



Adaptation and decarbonisation

September 2023

© Climate Change Committee copyright 2023

The text of this document (this excludes, where present, the Royal Arms and all departmental or agency logos) may be reproduced free of charge in any format or medium provided that it is reproduced accurately and not in a misleading context. The material must be acknowledged as Climate Change Committee copyright and the document title specified. Permission from copyright holders must be sought before any photographs are reproduced.

Summary and key findings

The Welsh Government commissioned the Committee to provide advice on “managing the interrelationships between climate change adaptation and decarbonisation” alongside our first independent assessment of the Welsh national adaptation programme (Prosperity for All: A Climate Conscious Wales).

This briefing aims to provide a useful starting point for policymakers working on climate mitigation or adaptation, to consider how to integrate the two agendas effectively.

(a) Adaptation and mitigation commitments

The Welsh Government has committed to addressing climate change through reducing its emissions to Net Zero and adapting to climate risks. These commitments are both urgent and closely linked.

The Welsh Government needs to deliver against its Net Zero and adaptation commitments.

- **The Welsh Government has set an economy-wide Net Zero emissions target for 2050 and for the Welsh public sector to be Net Zero by 2030.** Wales must now accelerate action to ensure it is on-track to meet its future carbon budgets and the Net Zero target.¹ The middle of the Third Carbon Budget is only five years away, and by then Wales should have reduced emissions by 39% compared to pre-pandemic (2019) levels.² Under the Environment (Wales) Act 2016, Wales's journey to Net Zero is mapped out by a series of five-yearly carbon budgets. Sectors with significant Welsh Government powers include agriculture and land-use, land-use change and forestry (AFOLU), waste, surface transport and buildings.
- **The Welsh Government has also set out a vision for climate change adaptation in Wales.** This vision describes that by 2030, Wales has the resources and is prepared, has the knowledge to understand the risk and challenges ahead and has the capacity to adapt to the impact of climate change.³ Under the UK Climate Change Act 2008, Welsh Ministers produce a report on the impact of climate change in Wales and the future priorities for the Welsh Ministers and others for addressing the impact. The Welsh Government published Prosperity for All: A Climate Conscious Wales, its national adaptation programme to respond to climate impacts, in 2019.
- **The Well-being of Future Generations Act requires action on mitigation and adaptation.** The Act requires public bodies to think about the long-term impact of their decisions, including decarbonising across sectors to mitigate the effects of climate change for future generations, and preparing for impacts from the changes in the climate that are already happening.

This briefing is set out in three sections:

1. The need for integrating climate adaptation and mitigation
2. Sectoral links and opportunities in Wales
3. Principles for strengthening joint delivery of adaptation and mitigation

1. The need for integrating climate adaptation and mitigation

(a) The case for acting now and avoiding lock-in

There is a clear understanding that both adaptation and mitigation are needed to respond to the challenges of climate change and can be tackled together.

- **With increasing temperatures, adaptation becomes more challenging.** High-levels of future global warming, which could reach around 4°C by 2100, would substantially limit the effectiveness of adaptation, leading to widespread threats to life and well-being, economic damage and systemic changes to the natural environment. Very high levels of adaptation could reduce some of the resulting impacts but would not be able to fully prevent them.⁴
- **Inaction on adaptation puts reaching Net Zero at risk.** Further climate change in Wales and the UK over the coming decades is inevitable, even if the world succeeds in reducing emissions. Without proactive and well-planned adaptation, many of the climate risks facing Wales, and the rest of the UK, will put efforts to reduce emissions rapidly over the next decade, and to Net Zero by 2050, at risk. In other areas, actions to reduce emissions undertaken without considering the changing UK climate could increase future climate risks.
- **Action taken now can reduce lock-ins to higher temperatures and higher risks.** Decisions made in the coming years must incorporate climate change risks to avoid locking in policies and technology that are not resilient. Acting early to avoid irreversible changes or expensive future retrofitting is an essential part of adaptation planning and policy, and should be considered alongside the significant economy-wide changes taking place to achieve Net Zero.
- **There are several common enablers and opportunities to deliver adaptation and mitigation.** Adaptation and mitigation responses are underpinned by common enabling factors. These include effective institutions and governance, innovation, investments, infrastructure, sustainable livelihoods and behavioural and lifestyle choices.⁵ We provide further detail on these in Section 3.

Reducing emissions and adapting to climate change are linked and interdependent.

