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# Climate Change Adaptation Plan 2023-2027



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# Climate Change Adaptation Plan 2023-2027

Authors: Harry James, Clive Walmsley, Sadie Waterhouse, Lucia Watts

Author Affiliation: Natural Resources Wales

## About Natural Resources Wales

Natural Resources Wales' purpose is to pursue sustainable management of natural resources. This means looking after air, land, water, wildlife, plants and soil to improve Wales' well-being, and provide a better future for everyone.

## Evidence at Natural Resources Wales

Natural Resources Wales is an evidence-based organisation. We seek to ensure that our strategy, decisions, operations and advice to Welsh Government and others are underpinned by sound and quality-assured evidence. We recognise that it is critically important to have a good understanding of our changing environment.

We will realise this vision by:

- Maintaining and developing the technical specialist skills of our staff;
- Securing our data and information;
- Having a well resourced proactive programme of evidence work;
- Continuing to review and add to our evidence to ensure it is fit for the challenges facing us; and
- Communicating our evidence in an open and transparent way.

## Recommended citation for this report:

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## Crynodeb Gweithredol

Mae'r Cynllun Ymaddasu cyntaf ledled y sefydliad hwn yn nodi sut y gall Cyfoeth Naturiol Cymru reoli risgiau hinsawdd i barhau i gyflawni ei gylch gwaith. Mae'n nodi camau allweddol i gynyddu gallu'r sefydliad i wrthsefyll effeithiau'r newid yn yr hinsawdd nawr ac yn y dyfodol. Hyd yn oed os cyflawnir yr uchelgeisiau Sero Net, yng Nghymru ac yn fyd-eang, mae llawer o effeithiau'r newid yn yr hinsawdd wedi'u 'cloi i mewn' oherwydd natur system y Ddaear. Mae cymryd camau cynnar, yn ogystal â meithrin capasiti i ymaddasu yn y sefydliad, yn hanfodol.

Mae'r Cynllun Ymaddasu yn tynnu sylw at y camau mae CNC yn eu cymryd heddiw, yn ogystal â'r rhai sydd wedi'u cynllunio neu sydd eu hangen yn y dyfodol. Mae'n adeiladu ar ddadansoddiad helaeth o risgiau hinsawdd i'r sefydliad a gyhoeddwyd yn ein Hadroddiad Risg Hinsawdd Sylfaenol a gynhyrchwyd yn ystod gwanwyn 2023. Mae'n dwyn ynghyd ddata meintiol ar effeithiau a risgiau hinsawdd e.e. newidiadau hinsoddol o Ragolygon Hinsawdd y DU (UKCP18) a'r ystod o risgiau hinsawdd o 3<sup>ydd</sup> Aseiad Risg Newid Hinsawdd y DU (CCRA3), ynghyd â data ansoddol ar ein camau ymaddasu drwy ymgynghori ag arbenigwyr o fewn CNC, i roi asesiad manwl o flaenoriaethau ymaddasu CNC. Cyflwynwyd dros 50 o gamau gweithredu o ymgynghoriad ar draws yr holl Grwpiau Busnes a Chyfarwyddiaethau. Fe'u blaenoriaethwyd yn unol â set o feini prawf ac fe'u dosbarthwyd o dan 32 o flaenoriaethau ymaddasu sefydliadol sy'n gysylltiedig ag Amcanion Lles y Cynllun Corfforaethol a'r camau i'w cymryd i'w cyflawni.

Prif ganfyddiad y Cynllun yw bod pob rhan o CNC, ei Grwpiau Busnes a'i Gyfarwyddiaethau yn cael eu heffeithio gan y newid yn yr hinsawdd, neu y byddant yn cael eu heffeithio ganddo. Fel yn achos Cymru gyfan, mae datblygiad y Cynllun hwn wedi nodi enghreifftiau da o gamau ymaddasu ar draws CNC, ond

nid ym mhob un o'n meysydd gwaith. Ond mae'r camau hyn yn aml yn fentrau unigol ac adweithiol yn hytrach na mentrau rhagweithiol strategol.

Ar draws CNC, nodwyd y pum thema ymaddasu â blaenoriaeth y mae angen eu blaenoriaethu dros yr 1-2 flynedd nesaf fel a ganlyn:

- Datblygu'r gallu i werthsefyll y newid yn yr hinsawdd mewn cynlluniau, cymunedau a chyfleusterau rheoledig.
- Sicrhau'r datblygiad cywir yn y lle cywir i osgoi niwed i natur.
- Datblygu gallu safleoedd ar dir yn ein gofal i wrthsefyll newid.
- Gwella gallu cymunedau i wrthsefyll.
- Lleihau risgiau mewn safleoedd gwarchoddedig a gwella eu cyflwr.

