal as a last resort route to decarbonisation and adaptation.** While sometimes essential for wider strategic decisions, hard-to-treat buildings may require extra attention rather than being offloaded to others to decarbonise and adapt. 'Hard-to-treat' buildings may have wider local, cultural or historical value.

4.2.2. Land use for climate action

The challenge: Underutilised land assets or an incomplete knowledge of current land use can limit the potential for organisations to implement emission reduction, climate adaptation or biodiversity initiatives.

The need: For organisations to fully understand the potential of land assets to support their ambition to address climate change within their estates.

Actions:

1. **Identify and map out land assets** owned by the organisation, including car parks. Classify different land types according to the Intergovernmental Panel on Climate Change (IPCC) guidance on land use[68] or the draft Land Sector and Removals Guidance from the Greenhouse Gas Protocol (GHGP)[69].
2. **Align land asset registers** with building stock and carbon management data, systems and processes.
3. **Carry out feasibility studies on land assets** for climate action and nature-based solutions (see section 4.8), e.g. tree planting schemes which increase flood resilience and create carbon sinks. Factor in the long-term investment and maintenance requirements.
4. **Provide internal training** on land use and climate change, referring to existing guidance such as the Local Government Association's (LGA) sustainability routemap (see resources).
5. **Communicate the 'non-financial' value of land** for decarbonisation and adaptation initiatives to senior decision makers, such as biodiversity and social value (see resources for guidance around social value).
6. **Collaborate internally** between sustainability, estates, and land management teams to understand and align decisions and activity on public sector land use.

7. **Engage with local stakeholders**[70] in the decision-making process for publicly owned land, and to help understand the suitability of local land assets not under the current financial control of the public sector organisation to be involved in mitigation or adaptation initiatives.
8. **Provide targeted educational and awareness-raising material for the public** on changes to land use, combined with their involvement in the decision-making process, to counter potential negative perceptions.
9. **Consider using land assets for pilot studies.** The public sector is well placed to use land for pilot projects, research plots and demonstration sites to test and showcase emerging technologies and practices.

4.2.3. Holistic planning

The challenge: A lack of strategic, holistic thinking on climate action can slow down project delivery, extend timeframes and lead to missed opportunities for cost savings.

The need: For long-term, strategic, systems thinking around climate action – bringing together decarbonisation and adaptation – to help manage resources and deliver net zero efficiently.

Actions:

1. **Produce phased and fully costed climate action plans**. This should take a holistic view and account for all activities under an organisation's operational control. E.g. consider decarbonisation of buildings and vehicles together. Installing electric vehicle charging infrastructure (EVCI) often requires increased electrical supplies, as does installing heat pumps or renewables on building and land assets. Reviewing these holistically can save time and reduce overall costs.
2. **Plan resources strategically using a clear pipeline of work.** This applies to human resource competition between essential maintenance and implementing climate actions, as well as funding resource availability.
3. **Appreciate that adaptation initiatives require long-term strategic decisions** and active management that goes far beyond implementation.

4.2.4. Collaboration

The challenge: Poor communication and a lack of collaboration can slow down progress on climate action, increase costs and lead to sub-optimal implementation.

The need: To create a culture of knowledge sharing on climate action, and to facilitate effective communication and collaboration between stakeholders, both internally and externally.

Actions:

1. **Set out clear governance structures within climate action plans**. Identify roles, responsibilities and governance processes to embed climate action into decision making across the organisation. Ensure specific climate action projects are linked

back to the overarching strategy or action plan, with clearly defined objectives and owners.

2. **Provide carbon literacy training** beyond core estates and sustainability teams to build buy-in from across the organisation (e.g. finance and procurement).
3. **Connect with existing working groups** and wider public sector support to avoid duplication, e.g. the Consortium of Local Authorities (CLAW), Local Government Climate Strategy Panel's Buildings Group, the Ystadau Cymru Sustainability Working Group and the Welsh Government Energy Service. Relevant networks outside of Wales include the Local Government Association, the Sustainable Healthcare Networks Hub, and the Carbon Trust's Public Sector Network.
4. **Collaborate internally to optimise the schedule for decarbonisation works.** This is particularly important at sites such as schools and healthcare buildings, where there are specific essential services and in-use requirements that may dictate when decarbonisation works can be scheduled (i.e. school holidays and planned care).
5. **Share knowledge** through best practice, case studies and lessons learned when projects haven't gone to plan**.** This can support organisations who are taking the first steps on climate action, or those with limited resources, to overcome barriers already met by others. e.g. the Royal College of General Practitioners (RCGP) e-learning materials on their Net Zero hub.

Resources:

- **Welsh Government Energy Service;** Energy Service (for public sector and community groups) | GOV.WALES
- **Heritage building energy efficiency**: Course Handbook: Level 3 Award in Energy Efficiency Measures for Older and Traditional Buildings
- **Electric vehicle guidance**: Electric vehicles: all you need to know - Energy Saving Trust
- **Guidance on sustainable land use**: Sustainability Routemap - Land use, land-use change and forestry, and agriculture routemap | Local Government Association and Sustainable Landscapes Sustainable Places - Landscapes Wales
- **Local authority property asset management**: CLAW | Home
- **UK Public sector collaboration and support**: Carbon Trust Public Sector Network
- **Support for UK Local Authorities:** Local Government Association
- **Collaboration and knowledge sharing on sustainable healthcare**: Sustainable Healthcare Networks Hub and Net Zero Hub, RCGP Learning guidance
- **Summary report mapping the social value across Wales:** Welsh Government social value review: summary report
- **National social value measurement framework for Wales:** National TOMs: Wales — National Social Value Taskforce
- **Local Partnerships Adaptation Toolkit:** Climate adaptation toolkit and risk generator
- **Cwm Taf Morgannwg**: Climate Change Risk Assessment.
- **WLGA guidance:** Carbon and biodiversity consideration in business cases
- **WLGA Climate Change Support Programme:** Buildings and Land use resources
- **Transforming towns programme -** Includes examples of adaptation measures in Welsh towns such as Pontypridd

Case study: Rhondda Cynon Taf County Borough Council Coed Ely solar farm

The challenge

This project addressed a joint challenge for Rhondda Cynon Taf County Borough Council (RCTCBC) and Cwm Taf Morgannwg University Health Board (CTMUHB). RCTCBC wanted to use their significant land holdings to develop renewable energy projects. Large generation projects can export energy to the grid but make better financial returns by directly feeding into large off-takers, e.g. high electricity demand buildings.

Reducing emissions from hospitals can be challenging: they have a large energy demand as they are in constant use, and require constant temperatures and conditions to be maintained for patient safety and comfort. The Royal Glamorgan Hospital's buildings are not ideal for rooftop solar and the health board had developed most of its own land.

The project

RCTCBC sought funding from the Welsh Government and the UK Government to develop a solar farm and agreed to supply some of the power to the Royal Glamorgan Hospital. The resulting Coed Ely solar farm is one of the largest local authority-led solar projects in Wales, with 6 MW of renewable energy capacity. The farm features 9,000 panels, generating enough electricity to power roughly 8,000 homes each year while also contributing to the hospital's electricity supply.

Lessons learnt

- **Collaboration between public bodies can unlock shared carbon reductions:** Developing this solar farm required collaboration between RCTCBC and CTMUHB. 5MW of the panels' 6MW capacity will be exported straight to the grid, where it will help power local people's homes, and the remaining 1MW will go to the hospital via a private wire. Thus, benefiting both the hospital and the council.
- **Potential collaborators may not be obvious:** The solar farm site is on the outskirts of two towns and several kilometres from the hospital. Preliminary discussions were held with several large building owners in the wider area before reaching an agreement.
- **Maximising local impact:** An overarching focus of this project was social value and maximising local benefits. Besides the more obvious impact of powering local homes and services, this project has created ten local jobs and generated over £600,000 in spending with local businesses and suppliers.
- **Land use change:** This solar farm was built on a reclaimed colliery site – which was unsuitable for agriculture due to its past use as a colliery tip. As biodiversity and nature were a goal when this site was being developed, this land is not only being used to generate renewable energy, but the team is also planting hedgerows, installing bee posts, bird boxes and bat boxes and the land is still being used for grazing.

4.3. Project development

4.3.1. Introduction

Climate action projects in the built estate need a clear route from concept stage through to implementation, operation and maintenance. However, the public sector can encounter challenges at all stages of the project development process. This section outlines actions to address common challenges around skills, collaboration, project funding, climate change adaptation and engaging with network operators.