(b) Co-benefits and trade-offs

The implications of actions taken to reduce emissions or adapt to climate change are intertwined. There are a range of potential co-benefits, trade-offs or unintended consequences which could occur between climate change adaptation and mitigation interventions over a range of scales and time.* These can be wide-ranging and beyond direct environmental impacts. For this briefing, we are focusing on the combined impacts (both positive and negative) between mitigation and adaptation.

There are opportunities to realise joint positive outcomes for adaptation and mitigation, if managed well.

* In this briefing, we only consider co-benefits and trade-offs between mitigation and adaptation, although there are multiple examples of additional co-benefits to health, air quality and biodiversity.

- **Co-benefit.** An action (whether primarily for adaptation or mitigation) that would support both mitigation and adaptation simultaneously.
- **Trade-off.** Mitigation actions which increase climate risk or make adapting to climate risk more difficult; or an adaptation action which increases greenhouse gas emissions or delays emissions reductions.

Co-benefits and trade-offs can be realised either deliberately or unintentionally. Developing an understanding of the system in which interventions are made can improve identification of potential outcomes and make explicit potential negative impacts.

Planning and taking action on adaptation and mitigation should aim to maximise co-benefits, minimise trade-offs and avoid unintended consequences. Table 1 presents a simple matrix for understanding the interplay of adaptation and mitigation interventions and where there may be possible co-benefits or trade-offs. Using systems thinking to understand the numerous complex connections between actions and system responses over multiple scales (including time) can help enable this.

| Table 1 Potential connections of actions for adaptation and mitigation objectives | | |
|---|--|--|
| | Potential co-benefits | Potential trade-offs |
| Adaptation interventions | Adaptation intervention with mitigation co-benefit For example: <ul style="list-style-type: none"> • Effective peatland restoration (leading to increased carbon sequestration) | Adaptation intervention with mitigation trade-off For example: <ul style="list-style-type: none"> • Air conditioning installation (leading to increased energy use and potentially higher emissions) |
| Mitigation interventions | Mitigation intervention with adaptation co-benefit For example: <ul style="list-style-type: none"> • Urban greening (leading to urban cooling during period of high temperature) • New transport networks to encourage active travel include natural solutions to manage flooding • Energy system planning and design for a decarbonised supply with a high level of reliability and resilience | Mitigation intervention with adaptation trade-off For example: <ul style="list-style-type: none"> • Increased energy efficiency in homes without any cooling or sufficient ventilation (potentially leading to increased overheating in homes) • Expansion of recycling and re-use waste infrastructure is located in areas exposed to climate hazards |

Notes: The examples given could also be pursued for other objectives (e.g. biodiversity, health) and the categories provided are not exclusive. For this briefing, we have provided examples from the perspective of reaching adaptation and mitigation objectives.

2. Sectoral links and opportunities in Wales

There are many potential co-benefits, trade-offs and unintended consequences for mitigation and adaptation. This section presents some key sectors which Wales will need to rapidly decarbonise and some examples for the potential associated co-benefits or trade-offs with adapting to climate change.

An understanding of the possible interactions between adaptation and mitigation is needed to maximise co-benefits.

The sectors below include the most urgent and well understood areas of overlap between mitigation and adaptation but are not an exhaustive list. For each, there is an identified upcoming opportunity for Wales to integrate mitigation and adaptation provided. Whether the potential co-benefits are realised and negative impacts minimised will depend on careful design and management of actions.

- **Buildings.** Action to reduce emissions from buildings, in particular improvements to fabric efficiency, can also make them more resilient to future changes in climate (e.g. more frequent and intense heatwaves) if designed and implemented well. Passive cooling measures also have large co-benefits.⁶ However, without consideration of the future climate when undertaking retrofit programmes, emissions reduction measures may inadvertently increase the exposure or vulnerability of building occupiers to climate risks. Box 1.1 gives a current example for Wales.

Box 1.1

Buildings intervention example in Wales

- **Goal.** As part of reaching Net Zero Wales, Welsh Government have set ambition areas across energy efficiency, low carbon heat and behaviour shift for residential buildings.
- **Activity.** The Welsh Government is delivering schemes to decarbonise socially rented homes by retrofitting energy efficiency measures and low-carbon heat.
- **Potential trade-offs.** Insulation measures in buildings to reduce heat loss and energy needs can cause unintended consequences which may increase the likelihood of overheating in warmer temperatures. Loft insulation and cavity wall insulation, installation of double glazing and draft proofing can increase the airtightness of buildings and without additional appropriate ventilation, this can increase the risk of exceeding comfortable indoor air temperatures, as well as negatively impacting indoor air quality. A pilot study over the summer of 2022 identified particular overheating risks for post-1990 flats across Wales.