Ochr yn ochr â'r risgiau sefydliadol hyn, nodwyd y tri cham ymaddasu pwysicaf fesul Grŵp Busnes i roi ffocws ar gyfer gweithredu.

Amlygodd yr ymgynghoriadau a gynhaliwyd yn ystod y broses i ddatblygu'r Cynllun hwn sawl rhwystr canfyddedig i ymaddasu i'r newid yn yr hinsawdd. Y prif rwystrau a nodwyd i ymaddasu'n llwyddiannus yn CNC oedd diffyg cyllid, adnoddau a chapasiti. Fodd bynnag, roedd materion eraill a nodwyd yn cynnwys argaeledd tystiolaeth, llywodraethu neu sgiliau priodol. Mae'n hollbwysig mynd i'r afael â'r rhwystrau hyn ar raddfa sefydliad gyfan er mwyn sicrhau bod modd cynyddu'r camau ymaddasu a'u cyflawni'n effeithiol. Mae angen gwneud rhagor o waith i ymchwilio i'r rhwystrau hyn a chynyddu gallu staff a'r sefydliad i ymaddasu.

Mae datblygiad y Cynllun hwn wedi'i arwain gan y tîm Newid Hinsawdd a Datgarboneiddio, ond gydag ymgynghoriad a mewnbwn gan bob Grŵp Busnes ac ystod eang o arbenigwyr thematig ar draws y sefydliad. Yn y pen draw, CNC sy'n berchen ar y cynllun a rhaid iddo gael ei ddarparu gan lawer ar draws y sefydliad. Bydd llywodraethu clir i sbarduno camau gweithredu a monitro cynnydd yn hanfodol drwy'r Grŵp Argyfwng Hinsawdd mewnol. Mater i Grwpiau Busnes a Chyfarwyddiaethau fydd cyflawni'r rhan fwyaf o'r camau a nodir yn y cynllun. Mae'n bwysig cydnabod, gan mai dyma'r cyntaf, na fydd y Cynllun yn gwbl gynhwysfawr er bod ymgynghoriad helaeth wedi'i gynnal.

Yn dilyn cyhoeddi'r Cynllun hwn, bydd CNC yn datblygu proses monitro a gwerthuso mwy ffurfiol wrth i'r cylch ymaddasu barhau dros y blynyddoedd nesaf. Bydd y Cynllun yn ddogfen fyw sy'n cynghori ac yn llywio ein gwaith cynllunio Busnes a Gwasanaeth blynyddol, cynlluniau Parhad Busnes a gweithgareddau rheoli risg. Bydd adolygiad llai manwl o'r Cynllun yn dilyn cyhoeddi ail NAP Cymru ar ddiwedd 2024. Rydym yn cynnig adolygu'r Cynllun hwn yn llawn bob pum mlynedd yn unol â'r amserlen ar gyfer adolygu NAP Cymru a CCRA y DU, i fynd i'r afael â newidiadau naill ai mewn mathau ac arwyddocâd risgiau hinsawdd neu natur a blaenoriaeth y camau ymaddasu.

# Executive Summary

This first organisation-wide adaptation plan sets out how Natural Resources Wales (NRW) can manage climate risks to continue delivery of our remit. It sets out key actions to increase the resilience of the organisation to present and future climate change impacts. Even if net zero ambitions are achieved, both in Wales and globally, many effects of climate change are 'locked in' due to the nature of the Earth system. Taking early action as well as building adaptive capacity in the organisation is imperative.

The adaptation plan highlights actions that we are taking today, as well as those planned or needed in the future. It builds upon an extensive analysis of climate risks to the organisation that was published in our baseline climate risk report in spring 2023. It brings together quantitative data on climate impacts and risk, e.g. climatic changes from the UK Climate Projections (UKCP18) and the range of climate risks from the 3<sup>rd</sup> UK Climate Change Risk Assessment (CCRA3), together with qualitative data on our adaptation actions through consultation with experts within NRW, to give a detailed assessment of our adaptation priorities. Over 50 actions were compiled from consultation across all of the business groups and directorates. They were prioritised according to a set of criteria and classified under 32 organisational adaptation priorities that are linked to our wellbeing objectives set out in our corporate plan.