4.3.2. Skills

The challenge: Internal and external skills gaps can limit the development of climate action projects. This can be through a lack of in-house know-how, inability to procure climate adaptation specialists, concerns about quality of outsourced work, or losing high-performing staff from the public to the private sector.

The need: To build internal knowledge and experience within sustainability, estates, finance and procurement teams on:

- Carbon management principles
- Climate risk, resilience and adaptation
- Climate action project identification
- Business case development and decision making e.g. ability to progress investment grade proposals
- Reviewing the quality of external consultants' work

Actions:

1. **List the key skills and knowledge needed to progress your project / programme**, starting with the list above and tailoring to your project.
2. **Carry out a skills audit** across relevant teams to identify strengths, weaknesses and gaps, e.g. through questionnaires, review of qualifications, and manager feedback.
3. **Refer to the skills audit and gap analysis to identify where additional support may be required** through collaboration with other teams.
4. **Source the right skillsets** by carrying out internal training, recruitment or outsourcing to procure external support.
5. **Prioritise staff retention** through promoting upskilling and development opportunities. For individuals living in Wales, a range of fully funded environmental courses are available through Green Personal Learning Accounts.
6. **Collaborate on procurement specifications when outsourcing decarbonisation and adaptation project work** across sustainability, estates and procurement teams. Provide clarity on the level of expertise required (e.g. senior versus junior), ask for evidence of quality assurance processes and testimonials. Weight the scoring towards quality over price, where possible.
7. **Engage with your assigned Welsh Government Energy Service Development Manager** to access free support with project identification, development and implementation. Town and community councils should engage with the service via their local authority.

4.3.3. Project funding

The challenge: Climate action projects often compete for internal capital and revenue funding with other public sector priorities, e.g. providing core services, maintenance and modernisation. Decarbonisation and adaptation projects may impact revenue and operational costs with their benefits often not being purely financial. Applying for external funding can, therefore, often become central to delivery; however, these can also be complex and resource intensive to access.

The need: To identify, design and implement climate action projects that maximise internal funding and can access external funding mechanisms.

Actions:

1. **Add indicative project costs into climate action plans** to give decision makers clear oversight of a pathway for decarbonisation projects through a manageable pipeline of work. This enables grant funding to be targeted for specific projects in a managed way, which in turn mitigates cost and timeframe overruns during delivery.
2. **Identify and prioritise 'no / low regrets' projects** which will provide a rapid return on investment, e.g. establishing metering and monitoring systems to optimise the energy generated by existing solar arrays, saving energy on electricity bills and potentially reducing the amount of additional solar required.
3. **Develop 'shovel-ready' projects** which can capitalise on additional funding at short notice, e.g. through new grant funds or underspend elsewhere.
4. **Communicate the advantage of revenue funding for feasibility work to decision makers.** Using revenue funding for early-stage project development (e.g. to RIBA stage 4) – which typically isn't supported by external funding – can create 'shovel ready' projects that can then access external funding.
5. **Communicate the co-benefits of investment** in decarbonisation and adaptation, showing decision makers how the projects address other policy areas/targets, e.g. air quality, health, fuel poverty, biodiversity etc.
6. **Explore collaborative and joint procurement options** to access larger funding schemes or more favourable lending terms.
7. **Collaborate with wider grants teams**, where they exist. Larger public bodies may have teams dedicated to applying for a range of types of grants, beyond those for climate action.
8. **Sign up for the Welsh Government Energy Service newsletter,** which provides a summary of live funding opportunities for Welsh public bodies or contact the Energy Service directly for advice.

4.3.4. Climate change adaptation in project development

The challenge: Decarbonisation strategies and project development plans are generally inadequate in addressing climate impacts. These could be negative impacts such as increased maintenance costs due to flooding or increased health and safety risks for building occupants due to structural damage or overheating. There may also be some positive impacts, in terms of energy, cost and carbon reduction through reduced heating demand over warmer winters, for example.

The need: To increase internal awareness and expertise on climate risks, adaptation and resilience, at the strategic level down to individual project-level decisions; for adaptation to become a higher priority in revenue and capital budget allocations.

Actions:

1. **Consider adaptation at the earliest stage of project development**. This reduces future project changes, costs, and risk of exposure to climate hazards.
2. **View adaptation from an insurance risk perspective**. Taking out insurance against climatic hazards will become increasingly challenging without adaptation and risk mitigation actions.
3. **Consider the need for specific adaptation projects** to address identified climate-related risks.
4. **Communicate the long-term benefits and risk mitigation (including financial) aspects of adaptation projects to stakeholders** where more traditional, definable KPIs are more challenging to demonstrate.
5. **Communicate the potential for adaptation initiatives to improve the health and safety of building users** to key decision makers.
6. **Incorporate adaptation with funding for decarbonisation projects** to make use of external funding where adaptation-specific funding is limited (e.g. considering the solar reflection / shading properties of glazing as well as thermal properties during window refurbishment programmes).
7. **Avoid maladaptation risk** by educating stakeholders and considering climate adaptation early during project development (e.g. ensuring building energy efficiency work, such as air tightness improvements, does not increase overheating risk).

4.3.5. Engaging with the Distribution Network Operator (DNO)

The challenge: The electricity grid is heavily constrained in many parts of Wales. The DNO is a critical stakeholder in many decarbonisation projects, specifically around low carbon heat, renewables and electric vehicles. Late engagement and poor communication with the DNO can delay projects and lead to unnecessary cost uplifts.

The need: To engage early with the DNO and hold regular and effective communication with the relevant departments and individuals. This allows a detailed understanding of any grid capacity constraints and the potential grid reinforcement costs needed to ensure project connections.

Actions:

1. **Engage early and regularly communicate with the DNO**: Scottish Power Energy Networks (SPEN) in North Wales and National Grid Electricity Distribution (NGED) in the South. Initially, find the relevant department and a named individual for ongoing communication. Regularly communicate with them to understand any constraints and planned grid upgrades – SPEN's Local Authority Network Insight tool (LANIT) can be used to support this. Keep them abreast of your strategic plans so these can be incorporated within their strategy, with an aim to socialise grid reinforcement works.

Larger public sector organisations have reported using standing monthly check-ins to support their project development and implementation work. Biannual meetings or connection surgeries may be more appropriate for smaller organisations.

2. **Make use of the funding given to DNOs** through their Ofgem funding to support public sector organisations by involving them in early-stage project design.

3. **Understand current supply capacities, export limits, and the need for upgrades.** Installing EVCI or heat pumps often requires electrical loads above existing supplies. Work with the DNO to identify potential for larger supply capacities to accommodate these technologies. This also applies to electricity export limits to the grid from renewable energy generation.

4. **Understand timeframes and costs for any network reinforcement work.** This can help provide accurate project timelines and costs early on in the project development phase.

5. **Consider flexibility services or behind-the-meter technologies** (i.e. battery energy storage) to help alleviate grid constraint risks in some instances. Other routes include prioritisation of direct consumption and private wire arrangements. These should still involve communication with the DNO.

6. **Roll out smart meters and/or half-hourly data meters** to add granularity to data collection, allow peak consumption monitoring, and enable participation in flexibility services and time of use tariffs.

Resources:

- **Fully funded courses for individuals in Wales** on a wide range of 'green skills': Green PLA matrix via Green Personal Learning Accounts:
- **Descriptions of skills/roles** e.g. for retrofit programmes: RISE guide on project team roles; and the National Retrofit Hub's 'definitive list of retrofit roles and skills'.
- **Guidance for public sector organisations on various emission reduction initiatives**: Energy Service (for public sector and community groups)
- **Local Partnerships: Climate Adaptation Toolkit**: Climate adaptation toolkit and risk generator
- **SPEN's local authority network tool**: Local Authority Network Insight Tool (LANIT) - SP Energy Networks
- **Pembrokeshire Coastal Forum:** Climate adaptation toolkit (see case study on next page).
- **Welsh Government climate resilience in buildings report:** Resilience of buildings to challenges associated with climate change

Case study: Pembrokeshire County Council adaptation strategy

The challenge

Aware that nearly 3,000 Pembrokeshire properties were already at risk of flooding or coastal inundation, as identified in its Well-being assessment in 2022[71], Pembrokeshire Public Services Board (PSB) sought to address the adaptation challenge before climate risks and hazards worsened.