Source: Welsh Government (2021) *Net Zero Wales Carbon Budget 2 (2021-25)*; Cardiff Metropolitan University (2022) *How resilient are buildings in the UK and Wales to the challenges associated with a changing climate?*

The National Peatland Action Programme is an opportunity to deliver joint mitigation and adaptation for Wales.

- **Land-use.** There are risks and opportunities from climate change for the ability of land to contribute to Net Zero. Woodland and hedgerow planting, catchment-sensitive farming, peatland restoration, and soil conservation (among others) can have benefits for increasing climate resilience, as well as carbon sequestration. Careful design and planning, such as about location, management options, and tree species mix, will be necessary to ensure such benefits are maintained over the long term despite a changing climate. Further information is given in the accompanying [Adaptation and the nature emergency](#) briefing. Box 1.2 gives an example for Wales.

Box 1.2

Land-use intervention examples in Wales

- **Goal.** The Welsh Government recently raised the ambition set out in the National Peatland Action Programme, so that by 2030 the programme will be delivering at a scale capable of reaching the net zero 2050 target of 45,000 ha of peatland restored.
- **Activity.** The National Peatland Action Programme (NPAP), launched in 2020, is Wales's first five-year restoration programme. Since its implementation, a data portal and distribution map of Welsh peatlands have been developed that provide important information regarding the condition and extent of peatlands in Wales.
- **Potential co-benefits.** Peatlands are critical for both carbon storage and other environmental services such as water regulation. If peatlands are not in good condition, they are at higher risk of degradation and carbon loss as the UK's climate changes. Peatland restoration therefore benefits both climate resilience and carbon storage.

Source: Welsh Government (2022) *Written Statement: Biodiversity Deep Dive*.

Low carbon transport systems must also be climate resilient.

- **Transport.** Changes to the transport system to achieve Net Zero can include electrification of rail and road transport, use of alternative fuels, increased use of public transport and increased active travel. These changes can increase exposure of passengers, cyclists and pedestrians to disruption from extreme weather if infrastructure is not sufficiently resilient to climate change.⁷ In order to achieve decarbonisation of the transport system we need climate resilient public transport networks. Effective design of new transport networks can also deliver adaptation benefits such as reduced disruption from extreme weather or damage from flooding. Box 1.3 gives an example for Wales.

Box 1.3

Transport intervention examples in Wales

- **Goal.** The Welsh Government has committed to invest in low-carbon, accessible, efficient and sustainable transport services and infrastructure that enable more people to walk, cycle and use public transport, and low-emissions vehicles.
- **Activity.** The Green Corridor Initiative in Wales is working across the 3,000 ha of natural habitats that line Welsh motorways and trunk roads.
- **Potential co-benefits.** This can improve quality of landscape for active travel, manage land to store carbon whilst also using natural solutions to manage floodplains and create sustainable drainage to deal with dangerous weather events like flooding.

Source: Welsh Government (2021) *Llwybr Newydd: the Wales transport strategy 2021*; Welsh Government (2022), *Road verges, green corridors and protecting wildlife*.

Climate risks need to be considered in spatial planning of new waste infrastructure.

- **Waste.** Shifting towards a circular economy requires reconfiguration or new waste management systems and infrastructure. As these are developed, there is a potential increased exposure to climate risks such as flooding of landfill sites, extreme heat preventing regular collections and reduced water availability for wet processes and site management.^{8,9} Box 1.4 gives an example for Wales.

Box 1.4

Waste intervention examples in Wales

- **Goal.** Wales published its Beyond Recycling strategy in March 2021. This sets targets to send zero waste to landfill by 2025 and to become a 'zero waste nation' by 2050.
- **Activity.** Flood risk assessments have been conducted on existing landfill sites across Wales, with some sites identified at risk from coastal erosion. The Welsh Government is undertaking a review of strategic waste and recycling infrastructure in partnership with local authorities, which will include consideration of climate resilience.
- **Potential trade-offs.** As Wales moves to increase recycling rates and introduces new waste management services and infrastructure, such as for deposit return schemes, there could be a trade-off of increased exposure to physical climate risks if these are not considered in the spatial planning and collection design.

Source: Welsh Government (2021) *Beyond Recycling*; Welsh Government (2022) *Prosperity for All: A Climate Conscious Wales Progress Report*.