The main message of the plan is that all areas of NRW, our business groups and directorates, are or will be affected by climate change. Just as it is the case for Wales as a whole, the development of this plan has identified good examples of adaptation action across NRW although not in all areas of our work. However, these actions are often individual and reactive rather than strategic proactive initiatives.

Across NRW the top five adaptation priority themes that need urgent action over the next 1-2 years were identified as:

- Building climate resilience into planning, communities and regulated facilities.
- Ensuring the right development in the right place to avoid harm to nature.
- Building resilience of sites on land in our care.
- Enhancing the resilience of communities.
- Reducing risks at, and improving condition of, protected sites.

Alongside these organisational priorities, the top three adaptation actions per business group have been identified to provide a focus to action.

The internal consultations that have been carried out during the process to develop this plan highlighted several perceived barriers to climate change adaptation. The main barriers to successful adaptation cited were a lack of funding, resources and capacity. However, other issues identified were availability of evidence, governance or appropriate skills. It is vitally important that these barriers are addressed at an organisation-wide scale to ensure that adaptation actions can be scaled up and delivered effectively. Further work is

required to investigate these barriers and increase the adaptive capacity of colleagues and the organisation.

The development of this plan has been led by the climate change and decarbonisation team but with consultation and input from all business groups and a wide range of thematic experts across the organisation. Ultimately, the plan is owned by NRW and must be delivered by many across the organisation. Clear governance to drive action and monitor progress will be essential through the business groups with organisation-wide oversight provided by the internal climate emergency group. It will be for business groups and directorates to deliver most of the actions detailed within the plan. It is important to recognise that as a first iteration, the plan will not be totally comprehensive even though extensive consultation has been carried out.

Following publication of this plan, we will develop a monitoring and evaluation process as the adaptation cycle continues over the coming years. The plan will be very much a live document that advises and informs our annual business and service planning, business continuity plans and risk management activities. A light touch review of the plan will follow the publication of the upcoming second Welsh National Adaptation Plan, the climate resilience strategy, in late 2024. We propose to fully revise this plan on a five-yearly basis in line with the timeframe for revision of the Welsh NAP and the UK CCRA, to address changes in either the types and significance of climate risks or the nature and priority of the adaptation actions.



# Introduction

The UK climate has already warmed by more than 1°C since 1850 and will continue to do so for decades, even if global mitigation measures are successful, and warming is limited to around 1.5°C. The impacts of current and future climate change will affect the whole of NRW and its remit. Adapting to climate change by reducing the risk of climate impacts and increasing our resilience and capacity to adapt is essential if we are to continue to fulfil our functions. Integrating adaptation across the organisation will be challenging due to the scale of changes required and will require difficult decisions to be made. However, we are already carrying out climate change adaptation measures and this experience and knowledge will be important when looking at mainstreaming climate change adaptation across the organisation.

The purpose of this adaptation plan is to drive climate change adaptation action and provide direction and guidance for the whole organisation to mainstream action to reduce our climate risk. Delivery of the plan and its outcomes will be the responsibility of the whole organisation.

The objectives of this plan are:

- To provide an organisational wide assessment of the climate risks and adaptation actions that should be our priority;
- To embed consideration of climate risk and adaptation to climate change into every business group and service plan within the organisation;
- To assist delivery of our corporate plan wellbeing objectives in an integrated way through recognising that all wellbeing objectives require consideration of adaptation;
- And ultimately, to manage and reduce our operational climate change risks to an acceptable level.

Climate change adaptation is not something that is new within NRW. In developing this plan, evidence of recent and on-going adaptation action has been identified, demonstrating an existing broad base of knowledge and action across some parts of the organisation. However, it is very clear that without a strategic approach to embed consideration of climate risk and the need for adaptation action across all of NRW, there will be a growing risk that impacts will seriously undermine our delivery. This plan seeks to steer all areas of the organisation on their climate change adaptation journey.

## What is Adaptation?

Climate change adaptation can be defined as:

‘the process of adjustment to actual or expected climate and its effects’ (ISO 14090: 2019)

It is further described by the UNFCCC as:

‘adjustments in ecological, social or economic systems in response to actual or expected climatic stimuli and their effects. [Adaptation] refers to changes in processes, practices and structures to moderate potential damages or to benefit from opportunities associated with climate change’ (UNFCCC 2023).

Put simply, climate change adaptation involves changing the way we work, live and manage the environment to reduce the impact of climate change. Successful climate change adaptation helps to reduce the risk of climate change impacts to individuals, businesses, communities and the wider environment by increasing their resilience.