The project

The PSB worked with Pembrokeshire Coastal Forum (PCF) and Netherwood Sustainable Futures (NSF) to develop a climate adaptation strategy[72]. They consulted with businesses, local authorities and community groups throughout this process, developing a co-ordinated strategic approach to bring agencies, authorities and community groups together to tackle the adaptation challenge.

Lessons learnt

- **Long-term thinking:** Adaptation doesn't happen overnight and requires long-term efforts. This strategy runs from 2022-27, which should allow for a mix of short- and medium-term actions to be delivered.
- **Stakeholder engagement:** The adaptation plan was the product of extensive stakeholder engagement, including participatory stakeholder workshops, surgeries and outreach meetings with community groups and local businesses. To identify the most relevant priorities and actions, 184 different contacts were engaged across Pembrokeshire. By doing this, the PBS hoped to equip individuals, groups and businesses with the information they need to take action.
- **Collaboration:** This adaptation plan is the product of collaboration between Pembrokeshire PSB, PCF, NSF and Pembrokeshire County Council, with funding from the UK Government through the UK Community Renewal Fund. This shared ownership and buy-in helps to bolster the deliverability of the plan and create a sense of shared responsibility.
- **Tracking progress:** The strategy sets out 39 priorities and 24 specific actions across four key areas (infrastructure; natural environment and agriculture; communities; business and industry), all of which need to be delivered over the next 5 years. The strategy recommends using a RAG (red, amber, green) system to track progress against these goals and suggests a party to take responsibility for this. By building monitoring and key responsibilities into the strategy, it sets the process up for success.

4.4. Energy efficiency

4.4.1. Introduction

Improving the energy efficiency of the existing built estate is an essential step to reducing an organisation's operational carbon emissions. Energy efficiency measures can directly reduce energy consumption and help optimise other systems (e.g. reducing the size and cost of heat pumps). Strong energy management practices will help improve energy efficiency. This section covers 'low hanging fruit' – cost-effective quick wins for reducing energy and carbon emissions – and energy efficiency tips for the building fabric and building systems.

4.4.2. 'Low hanging fruit'

The challenge: Relatively rapid, simple and cost-effective energy savings are achievable in the public sector built estate. Most organisations have already made good progress on this but there are still opportunities for 'easy' savings across the sector.

The need: For organisations to identify and implement 'no-regrets' energy efficiency improvements that deliver rapid cost, energy and carbon savings.

Actions:

1. **Prioritise general building maintenance.** It takes less energy to heat a dry building than a damp building. Regularly clearing gutters and drains and checking for leaks from damage to the building fabric can help improve energy efficiency and increase climate resilience by reducing the likelihood of water ingress during heavy rain or storms. This can also help avoid the need for costly and energy-intensive repair works and improve the comfort and health of building occupants.
2. **Upgrade to LED lighting.** LED upgrades have rapid paybacks; however, some public sector buildings are still using older fluorescent lighting.
3. **Use lighting controls**, such as passive infrared sensors (PIR) in corridors and bathrooms that respond to occupancy levels, or more advanced DALI (Digital Addressable Lighting Interface) controls that can enable independent lighting controls and daylight dimming, to reduce energy consumption from lighting.
4. **Ensure lighting illuminance (lux) levels are appropriate for the building/room operation.** The required lux level will vary depending on the task being carried out in a space. (Guidance from CIBSE and the HSE is provided in the resources section.)
5. **Improve air tightness** to reduce draughts and heat losses, e.g., check doors and windows close properly, install correctly weighted door closers and draught excluder strips. Check loft insulation to ensure full coverage, e.g. there are no gaps or uneven sections.
6. **Use thermal imagery** to identify cold bridges and preventable heat losses.
7. **Review water flow rates at outlets** and install restrictors and tap aerators where necessary. Refer to the CIBSE Guide G: Public health and plumbing engineering[73].
8. **Set out clear energy management governance** with roles for individuals, transparency, collaboration and accountability.
9. **Review system settings and controls** for optimum operation – see section 4.5

10. **Implement a motor management policy (MMP)** to provide a structured approach to the specification, purchase, repair and maintenance of motors.
11. **Install or repair pipework insulation** to reduce pipework distribution heat losses, including lagging valves and flanges.
12. **Monitor, clean, and regularly replace filters for air handling and ventilation units.**
13. **Carry out annual inspections of air conditioning equipment** and ensure CIBSE TM44 inspections are carried out every 5 years for systems over 12kW.
14. **Make incremental improvements instead of like-for-like replacement**. When equipment fails, more efficient versions should be fitted as standard rather than like-for-like replacement that misses the opportunity for saving energy and locks in low-efficiency equipment.

4.4.3. Building fabric

The challenge: The public sector estate has a wide range of physical building types, many of which pose challenges to improving their fabric. Using inappropriate interventions for specific building types and locations and failing to consider ventilation requirements can bring about unintended consequences such as damp, mould and decay. There is no 'one-size-fits-all' approach when it comes to building fabric upgrades.

The need: To understand the range of building types within an organisation's estate and deliver targeted, appropriate building fabric measures, along with appropriate ventilation.

Actions:

1. **Refer to building stock data** (see section 4.2.1) to identify and prioritise properties with potential for building fabric upgrades. Where possible, group properties by building archetype and determine packages of appropriate fabric measures for each archetype. Specific measures may also require tailoring to individual properties within archetypes. Ensure ventilation is considered alongside all building fabric upgrades and insulation installations.
2. **Install loft insulation.** This is a cost-effective measure that can deliver impactful savings. As well as keeping warmer in colder weather, well-insulated buildings should be cooler in hot weather, improving climate resilience. Seek a minimum thickness of 300-400mm for mineral wool loft insulation. Ensure insulation is installed correctly, providing even coverage including across access hatches or storage areas.
3. **Replace single glazing with double glazed or triple glazed windows.** This can improve thermal performance as well as noise and wellbeing. It's important to consider the g-value (measure of solar energy transmittance) of the glazing with respect to the risk of summer overheating, especially on southerly facing elevations. **Adopt secondary glazing** where double glazing is too expensive or where building characteristics (e.g. heritage aspects) limit its adoption.
4. **Undertake condensation and exposure risk assessments before insulating cavity walls.** This measure may not be appropriate for properties which are particularly exposed to driving rain, as filling insulation cavities can create a route for water ingress. Most of Wales falls into the 'very severe' and 'severe' exposure

categories, according to Building Regulations Approved Document C: site preparation and resistance to contamination and moisture[74].

5. **Insulate suspended floors.** Solid floors can be challenging when retrofitting insulation; however, suspended floor voids can be more easily insulated to reduce heat losses. Ensure appropriate materials are used to insulate according to building type, e.g. avoid spraying foam insulation directly onto timbers in traditional buildings.

6. **Reduce heat losses from solid wall buildings with external wall insulation (EWI)**. Significant care should be taken when specifying EWI and choosing the contractor. It's essential to confirm that best practice methodology will be followed, with processes in place to review this, to remove any risk of condensation or damp developing. (Link to EWI best practice provided in the resources section).

7. **Consider internal wall insulation (IWI) where external wall insulation is not appropriate**. Additional considerations for IWI include disruption to building occupants, impact on historic features (e.g. ornate cornicing) and building services and internal floor area reductions. (Link to IWI best practice provided in the resources section).

8. **Ensure that fabric upgrades don't increase vulnerability to climate hazards.** This is especially relevant for overheating risk in the built estate due to improved air tightness and thermal performance.

9. **Address risks to existing building fabric from climate change.** Whilst planned work should take into account climate change, risks to existing building fabric should also be actioned.

4.4.4. Building systems

The challenge: Old or inefficient building systems (heating, cooling, ventilation and lighting equipment) can lead to unnecessary energy consumption and costs.

The need: For building services and systems to operate as efficiently as possible, minimising energy demand and costs.

Actions:

1. **Optimise the performance of motors**, for example, in hot water distribution and ventilation equipment. Install variable speed drives (VSDs) on induction motors to reduce the operational demand of motor systems. Upgrade belt-driven motors; these older-style motors have higher energy losses, generate more noise, and have higher health and safety risks than modern motors. Convert IE2 and IE3 motors to high specification IE4 / IE5 motors. The higher efficiencies of these motors, combined with their long run times, can result in significant operational savings that outweigh the higher installation costs.