The growing dependence of other systems on electricity highlights the importance of considering changing climate hazards.

- **Energy.** A decarbonised energy system will not be reliable if it is not climate resilient. The cascading impacts of electricity failure are already significant. These will continue to grow as the economy becomes increasingly electrified and as extreme weather events become more common and severe. Critical services such as telecoms, banking and other infrastructure already depend on a reliable and resilient electricity system.¹⁰ Whilst mainly a reserved area, the consequences of failure will be felt in Wales, and more acutely felt by the more vulnerable in society. Careful system-level and asset-level planning and design is needed from the outset to ensure that a decarbonised system, with a higher degree of weather-dependence, can be made reliable and resilient.¹¹ Box 1.5 gives an example for Wales.

Box 1.5

Energy intervention examples in Wales

- **Goal.** By 2030, Wales aims to generate renewable electricity equal to 70% of its electricity consumption.
- **Activity.** The Welsh Government is facilitating the development of local energy planning for reaching climate change targets by exploring a range of different local energy scenarios. Planning for the range of climate hazards that future energy systems will face over their lifetime will be needed too.
- **Potential co-benefits.** In order to support the UK Government target of up to 50 GW of offshore wind by 2030, in the next seven years it will have to install more than five times the amount of transmission infrastructure in England and Wales than has been built in the last 30 years. This is an opportunity to ensure that these investments are designed to a range of possible climate conditions that it will be required to operate under during their lifetimes, such as increased heatwaves or flooding, to reduce weather-related disruption or power outages.

Source: Welsh Government (2023) *Consultation Document: Review of Renewable Energy Targets*; Welsh Government (2021) *Welsh Government's response to the Welsh Affairs Parliamentary Committee inquiry on renewable energy 2021*; CCC (2023) *Delivering a reliable decarbonised power system*.

3. Strengthening joint delivery of adaptation and mitigation

The Welsh Government has set ambitions to deliver a Net Zero Wales and adapt to climate change. To deliver this, there are a number of common enablers that can support decision-makers to manage co-benefits and trade-offs. We also provide below a series of recommendations that could support joint delivery of adaptation and mitigation and ensure co-benefits are optimised, negative impacts are reduced and trade-offs are addressed.

The goal is to ensure co-benefits are optimised, negative impacts are reduced and trade-offs are addressed.

(a) Enablers

A series of common enablers can support effective decision-making and delivery across each sector for both mitigation and adaptation.

- **Data, monitoring and research.** More data is needed to better understand the inter-related impacts of mitigation and adaptation actions. C40 have developed an 'Adaptation and Mitigation Interaction Assessment (AMIA) tool' which is a positive step forward on this.¹² Furthermore, when considering useful data to collect and monitor over time, organisations across the public and private sector should consider adaptation needs alongside potential mitigation indicators.
- **Skills and workforce.** Skills need to be built up to foster systems thinking and build on growing Net Zero competencies to integrate adaptation.
- **Governance.** Governance structures to enable delivery and accountability for mitigation should also, where possible, include a remit for adaptation. For example, internal government working groups or climate change boards.
- **Engagement and education.** Public engagement and wider education on climate change should combine information on mitigation and adaptation. For example, citizen's assemblies should discuss the choices to reduce emissions and how to adapt to climate risks.
- **Funding and investment.** Delivering mitigation and adaptation at the necessary scale to fully prepare for climate change will require mobilising investment.^{13,14} Knowledge and capabilities should be built to design financial packages that achieve the best outcomes across mitigation and adaptation. Any investments made should include consideration of climate impacts.

(b) Recommendations

We recommend seven near-term actions for Welsh Government to strengthen joint delivery for mitigation and adaptation:

1. **Build the knowledge base on joint impacts of policy measures.** Effective monitoring and evaluation is necessary to understand both expected and unexpected impacts of actions taken to deliver mitigation and adaptation outcomes. This can help identify necessary adjustments or changes to improve delivery.
2. **Develop systems thinking capabilities** to understand potential consequences and minimise negative unintended consequences. Decision-makers need to be able to undertake systematic assessments of outcomes across multiple scales (e.g. spatial, temporal) and assess potential for cascading impacts or lock-in risks.
3. **Enhance skills across 'Team Wales'.** In early 2023, the Welsh Government published its Net Zero Skills Action Plan which set out priority actions to identify Net Zero skill requirements across sectors while building inclusive partnerships to deliver skills policy.¹⁵ This is a positive step that could be built on to further develop skills for delivering adaptation across Wales.
4. **Embed adaptation into mitigation policy.** Include an assessment of climate risks (potential co-benefits and trade-offs with adaptation) during development of mitigation policy. Detail how policies will maximise co-benefits of action on delivering carbon reductions and adapting Wales to climate change and where possible, minimise trade-offs.
5. **Acknowledge trade-offs.** For some policy actions there may be unavoidable trade-offs. In these scenarios, decisions made over trade-offs should be made explicit and potential other measures investigated to minimise negative impacts.
6. **Engage with local communities.** Leadership is needed to achieve a collective vision for Wales that delivers benefits for communities across both mitigation and adaptation. Understanding how mitigation policies may increase vulnerability or exposure to climate risks should be a key principle. There is also a wealth of local knowledge which will be vital to the success of a wide range of interventions, particularly around issues such as social care or monitoring of habitats.
7. **Make investments climate resilient.** As investment is made to deliver Net Zero and adaptation, climate risks must be incorporated into financial processes and decisions to ensure that possible co-benefits are realised and trade-offs avoided. This is particularly important for the large infrastructure and energy investment flows needed to rapidly build new low-carbon capital stocks over the coming decade.

Endnotes

- ¹ Climate Change Committee (CCC) (2023) *Progress report: Reducing emissions in Wales*, <https://www.theccc.org.uk/wp-content/uploads/2023/06/Progress-Report-Reducing-emissions-in-Wales.pdf>.
- ² CCC (2023) *Progress report: Reducing emissions in Wales*, <https://www.theccc.org.uk/wp-content/uploads/2023/06/Progress-Report-Reducing-emissions-in-Wales.pdf>.
- ³ Welsh Government (2019) *Prosperity for All: A Climate Conscious Wales*, https://www.gov.wales/sites/default/files/publications/2019-11/prosperity-for-all-a-climate-conscious-wales_0.pdf.
- ⁴ CCC (2021) *Independent Assessment of UK Climate Risk*, <https://www.theccc.org.uk/wp-content/uploads/2021/07/Independent-Assessment-of-UK-Climate-Risk-Advice-to-Govt-for-CCRA3-CCC.pdf>
- ⁵ IPCC (2014) *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*.
- ⁶ CS-NOW (2022) *WPE2 Deliverable E2. 1: Interim Report Rapid evidence assessment and qualitative rating of co benefits and trade offs*.
- ⁷ Jaroszweski, D., Wood, R., and Chapman, L. (2021) *Infrastructure*. In: *The Third UK Climate Change Risk Assessment Technical Report*. [Betts, R.A., Haward, A.B., Pearson, K.V. (eds)] Prepared for the Climate Change Committee, London.
- ⁸ Winne, S., Horrocks, L., Kent, N., Miller, K., Hoy, C., Benzie, M., & Power, R. (2012) *Increasing the climate resilience of waste infrastructure*, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/183933/climate-resilience-full.pdf.
- ⁹ Jaroszweski, D., Wood, R., and Chapman, L. (2021) *Infrastructure*. In: *The Third UK Climate Change Risk Assessment Technical Report*. [Betts, R.A., Haward, A.B., Pearson, K.V. (eds)] Prepared for the Climate Change Committee, London.
- ¹⁰ CCC (2023) *Delivering a reliable decarbonised power system*, <https://www.theccc.org.uk/publication/delivering-a-reliable-decarbonised-power-system/>
- ¹¹ CCC (2023) *Delivering a reliable decarbonised power system*, <https://www.theccc.org.uk/publication/delivering-a-reliable-decarbonised-power-system/>
- ¹² C40 (2018) *Adaptation and Mitigation Interaction Assessment (AMIA) tool*, https://www.c40knowledgehub.org/s/article/Adaptation-and-Mitigation-Interaction-Assessment-AMIA-tool?language=en_US
- ¹³ CCC (2023) *Investment for a well-adapted UK*, <https://www.theccc.org.uk/publication/investment-for-a-well-adapted-uk/>.
- ¹⁴ Sixth Carbon Budget Advisory Group (2020) *The road to Net-Zero Finance*, <https://www.theccc.org.uk/publication/the-road-to-net-zero-finance-sixth-carbon-budget-advisory-group/>.
- ¹⁵ Welsh Government (2023) *Net zero skills action plan*, <https://www.gov.wales/net-zero-skills-action-plan>.

Adaptation and decarbonisation
September 2023

Climate Change Committee
1 Victoria Street
Westminster
SW1H 0ET

www.theccc.org.uk
@theCCCuk