Adaptation is not climate change mitigation. The two are separate although intrinsically linked. Mitigation is the process of reducing greenhouse gas emissions and maintaining and enhancing carbon stores to limit GHG concentrations in the atmosphere and thereby reduce the future rate of climate change. Adaptation is the process of adjusting to current and future climate change to reduce the impact. Our plans to reduce our own emissions are set out in our net zero plan.

## Remit of the Adaptation Plan

This plan is wholly focussed on how climate change impacts, such as heat, flooding and drought, will affect the whole organisation and the way we operate. The plan covers all areas of the organisation, considering the risks at a national (Welsh) scale. It does not consider climate risks at the place scale that would be relevant to our operations directorate. However, this is something that we are addressing. We have developed guidance to help PSBs to develop local climate risk assessments that when complete will enable evaluation of climate risk in a local context. The plan does not focus on our wider advocacy or public facing role and its collaboration role with other stakeholders. It also does not provide guidance on how other organisations can adapt to climate change, although the process and development of the plan is potentially applicable to our partners.

This is our first climate change adaptation plan. Its development has been led by the climate change and decarbonisation team but with consultation and input from all business groups, heads of service and a wide range of thematic experts across the organisation. Ultimately, the plan is owned by NRW and must be delivered by many across the organisation. Clear governance to drive action and monitor progress will be essential through the business groups, with NRW-wide oversight through our internal climate emergency group. It is important to recognise that as a first iteration, the plan will not be totally comprehensive even though extensive consultation has been carried out. It will be for business groups and directorates to deliver the actions detailed within the plan.

The adaptation plan is a five year plan, however it must not be static. It will need to be a live document that evolves as our understanding of climate risk, impacts

and climate change evolves and policy changes - see the monitoring and evaluation section for more information.

In 2023, the UK Climate Change Committee reviewed Welsh adaptation activity and the delivery of the current Welsh Government National Adaptation Plan (Prosperity for All: A Climate Conscious Wales) (Welsh Government, 2019). This review concluded that: there is insufficient progress in delivery and implementation of adaptation and monitoring is limited, but there are some positive examples of good plans in place, although this is not consistent across sectors (CCC, 2023). Just as it is the case for Wales as a whole the development of this plan has identified good examples of adaptation action although not in all areas of our work. The CCC review will feed into the development of the 2<sup>nd</sup> Welsh National Adaptation Plan in 2024, the climate resilience strategy. We have already provided input into the Welsh Government's own progress report on the existing NAP, and the production of this adaptation plan will provide valuable input to inform the development of the next NAP. After publication of the 2<sup>nd</sup> NAP, we will look to establish the extent to which any upcoming priorities need including in our own adaptation plan.

Additionally, another key report investigating how organisations report on adaptation action highlighted that there needs to be more consistent linking of adaptation actions to risks, with clear ownership and timescales, and more information on the effectiveness of actions in reducing risk (CCC, 2022). The development of our baseline assessment and this adaptation plan has taken into account the associated climate risks and parties responsible for delivery that will be supported by the climate change and decarbonisation team.

## **NRW Responsibility for Adaptation Planning**

There is currently no statutory requirement for NRW to produce an organisational adaptation plan. However, given that the observable impacts of climate change are becoming much more significant it is considered best practice to do so. The Climate Change Act (2008) gives both the Secretary of State (Westminster) and Minister (Welsh Government) the power to direct reporting authorities (defined as bodies with functions of a public nature and statutory undertakers) to produce reports on the current and future predicted effects of climate change on their organisation and what they are doing to adapt to climate change (Defra 2011). This includes water companies, energy companies, road and rail companies, aviation, Defra and other public bodies. This requirement has resulted in bodies in the UK and England, including Natural England and the Environment Agency, producing three iterations plans to report under the Adaptation Reporting Power. Currently, Welsh Government has chosen not to require Welsh public bodies to do similarly. Despite the absence of a statutory duty, there are an increasing number of Welsh public bodies such as local authorities who are producing adaptation plans. The publication of the ISO14090 guidance standard for organisational adaptation in 2019 has provided significant impetus for many organisations public and private to develop plans, including NRW.

## How To Understand This Document

This plan's sections and actions are framed around our corporate plan and its wellbeing objectives and each of the 'steps to take' within each objective. Therefore this plan directly supports the integrated delivery and achievement of our three wellbeing objectives.