2. **Maximise cold chain efficiency**. Often overlooked, but reducing the continuous power demand from the cold chain (fridge and freezers) through correct sizing, motor optimisation, pipework insulation, smart controls and correct temperature settings can lead to tangible savings.

3. **Upgrade air handling units to electronically commutated (EC) plug fans**. EC fans have increased efficiency and built-in variable speed controls, allowing significant energy savings over traditional motor driven fans.
4. **Review the suitability of Liquid Pressure Amplification (LPA) for cooling systems,** such as air conditioning. This can increase the system's efficiency by 30-40% but needs careful design and is more suitable for larger systems.
5. **Ensure building system controls are actively managed and set correctly** for ongoing optimised performance and cost reduction – see section 4.5.

Resources:

- **Guidance on quick wins for energy efficiency**: Energy efficiency guidance note: Top 10 'Low to No Cost' Energy Efficiency Tips
- **Buildings maintenance checklist:** Historic England maintenance checklist
- **Welsh Building regulations for moisture control:** Approved Document C: site preparation and resistance to contaminants and moisture
- **Lighting design guidance:** CIBSE SLL Lighting Publications and the Health and Safety Executive Lighting, thermal comfort, working space, noise and vibration
- **EWI best practice:** Understanding Best Practice in Deploying External Solid-Wall Insulation in the UK
- **IWI best practice:** Retrofit Internal Wall Insulation: guide to best practice
- **UK Net Zero Carbon Building Standard Pilot:** Pilot Version | UK Net Zero Carbon Buildings Standard

Case study: Theatr Clwyd, Flintshire

The challenge

The Grade II-listed Theatr Clwyd needed an extensive redevelopment to address failing infrastructure and building services, including non-functioning ventilation and potentially unsafe electrical systems. There are specific regulations for carrying out such work on listed buildings, which can make certain retrofit measures – such as solar arrays or cladding – particularly challenging.

The project

Theatr Clwyd undertook a deep retrofit of the existing building. For this fabric-first retrofit, fabric upgrades included high-performance insulation to external walls, highly insulated green roofs and triple-glazed windows, including low embodied carbon timber framed glazed foyer spaces. The design targeted a high degree of air tightness to reduce drafts and stabilise indoor temperatures, providing comfort and lower energy costs. Externally, a sun shading canopy of larch and reused steel reduces solar gain. Natural passive ventilation is promoted where possible, and smart mechanical ventilation with heat recovery (MVHR) is used in key areas to filter the fresh air whilst minimising energy waste. The site is now gas-free as the old boilers were replaced with air source heat pumps to provide low carbon heating. These are complemented by a large solar PV array on the roof, producing renewable energy for the site.

Lessons learnt

- **Energy efficiency can have a demonstrable impact on emissions:** With the building fabric and services upgrades, LED lighting, new low-carbon heating, kitchens using electric cookers and onsite renewable energy generation from solar, this retrofit should reduce the operational carbon footprint by 85%[75].

- **Behaviour change efforts can enhance physical measures:** The theatre is providing carbon literacy training to staff, and the Theatre Green Book framework is helping the theatre create more sustainable productions.

- **Lower carbon doesn't necessarily mean lower cost:** Energy costs are expected to be higher compared to fossil fuelled buildings, so it will be important to track electricity generation from the solar panels and to monitor the performance of the heat pumps to ensure both are working optimally.

- **Phasing large programmes of work allows the show to go on:** This whole building renovation took over four years to complete due to the complexities and number of areas receiving upgrades. By phasing the works and using temporary venues, disruption was minimised, with performances going ahead and community groups still able to use parts of the building.

4.5. Controls and behaviour

4.5.1. Introduction

Once energy efficient equipment and renewable energy technology have been installed, it is critical that they are actively managed with the appropriate level of controls to operate systems optimally. This reduces energy demand, prolongs equipment lifespan, reduces maintenance and can allow organisations to benefit from additional savings and energy or carbon reductions.

Alongside advanced controls, building occupants' behaviour can have a significant impact on the efficiency of building systems and the overall energy demand of a building. Below are actions related to controls and behaviour to help buildings operate efficiently.

4.5.2. Energy management knowledge gap

The challenge: Poor energy management processes or a lack of technical knowledge can result in unnecessary and avoidable energy consumption from building systems. It can also result in the underperformance of renewable energy technologies.

The need: Optimised building energy systems across the public sector estate, with energy management teams suitably resourced and trained.

Actions:

1. **Understand the current staff skillsets on energy management** and provide training where gaps are identified. (see section 4.3.2).
2. **Ensure staff have appropriate training on building systems controls.** In larger buildings, there should be an individual responsible for Building Management System (BMS) operation, maintenance and training other members of staff.
3. **Ensure technical and maintenance staff have knowledge and training on control system operation** with regular training updates.
4. **Ensure staff are aware of the health and safety considerations** with regards to building controls and equipment operation, such as domestic hot water storage temperatures and legionella risk.
5. **Assign log books and handover notes to each building** so knowledge is retained when staff and/or contractors are unavailable or move roles.

4.5.3. Building controls

The challenge: A lack of adequate building management controls – or a lack of active management of these controls – leads to increased emissions through avoidable energy consumption or underperformance of renewable energy assets.

The need: For building systems to be monitored and managed through appropriate control systems, so that energy use is reduced and building systems operate efficiently.

Actions:

1. **Review existing controls** to understand what is already in place, what they control, if they are centralised or separate, and if they are connected to a BMS.

2. **Ensure that building systems controls are matched to building occupancy and usage patterns.** e.g. Regularly review and update temperature set points and operation time controls. This is especially important for education and seasonal use cases where there are large periods with little to no building usage or to reflect daylight savings time changes etc.
3. **Use occupancy sensors to effectively manage building systems** such as ventilation controls and lighting operation. This is especially important in low occupancy areas such as toilets, corridors and storage rooms.
4. **Use daylight sensors and/or time controls for external lighting systems.** These controls should be checked/updated twice a year to reflect seasonal variations in lighting demand.
5. **Match heating controls with cooling controls** to ensure they do not compete with each other, with a deadband between the set points.
6. **Use heating or cooling system upgrades as an opportunity to update older control systems.** This will help ensure that new equipment is used efficiently by also modernising the control technology.
7. **Ensure weather compensation controls are installed on heating and cooling equipment.** This should be included as standard and is especially important on low temperature systems (e.g. heat pumps).
8. **Ensure building system controls are monitored and visible.** Keep BMS controls visible in a central location rather than on a computer hidden away in a side office.
9. **Set 'out of range' alarms on control systems** to alert staff of irregular or inefficient operation in real time, not a month later.
10. **Set minimum and maximum heating and cooling set points to avoid user discomfort and unnecessary energy use.** Estate managers should be mindful of room usage and gender-based comfort levels when setting heating set points.
11. **Avoid independent user access to building system controls.** This avoids continuous changes to set points that reduces system efficiency.

4.5.4. Behaviour change

The challenge: The behaviour of building users significantly affects a building's energy use and carbon emissions. A lack of engagement in climate action can delay progress in carbon reduction.

The need: For building users to support the estates management staff by actively engaging in reducing energy consumption and carbon emissions, alongside wider sustainability initiatives and well-being improvements.

Actions:

1. **View behaviour change at the organisational / systems level** as well as the individual level. Look for opportunities to remove structural or physical barriers before addressing psychological barriers. Ensure strategy and communication support behaviour change. Are there organisational policies or processes that 'bake-in' undesirable behaviours? How do different policies across different departments interact to influence behaviours across the organisation? Does the physical

environment enable staff to make the desired changes? Could automation remove the need for behaviour change (e.g. lighting controls)?

2. **Review training needs for behaviour change initiatives.** Tailor training to different directorates or end users. Consider mandatory training on general carbon literacy as well as more specific content where appropriate. Consider accessibility requirements and differing abilities to engage with any behaviour change initiatives before implementation (e.g. mobility, language).

3. **Upskill staff to influence and deliver behaviour change initiatives in-house.** Engaging staff to understand current behaviours and involving them in designing and implementing behaviour change initiatives could help build ownership and increase the likelihood of success. Identify willing champions in different departments who contribute to decision making and lead by example.

4. **Make sustainable choices the no-regret default option**. By carefully considering the placement of the sustainable choice, it can become the default. For example, making recycling bins more visible and easier to use than general waste bins could help encourage recycling as the default.

5. **Consider mandatory restrictions for some energy/emission intensive behaviours.** This could be, for example, through setting maximum and minimum temperatures for heating and cooling (see 4.5.3).

6. **Make energy use visible** to encourage action on reducing energy use. Examples could be Display Energy Certificates (for eligible public buildings) in prominent positions or live energy use monitoring on visible displays.

7. **Consider approaches to evaluate the impact of behaviour changes.** Qualitative insights may be more appropriate than quantitative data. Use internal checks to monitor progress and ensure guidance is followed and resources are being used.

Resources:

- **CIBSE guides for building controls:**
  - LG14 Control of electric lighting (2023)
  - Guide H: Building control systems (2009)
- **UK government advice on frameworks on behaviour change:** Behaviour change: guides for national and local government and partners
- **UK government advice on adopting green choices:** Adopting green choices and behaviours
- **Local government association support on climate behaviour change projects:** Six steps to undertaking a climate behaviour change project
- **Behaviour change in healthcare:** PHW-BSU-Responding-to-Climate-Change
- **COM-B Behaviour change model used by Denbighshire County Council:** Climate and ecological change: Behaviour change for sustainability
- **Welsh Government advice on waste and recycling:** Workplace recycling
- **WLGA Climate Spotlight Sessions:** Spotlight Session #5 (see Case study on next page)
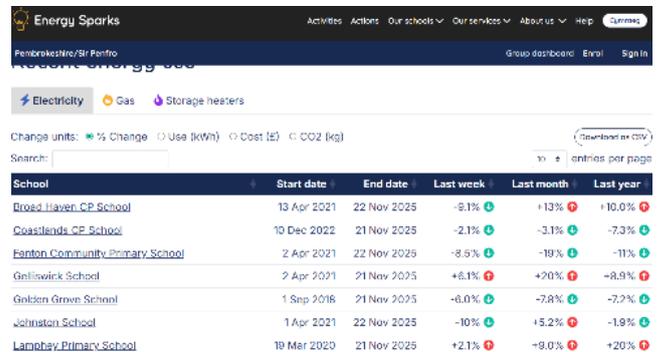
Case study: Pembrokeshire schools use Energy Sparks

The challenge

To help schools around the county reach net zero, Pembrokeshire County Council (PCC) worked with Egni Coop on a project involving roof mounted solar panels, data monitoring and sustainability education for pupils in schools. Recognising that technology alone won't be enough to achieve their net zero ambition, PCC looked at how behaviour change could affect energy savings. With

Egni, they were able to offer Energy Sparks platform usage, education officer support and curriculum activities.

The project

Participating schools received funding to set up an Energy Sparks account, an online platform that displays the school's electricity and gas usage. The platform allows schools to track their energy saving actions and understand their impacts on carbon emissions. Egni also ran a 'We are Energy Warriors' pupil education programme: a series of bilingual workshops and experiences which empower pupils to take action to reduce energy consumption in school, as well as learning about wider sustainability issues.

Lessons learnt

- **Joint behaviour change and education campaigns can have real impact:** Egni was selected for this project in part because of their educational support, long-standing engagement with schools, and support available via Energy Sparks. Teachers stated that pupils became far more engaged and were proactive about climate change, turning lights off, discussing if the school heating needed to be on, with more awareness of their impacts as a school community. On top of this, two-thirds of schools reduced their energy use and the top perfroming schools cut electricity use between 10-24%.

- **Gamification:** Using the right hook to capture users' attention is important; by making actions fun with points to earn helped involve school children. Pennar Community School topped the Energy Sparks scoreboard in Wales with over 1,000 points, representing their efforts across many different energy saving activities.

- **Explore different funding and shares options:** Egni Coop used funds from its shareholders and secured grant funding from Ynni Cymru, Welsh Government and National Grid Electricity Distribution (NGED), so there was no capital outlay for the council. Further benefit was secured for the participating schools upon solar installation by making them co-op members, owning £500 in shares.

- **Data alone is no use:** Having someone responsible for monitoring the energy use, driving forward actions and capturing progress helps recording energy use have effect. Schools who fully engaged with the process saw the best results.

- **Partnerships can help reach the wider community:** This partnership between a public sector organisation and a community energy group has provided multiple benefits for both organisations and the wider school communities.

4.6. Low carbon heat

4.6.1. Introduction

It is estimated that heating is responsible for ~50% of the energy use in Wales[76]. Currently, low carbon heating makes up only ~5% of the total energy demand for heating in buildings in Wales[77]. This highlights the scale of the challenge for decarbonising heating. Through the adoption of low carbon heating, public sector organisations can make tangible reductions to their fossil fuel use and direct (scope 1) emissions. This section includes actions on the fundamentals of low temperature heating, heat pump deployment and heat networks.

4.6.2. Low temperature heating fundamentals

The challenge: Organisations that are used to traditional high temperature heating systems (e.g. 50-80 °C for gas or oil boilers) can struggle with migrating over to lower temperature systems (e.g. 25-45 °C for heat pumps) and the different operational conditions that these require. This can lead to poor performance with sub-optimal operation, which increases running costs and limits potential carbon savings.

The need: For low temperature heating systems (e.g. heat pumps) to be installed to a high standard and operated correctly so they can reach their optimum performance, be cost-effective, and significantly reduce carbon emissions.

Actions:

1. **Identify and engage with the DNO.** (see section 4.3.5).
2. **Aim to carry out fabric upgrades before a heat pump is sized and installed**. This will reduce the energy demand on the heat pump (see section 4.4.3 on building fabric). However, where grant funding for low carbon heating is available, this should not prevent an installation.
3. **Carry out detailed heat loss calculations** to make sure the heat pump is appropriately sized. Aim for the lowest system temperature possible for best efficiencies. Consider heat pumps that provide heating and cooling to further improve the building's energy efficiency and make it more resilient to warmer temperatures.
4. **Assess whether or not a buffer tank is needed.** Buffer tanks can reduce the efficiency of the system and should only be considered in specific use cases, e.g. when using multiple heat sources.
5. **Review existing heat emitters** (e.g. radiators or air handling units) in line with the heat loss calculations to determine if any heat emitter upgrades are required.
6. **Make sure building users (staff and/or tenants) are aware of the potential disruption** of the installation. Plan this accordingly with building use/occupancy to mitigate any disruption and support user acceptance.
7. **Ensure the specification for the system considers all options for optimising heat pump performance through smart monitoring and controls, e.g.**
   - **Sub-metering, smart meters, and internet-enabled connectivity as standard** to provide real-time, remote monitoring.
   - **Advanced BMS controls** that modulate the system and are not on/off controls, especially for commercial systems (see 4.5.3).

- **Weather compensation.** The weather curve should be set at commissioning with fixed temperature avoided. AI controls can now modulate flow temperatures based on both external and internal conditions, which have been shown to improve the heat pump system's performance.
- **Flexibility to respond to time-of-use or type-of-use tariffs** and contribute to energy demand and supply dynamics in the wider energy system. This can shift heating demand to low price periods to improve running costs and reduce overall peak loads, which supports network management and can reduce the need to grid reinforcement work.
- **Integration with solar and batteries** to optimise the performance of whole energy systems and minimise running costs.

8. **Insulate new pipework to a high standard** both internally and externally. Consider internal pipework protection treatment in non-domestic installs to prolong the lifetime of the pipework.
9. **Review the electricity tariff** and switch to a time-of-use or type-of-use tariff where possible under energy procurement requirements.
10. **Ensure a detailed handover with building users and system operators** so they are aware of the differences between operating a low-temperature system and the original higher temperature system. For example, it may be best to leave the system running over the weekend to avoid lag and increased power getting the building back up to temperature on a Monday morning. This knowledge handover should include all building users (e.g. in an education setting, this would include maintenance staff, teaching staff, office staff and students).

4.6.3. Heat pump deployment

The challenge: Heat pump deployment is not currently at the levels required to reduce the emissions from heating by the net zero ambition of 2030 in the public sector, or to meet the Welsh Government's ambition of deploying 580,000 heat pumps by 2035.

The need: To increase the overall number and rate of high-quality heat pump deployments.