The plan contains an overview of the adaptation priority themes with relevance to included areas of the organisation. All groups within the organisation are included within the adaptation priority themes, indicating potential cross-NRW adaptation action. Additionally, for each business group, or sub-group, we have presented the top 5 priority actions to guide groups with where to start with adaptation.

To further understand the risks to the organisation from which the adaptation plan actions are developed, see the baseline risk assessment summary section of this document.



# Climate Change Risks

Climate change risks to individuals, communities and businesses in the UK are collated and assessed every 5 years in the UK-wide Climate Change Risk Assessment. The 3<sup>rd</sup> Climate Change Risk Assessment (CCRA3), published in 2021 defines the scale and magnitude of climate risks for Wales and the other nations of the UK. CCRA3 provides a list of 61 risks and/or opportunities for Wales (Figure 1), rated according to the urgency and nature of action required (Netherwood 2021). The current level of adaptation action is only deemed appropriate for nine risks, which mostly relate to business, infrastructure, and international dimensions. CCRA3 paints an increasingly critical situation with the level of action failing to keep pace with the growing level of risks: the highest urgency score has been given to 34 of the 61 risks (56%), up from 36% for those risks in CCRA2 published in 2017. The 61 risks and opportunities are divided into categories of Natural Environment and Assets (N); Infrastructure (I); Health, Communities and the Built Environment (H); Business and Industry (B); International Dimensions (ID).

<b>N1:</b> Risks to terrestrial species and habitats from changing climatic conditions	<b>N2:</b> Risks to terrestrial species and habitats from pests, pathogens and INNS	<b>N4:</b> Risks to soils from changing climatic conditions	<b>N5:</b> Risks to natural carbon stores, carbon sequestration and GHG emissions	<b>N6:</b> Risks to agricultural and forest productivity from changing climate conditions	<b>N7:</b> Risks to agriculture from pests, pathogens and INNS	<b>N8:</b> Risk to Forestry from pests, pathogens and INNS	<b>N11:</b> Risks to freshwater species and habitats from changing climatic conditions
<b>N12:</b> Risks to freshwater species and habitats from pests, pathogens and INNS	<b>N14:</b> Risks to marine species and habitats from changing climatic conditions	<b>N16:</b> Risks to marine species and habitats from pests, pathogens and INNS	<b>N17:</b> Risks to coastal species and habitats	<b>I1:</b> Risks to infrastructure networks	<b>I2:</b> Risks to infrastructure services from river and surface flooding	<b>I5:</b> Risks to transport networks from slope and embankment failure	<b>I12:</b> Risks to transport from temperature, high winds, lightning
<b>H1:</b> Risks to health and wellbeing from high temperature	<b>H3:</b> Risks to people, communities and buildings from flooding	<b>H4:</b> Viability of coastal communities - risks of sea level rise	<b>H6:</b> Risks to household energy demand from temperature changes	<b>H11:</b> Risks to cultural heritage from climatic change	<b>H12:</b> Risks to health and social care delivery from extreme weather	<b>H13:</b> Risks to education and prison services from extreme weather	<b>B1:</b> Increased risk of flooding to business sites
<b>B2:</b> Risks to coastal business locations and infrastructure from climatic change	<b>B6:</b> Disruption to business supply chains and networks from extreme weather	<b>ID1:</b> Risks to food availability, safety and quality	<b>ID4:</b> Risks to the UK's international interests and responsibilities	<b>ID5:</b> Changes to international governance affecting the UK	<b>ID7:</b> Risks to international trade routes from climate hazards	<b>ID9:</b> Risks to public health from overseas (vector borne disease)	<b>ID10:</b> Risk multiplication to the UK
<b>N3:</b> Opportunities from new species colonisations of terrestrial habitats	<b>N9:</b> Opportunities from new/alternative species becoming suitable for agriculture and forestry	<b>N10:</b> Risks to aquifers and agricultural land from sea level rise/saltwater intrusion	<b>N15:</b> Opportunities for marine species, habitats and fisheries from changing climatic conditions	<b>N18:</b> Risks/Opportunities for landscape character from climate change	<b>I3:</b> Risks to infrastructure services from coastal flooding and erosion	<b>I4:</b> Risks to bridges and pipelines from flooding and erosion	<b>I6:</b> Risks to hydroelectric generation from low or high river flow
<b>I7:</b> Risks to subterranean and subsurface infrastructure from subsidence	<b>I10:</b> Risks to energy from high and low temperature, high wind and lightning	<b>I13:</b> Risks to digital from high and low temperature, high winds and lightning	<b>H2:</b> Opportunities for health and wellbeing from high temperatures	<b>H5:</b> Risks to building fabric from moisture, wind and driving rain	<b>H7:</b> Risks to health and wellbeing from changes in air quality	<b>H8:</b> Risks to health from vector borne diseases	<b>H9:</b> Risks to food safety (high temperatures) and food security (extreme weather)
<b>H10:</b> Risks to health from poor water quality and interruptions in supply	<b>B3:</b> Risks to business production processes from water scarcity	<b>B5:</b> Risks from reduced employee productivity due to infrastructure disruption and higher temperatures	<b>B7:</b> Opportunities from changes in demand for goods and services due to long-term climate change	<b>N13:</b> Opportunities from new species colonisations of freshwater habitats	<b>I8:</b> Risks to public water supplies from reduced water availability	<b>I11:</b> Risks to offshore infrastructure from storms and high waves	<b>B4:</b> Risks to business finance, investment and insurance due to extreme weather
<b>ID8:</b> Risks to the UK financial sector from climate change overseas	<b>I9:</b> Risks to energy generation from reduced water availability	<b>ID2:</b> Opportunities for UK food availability and exports	<b>ID3:</b> Risks and opportunities from climate driven migration to the UK	<b>ID6:</b> Opportunities from increased trade for the UK due to new trade routes from Arctic ice melt			