Actions:

1. **Create a strategy for heat pump deployment across the built estate.** Prioritise 'easier' installations e.g. in newer buildings, or those with higher fabric standards, to obtain learnings in procurement, installation, operation and maintenance before moving on to more challenging buildings or those with greater heat demand.
2. **Specify the outcome, not just the equipment**. Traditionally procurement process only specifies the heat pump equipment and not the outcome (e.g. coefficient of performance).
3. **Ask for evidence, not just qualifications, from installers** to demonstrate experience and skillsets in installing high performing systems.
4. **Don't fit and forget.** Ensure that active management and maintenance of the heat pump is considered as part of the installation, along with any required training.
5. **Upskill maintenance staff,** and involve them from the outset, where low carbon or low temperature heating is a new technology to ensure optimised operation.

6. **Engage tenants with the technology** and ensure they are comfortable with the operation when installing in a residential property (e.g. social housing).
7. **Support the supply chain** by providing/supporting skills and training for installers, apprenticeships, local suppliers and increasing market demand.
8. **Build knowledge, share learnings and collaborate** to support best practice and the dissemination of solutions.
9. **Promote the carbon savings and improved comfort of low carbon heating** where the financial case is less strong to encourage heat pump deployment.
10. **Electrify fossil fuel appliances** when switching over to low carbon heating, such as autoclaves and cookers, so that the gas/fossil fuel supply can be removed and savings from the gas standing charge can be realised, alongside further emission reductions.

4.6.4. Heat networks

The challenge: Heat networks can offer an efficient, low-carbon solution for the public sector estate, but many existing systems underperform due to high heat losses, uncontrolled flows, poor water quality, insufficient monitoring, or poorly commissioned building interfaces. These issues lead to higher carbon emissions, higher operating costs, overheating in buildings and reduced reliability for end users.

The need: For public sector organisations to take a more active role in understanding how their buildings connect to and rely on heat networks. For those organisations to consider how well their networks are performing, and what practical steps can be taken to improve efficiency, reliability, comfort levels for occupants, reduce costs and cut carbon emissions.

Actions:

1. **Understand the organisation's relationship with heat networks.** Identify which buildings are connected, could connect, or influence the network, and clarify your role - whether as a customer, operator, landlord, or anchor load.
2. **Gather key performance information.** Collect heat meter data, temperature readings, and outage records to assess performance; request this from the operator if not readily available. The UK Government has released guidance[78] to help with this.
3. **Commission or request a heat network optimisation assessment.** Periodic inspections can uncover simple issues like open bypass valves or poor insulation that, once fixed, improve efficiency and reduce costs. Grant funding[79] is available to improve network efficiency.
4. **Reduce uncontrolled network flows and bypasses.** Work with operators to control flow rates, fix bypasses, and recommission interfaces to cut heat losses and improve return temperatures.
5. **Ensure good water quality management.** Regular sampling, dosing, and filtration help prevent corrosion and equipment failure, ensuring long-term reliability.
6. **Address heat losses by improving insulation and fixing damaged sections.** Replacing missing or damaged insulation is a quick, cost-effective way to reduce energy waste without disrupting operations.

7. **Prepare buildings for lower-temperature heating.** Review systems to ensure they can operate at lower flow temperatures, which support future low-carbon heat sources and reduce current losses (see 4.6.2).
8. **Maintain accurate metering and billing systems.** Ensure meters work properly, readings are taken consistently, and billing reflects actual consumption to support fair cost recovery and performance tracking.
9. **Keep consistent communication with the heat network operator.** Regular meetings help monitor performance, plan maintenance, resolve issues, and explore optimisation or decarbonisation opportunities.
10. **Integrate heat network improvements into decarbonisation plans.** Include network upgrades in your net zero strategy by planning for low-carbon heat sources and network expansion as systems age.

Resources:

- **Learnings from the implementation of funded low carbon heat projects in Wales:** Public sector low carbon heat: technology introduction and project learnings
- **Heat Strategy for Wales:** Heat strategy for Wales
- **UK government guidance on heat networks:** Heat networks guidance
- **UK government guidance on heat network optimisation:** Heat networks optimisation guidance
- **Application advice for Heat Network Efficiency Scheme, Round 11:** Apply for the Heat Network Efficiency Scheme (HNES): Round 11
- **Map, reports and background on the use of mine water as a heat source:** Mine water heat
- **Cardiff Heat Network case study resources:** Cardiff Heat Network Ltd , Low carbon district heating with Cardiff Council and Low-carbon district heat network in Cardiff news article.

Case study: National Museum Wales

The challenge

National Museum Wales (NMW) has been upgrading its heating systems over the past four years, having implemented low carbon heat updates in four of its seven sites. The museums are replacing ageing fossil fuel boilers with air source heat pumps (ASHP), improving energy efficiency and reducing carbon emissions. NMW manages a vast estate with buildings of all ages, constructions, heating sources and insulation levels, including listed historic buildings and modern offices. This requires a range of sizes of heat pumps and heating systems to suit different building types. Planning permissions and listed building consent applications have been required and sympathetic installations were a key requirement for several buildings.

The project

With support from the Welsh Government Energy Service and the Public Sector Low Carbon Heat Grant, NMW has been taking a phased approach. It started in 2022 by replacing gas boilers in three smaller offices with 4kW and 8kW heat pumps and upgrading radiators and calorifiers. Following the success of the pilot phase, and with senior management and the finance department fully behind the projects, the museum continued this work at different sites. Over 1MW of fossil-fuelled boilers have now been replaced with low carbon heat pumps, saving over 300 tCO$_2$e equivalent annually.

Lessons learnt

- **Achieving wider organisation buy-in can be difficult:** NMW started with a smaller £40k pilot project and used its success to get buy-in from senior management and the finance department. Evidencing that the team can manage such a project and that it works well in this type of estate can be hugely beneficial.
- **Start small:** Although heat pumps are a proven technology and many case studies are available, changing out the boiler in a small building first can help build confidence. After starting with a £40k project in 2022, the Museum has now secured over £2.4 million to implement increasingly ambitious upgrades.
- **Remove LPG and oil first**: Prioritise buildings by existing fuel type, as the financial savings, operational issues and carbon savings from eliminating LPG and oil deliveries will be higher than from replacing gas boilers.
- **Improve controls and efficiency in tandem:** All of these sites have also had their Building Management System (BMS) upgraded to improve the control of the new heating systems. Many have installed additional roof insulation where possible to prevent heat loss and improve the efficiency of ASHPs. Heat emitters have only needed to be replaced in a few instances, with larger radiators being installed in rooms with high heat losses.

4.7. Renewable energy

4.7.1. Introduction

Renewable energy generation – from solar, wind or hydro sources – can reduce emissions and running costs and increase energy security, especially when paired with battery energy storage. Renewable technologies are a visual indicator of climate action and can demonstrate to the citizens and businesses in the wider community that public bodies are leading by example.

This section outlines actions to maximise the opportunities presented by renewable energy: identifying the right opportunities, securing grid connection, funding and resource, effective monitoring, and climate resilience for renewable energy technologies.

4.7.2. Identifying sites for renewable energy

The challenge: The potential for land assets to support renewable energy generation is underutilised, which limits the rollout of renewable technologies.

The need: For public sector organisations to understand their own estate and collaborate with external stakeholders (e.g. landowners) to maximise renewable energy generation.

Actions:

1. **Maximise and implement all appropriate roof-mounted solar PV opportunities, which directly supply electricity to public sector assets,** prior to assessing stand-alone renewable energy generation potential.
2. **Conduct renewable energy feasibility studies on land assets** (see section 4.2.2). The Welsh Government Energy Service can support with this. **Evaluate the use of solar car ports** where organisations have little/no land assets but have car parks under their control.
3. **Consider prioritising brownfield sites** for renewable development to facilitate new use of underutilised land assets, e.g. former landfill sites.
4. **Collaborate with other public sector organisations and community energy organisations** to explore the possibility of shared renewable energy developments on land assets (see Coed Ely solar farm case study).
5. **Increase collaboration with local energy projects** by releasing land for joint ventures and committing to purchasing the electricity. Local renewable energy with community support can directly benefit and empower communities across Wales whilst simultaneously benefiting public sector bodies.
6. **Consider leasing land for renewable energy generation.** Many public sector organisations do not own land or have limited funds for procuring land. **Collaboration with third-party land owners** near public sector buildings may present alternative development opportunities (land leasing, direct wire, etc.) for renewable energy developments.
7. **Engage other public sector organisations** that have successfully developed renewable energy projects on different types of land holdings (i.e. owned, shared or direct wire) to support knowledge sharing and lessons learned. Examples include Morriston Hospital, Swansea, and the Coed Ely Solar Farm in Rhondda Cynon Taf.

8. **Consider battery energy storage technology to support renewable energy projects.** This can be at a building level or through the use of land assets to provide larger-scale battery energy storage capabilities.

4.7.3. Grid connection

The challenge: Some sites can face grid connection barriers arising from insufficient capacity on the electricity network. This can lead to high grid connection costs, long connection timescales and curtailed grid connection offers, which can impact the feasibility of a renewable energy project (see 4.3.5 for strategic actions on working with DNOs).

The need: Avoid or navigate grid connection constraints to help unlock or improve the technical and financial viability of renewable energy generation projects.

Actions:

1. **Identify and engage with the relevant DNO.** (see section 4.3.5).
2. **Identify and prioritise building integrated renewables or land-based renewables in proximity to a public sector load**. This allows the electricity generated to be consumed directly through a dedicated private wire. Sizing the renewable asset to match the load also supports with minimising the amount exported to the grid, avoiding any export limitations.
3. **Explore alternative connection points and offers** if appropriate for the scale of the project. An alternative connection point may increase costs due to longer cabling requirements but could unlock grid connection restrictions. Non-firm connection offers could allow connection without delay but with the trade-off of export capacity being curtailed during certain periods.
4. **Scale down the overall generation capacity**. In many cases, grid reinforcements are only triggered when a project exceeds a certain capacity threshold. So, by slightly reducing the project size, delays and additional costs may be avoided. If reinforcement works are already in progress, this size reduction might only need to be temporary, allowing you to phase the project over time.

4.7.4. Internal resource and funding

The challenge: Public sector resources are limited and subject to competing priorities. Some renewable developments come with lengthy development timescales and high-risk development costs. Securing senior team buy-in can therefore be challenging. Organisations often also lack the expertise and experience in developing renewable energy projects, especially larger-scale ground-mounted developments. (See section 4.3.2 for actions on skills).

The need: Senior buy-in to renewable energy project development, with adequate allocation of personnel and financial resources.

Actions:

1. **Engage with The Welsh Government Energy Service** for advice and support throughout a project's development and for sign-posting to appropriate available funding sources.
2. **Engage with local community energy organisations** and consider facilitating a community led development or joint venture where public sector land is leased and a power purchase arrangement agreed. Experienced community groups could bring the required expertise directly into a project's delivery. Community groups may be eligible for different sources of development or capital funding to public bodies. Partnering with a local enterprise could increase local project benefits, boost support for the project and show local leadership.
3. **Focus on and communicate the wider benefits of the project**. This can support with obtaining senior buy-in and keep focus and resources on driving the project forward. Examples of wider benefits include biodiversity and habitat enhancement, education opportunities and supporting local job creation.
4. **Consider additional revenue opportunities** from battery energy storage and flexibility services.

4.7.5. Monitoring and optimising renewable energy installations

The challenge: Organisations tend to 'fit and forget' when it comes to installing renewable energy assets. This can lead the system to underperform due to inadequate optimisation.

The need: For the high-quality installation of renewable energy systems that are actively monitored and optimised for maximum energy generation.

Actions:

1. **Monitoring systems to be installed as standard during installation.** This requires tenders and contracts to keep pace with the technology and specify monitoring. It may also require internet connections, which needs to be considered in remote areas.
2. **Set performance management plans (PMPs)** for renewable installations that include metering and monitoring. This will be a requirement for Welsh Government funding moving forward.
3. **Review the use of solar PV optimisers** at design stage to allow for module level monitoring. This can increase performance but also support monitoring, maintenance and repairs.
4. **Organisations should retrospectively inspect old systems** to ensure generation and performance are in line with expectations and design stage calculations.
5. **Record individual renewable installation generation data** and communicate this to the relevant teams internally to continually monitor performance.
6. **Submit annual renewable generation and capacity to the public sector emission reporting.** This will be a new requirement from 2025.
7. **Visually inspect renewable systems** to ensure high system performance at least annually and after adverse weather (e.g. inspect flat roof solar PV for damage and cleaning needs). For solar PV an annual inspection should occur after the winter and

before the summer generation window. The use of drone technology can be a practical solution where regular visual inspection costs (i.e. scaffolding) are high.

8. **Monitor security systems regularly** to prevent damage to renewable assets and potential loss of performance, this can include bird/animal protection.

4.7.6. Climate resilience and renewables

The challenge: A lack of skills and planning around climate resilience can leave renewable energy assets at risk of climate hazards, which can lead to system downtime, lower performance and increased cost for public sector organisations.

The need: For climate resilience and adaptation to future climatic hazards to be appropriately considered when designing, installing and maintaining renewable energy generation.

Actions:

1. **Carry out skills mapping and training opportunities on adaptation** so employees are able identify and take the appropriate action for climatic risks to renewable assets. (see section 4.3.2 and 4.3.4).
2. **Ensure the appropriate design conditions are used** for installations and they account for a reasonable expectation of future extreme weather events (i.e. solar PV wind loading, fixings etc.).
3. **Consider an increased future risk of surface water and coastal flooding** when locating new renewable equipment. This could include transformers and substations on raised plinths or higher ground to reduce flood risk.
4. **Climate change may present opportunities**, such as higher sunshine hours in the summer, which can be accounted for when considering new system feasibility and design (i.e. estimating the future generation of long term assets).
5. **Carry out risk assessments for the indirect impacts of climatic hazards** that could affect renewable assets, such as stronger wind speeds and increased tree fall risk or increased temperatures on battery energy storage, when considering new renewable energy installations.
6. **Ensure lessons are learned and communicated** where existing renewable systems are affected by climatic hazards.

Resources:

- **Welsh Government Energy Service guidance on renewable energy:**
  - Performance management tool: renewable electricity generating stations
  - Local and shared ownership of energy projects: guidance
  - Monitoring and maximising the performance of roof-top solar arrays: guidance and tools
  - Community energy toolkit
  - Private wiring for renewable generation projects: best practice guide
  - Power Purchase Agreements (PPAs): guidance
- **Guidance for local planning authorities to reduce flood risk:** Technical advice note (TAN) 15: development, flooding and coastal erosion

Case study: Torfaen schools rooftop solar

The challenge

Torfaen County Borough Council (TCBC) looked at roof mounted solar technology with an aim to reduce grid electricity use, support carbon reduction goals, save money for schools and provide a learning opportunity for students. TCBC had to find the most appropriate school rooftops and then start the process of installing solar PV.

The project

All schools across the county were reviewed in an initial scoping exercise to assess roof orientation, structural condition, planned roof maintenance, long term plans for the sites and noting any specific planning designations. Sites were prioritised on multiple factors, including generation capacity, ratio of solar array size to site demand, ease of access to the roof and existing maintenance plans. In the end, the council installed roof-mounted solar PV panels across 14 schools in 2023, adding 715 kW of renewable energy generation to their estate[80].

Financial modelling of the multi-site opportunity showed good financial returns so the council applied for £1.2 million loan funding from the Wales Funding Programme.

Lessons learnt
- **Working in school buildings:** When installing solar in schools, east facing roofs are the best orientation to use as operational demand is morning biased. Maintaining a pipeline of potential buildings to work on is important, as installs tend to occur in school holidays and work needs to be tightly scheduled.
- **Learning by doing:** By integrating solar energy data into the school curriculum, schools are monitoring their performance alongside the educational benefits supporting climate education.
- **Think big:** Whilst the council could have installed solar on schools one by one, bundling buildings together made the project more attractive for installers and reduced administrative costs.
- **Loan funding application**: The solar reviews and financial models indicated that taking a loan made financial sense given the acceptable paybacks. There is an estimated £240,000 combined annual savings in running costs across all schools.
- **Project coordination**: Schools still had to be contacted one by one and kept informed of project plans. The contractor and council team worked together to fit around the schools' daily schedules.

4.8. Nature-based solutions to climate change

4.8.1. Introduction

Nature-based solutions to climate change involve working with nature to reduce and remove emissions and support climate adaptation. Nature-based solutions can help restore or create carbon 'sinks', where carbon is 'sequestered' - removed from the atmosphere and stored in vegetation, soils and sediments - over time. They can also protect us from extreme weather through natural defences, such as land management to absorb and slow down flood waters or tree planting to provide shade and cooling in urban areas during heat waves. These types of solutions play an important role in enhancing biodiversity and supporting nature recovery. Examples include:

- **Forests, hedgerows and peatlands** naturally absorb and store vast amounts of carbon dioxide from the atmosphere. Trees and vegetation can help build resilience to flooding and heat waves.

- **Healthy soils** store significant amounts of carbon, with fungi playing a key role. Regenerative agriculture and restoring soil health increases the potential for carbon sequestration in soils.

- **Seagrass, wetlands and salt marshes** are incredibly efficient at sequestering carbon, acting as powerful 'blue carbon' sinks by capturing and storing vast amounts of carbon dioxide from the atmosphere in their plants and rich sediments below them, often at rates far exceeding forests on land. They also help protect coastlines from storm surges and rising sea levels.

Nature-based solutions are crucial for both mitigation and adaptation and deserve a greater profile in public sector decision-making. Seeking outcomes that deliver climate resilience, nature recovery and carbon sequestration across the public estate is fundamental to meeting the needs of future generations, as set out in the Well-being of Future Generations Act, as well as responding to Wales's Nature Recovery Action Plan (2015 & 2020)[81].

This section of the report presents actions on carbon sequestration, natural flood management and urban green infrastructure, building on actions set out in section 4.2.2 on strategic land management.

4.8.2. Carbon sequestration (mitigation)

The challenge: There is potential for carbon to be stored in the land assets that are owned, managed, leased and influenced by public bodies. While it is not the 'silver bullet' to offset residual carbon emissions from public bodies (there simply isn't enough land available), effective management of the vegetation and soils on public sector land provides another means to tackle the climate emergency.

The need: For carbon sequestration to become routinely considered and incorporated into the management of individual land assets, and as part of public sector asset management strategies.

Actions:

1. **Refer to baseline carbon mapping** of land assets to inform decisions on nature-based solutions for carbon sequestration (see section 4.2.2 for guidance and links to resources).

2. **Identify and target actions for different types of landscapes / land assets,** i.e. determine which assets require protection (e.g. retaining existing natural woodland), restoration (e.g. drained peatlands) or improvement (e.g. bringing ecological diversity into degraded landscapes dominated by a few species).

3. **Review management practices for farmed land** such that emissions are reduced and sequestration is maximised. County farms, managed by local authorities, have a role in doing this to meet the aims of the Sustainable Farming Scheme[82].

4. **Integrate land carbon outcomes into capital programmes requirements** for asset and property strategies, asset transfer and management and maintenance regimes.

5. **Consider the role of the public sector in enabling others to achieve land carbon outcomes,** e.g. through place planning and guidance. Local authorities in particular, have the opportunity to signal to communities and stakeholders optimising land use for carbon storage is the 'right thing' to do as an integral part of planning and decision-making, e.g. through Supplementary Planning Guidance.

6. **Apply the mantra of 'the right tree in the right place'** to ensure the desired benefits are achieved and unintended consequences are avoided[83].

4.8.3. Natural flood management

Natural Flood Management (NFM) reduces flood risk by restoring or mimicking natural processes to slow, store, and spread water across a river catchment, rather than relying solely on engineered defences. Techniques involve planting trees, restoring wetlands, ditch maintenance, creating leaky dams and improving soil health. This increases water infiltration and holds water upstream, allowing waterways to meander along their natural courses to reduce flood risk, thereby reducing peak flows downstream.

The challenge: Overcoming regulatory and permitting uncertainty, siloed working, and a lack of early-stage planning are some of the key barriers to scaling up natural flood management. Water catchment areas span local authority / public sector boundaries, requiring collaborative management decisions.

The need: To increase resilience to flooding using natural flood management techniques and maximise co-benefits such as increased carbon storage in soil and vegetation, natural filtration of water pollutants and cost and carbon savings compared to using traditional 'grey' infrastructure (typically concrete or steel).

Actions:

1. **Slow water run-off in upland areas** by planting woodland and creating leaky barriers (e.g. log dams) in streams.

2. **Improve water infiltration into the ground** by reducing soil compaction, using cover crops and managing grasslands.

3. **Restore natural features** such as reconnecting rivers to their floodplains, creating wetlands, ponds, and scrapes to store excess water.

4. **Create woodlands, plant trees and hedges** to intercept rainfall, improve soil structure with roots, and release water slowly.

5. **Reduce the risk of potential landslides** by restoring vegetation on hillsides to slow water runoff.

6. **Explore opportunities for funding initiatives via the Natural Flood Management Fund** (for local authorities)[84].

4.8.4. Urban green infrastructure

The challenge: Urban areas face particular challenges around climate change – flooding and overheating – as well as poor air quality, public health issues and lack of biodiversity.

The need: Urban green infrastructure (GI) is vital because it uses natural systems like parks, green roofs, green walls and wetlands to solve urban challenges, such as managing flood risk, improving air and water quality, reducing urban heat, boosting public health through recreation and stress relief, enhancing biodiversity, and creating attractive, economically vibrant places. It offers multifunctional benefits and can provide a sustainable, cost-effective alternative or complement to 'grey' infrastructure.

Actions:

1. **Engage with existing local nature and biodiversity initiatives,** e.g. Local Nature Partnerships and Local Biodiversity Action Plans, accessible through the Wales Biodiversity Partnership[85].
2. **Explore available funding for nature recovery initiatives,** e.g. Local Places for Nature[86]
3. **Consider urban tree planting for temperature regulation**: Urban trees and green spaces provide shade and cooling, helping to reduce the negative impacts of heatwaves.

Resources

- **The Wales Biodiversity Partnership:** Local Nature Partnerships - Wales Biodiversity Partnership

- **The WLGA's resources for carbon and biodiversity considerations in business cases:** Resources - Carbon and Biodiversity Integration - WLGA

- **Information on the latest innovations in green roof and wall technology:** www.livingroofs.org
- **The Royal Horticultural Society's advice for plants for pollinators:** Plants for Pollinators advice and downloadable lists / RHS Gardening

- **Information on living roofs and walls, and how they can improve cities' resilience to climate change:** *Living Roofs and Walls - Technical Report: Supporting London Plan Policy*

- **Guidance surrounding tree planting:**

    o **Advice on responsible, regenerative tree planting:** Right Tree Right Place | Warwickshire Wildlife Trust

    o **Information about the i-Tree Eco project;** software application which is used to quantify the structure and environmental effects of urban trees and calculate their value to society: i-Tree Eco - Forest Research

Case study: Restore the Thaw Landscape- Vale of Glamorgan

The Challenge

Many of the watercourses in the UK have been shown to have had significant biodiversity and habitat loss in recent years, as well as experiencing higher levels of pollution. Alongside the negative effects of habitat and biodiversity loss, these impacts also reduce the natural resilience of watercourses to respond to changes in climate, such as storms and intense rainfall events leading to flooding, but also to warmer and drier summers.

Response to these issues requires collaboration and action at scale.

The Project

Restore the Thaw Landscape delivers biodiversity improvements, at scale, in the catchment area of the River Thaw, along its tributaries and in the surrounding landscape. Its focus is on creating both natural connections for wildlife and networks of connections between organisations and the community.

The Thaw's catchment includes steep sided valleys to lowland grassland, to coastal habitats and semi-industrial areas, running from Llanharry in Rhondda Cynon Taff through the Vale of Glamorgan to West Aberthaw on the Severn Estuary. The Thaw landscape has protected sites, including 7 SSSIs and 120 Sites of Importance for Nature Conservation (SINC). The project is improving the natural condition of the Thaw Landscape, while engaging landowners, businesses, networks of organisations and communities in the area in addressing the nature emergency. The project is being funded by the Vale of Glamorgan Council's Project Zero, the Waterloo Foundation and Nature Networks (National Lottery Heritage Fund) on behalf of Welsh Government and in partnership with Natural Resources Wales.

Lessons Learnt

- Biodiversity improvements at scale are possible when the right stakeholders are involved (e.g. local council, landowners, and local community).
- Nature based solutions can help in protecting and enhancing local wildlife and habitats, such as the water vole reintroduction and otter habitat improvements.
- There are opportunities for volunteers to get involved in conservation efforts, supporting the mental health and wellness of residents in the local community.
- Collaboration has seen positive outcomes between the project and landowners with improved awareness and education reported from this key stakeholder group.

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