Figure 1: Climate change risks for Wales in CCRA3.

# Climate Trends - Setting the Context

## Current and Future Climate Change

The UK's climate has already changed significantly due to anthropogenic climate change. Figure 2 shows the temperature change in Wales since 1884 and demonstrates that the likelihood of higher annual temperatures is increasing since 2002. The warmer colours indicate the average recorded temperature that year. The Met Office's State of the UK Climate 2022 report highlights the following climate trends (Kendon et al 2023):

- Observations show that UK extremes of temperature are changing much faster than average temperatures.
- 2022 was the warmest year in the UK since 1884. 0.9°C above the 1991-2020 average. It was the first year where the UK's annual mean temperature was above 10°C.
- All of the top 10 warmest years for the UK since 1884 have occurred in the 21<sup>st</sup> Century. This is also the same for near coast surface sea temperature.
- There was a reduction in the number of days where heating was required but an increase of 7 days where cooling was required in buildings in 2022 compared to the 1991-2020 average.
- The UK had its driest summer since 1995 in 2022. However there has been a slight increase in heavy rainfall across the UK in recent decades.
- Widespread and substantial snow events have occurred in recent years but their number and severity has declined since the 1960's.
- Sea level around the UK has risen by 18.5cm since the 1900s, with an 11.4cm rise between 1993-2022. The rate of sea level rise is increasing with rates over the past 30 years of 3.0-5.2mm per year corrected for vertical land movement.
- Spring and autumn seasons are extending.

Biodiversity in the UK is being affected by climate change, with nearly 1 in 6 species now threatened with extinction (Burns et al., 2023). The Living With Environmental Change Biodiversity Report Card (Morecroft and Speakman, 2015) highlighted the impacts that climate change is having on terrestrial and freshwater species, with some key findings below:

- Many species are shifting further north, and higher in altitude, to gain access to areas of suitable climate,
- This is compounded by warmer springs causing life-cycle events of many species to occur earlier in the season.
- Montane, wetland and coastal habitats are the most sensitive to climate change due to increased temperatures, changes in water availability and sea-level rise.

For marine habitats, multiple stressors of climate change and human activities are reducing the resilience of natural systems (MCCIP, 2020) with impacts from



ocean acidification, changes in stratification and salinity of seawater, coastal erosion and Arctic sea ice loss. These are all having impacts on the ability of marine species to migrate, the availability of food and threats to fisheries, with shellfish fisheries in Wales potentially more at risk from ocean acidification.

In Wales, there has been an average decline in species abundance by 20% since 1994 with 18% of species threatened with extinction (Burns et al., 2023). However, Wales remains a stronghold for seabird species, with little change to abundances in 40 years (Burns et al., 2023). Although changes are likely to occur into the future, understanding the impacts of climate change to biodiversity are vital in ensuring adaptation actions are useful and effective. Reports are increasingly detailing the positive impacts nature-based solutions and land management decisions are having on ecosystems if measures are included, among others, to enhance ecosystem resilience and diversity (MCCIP, 2020; Morecroft and Speakman, 2015). Overall, climate change is highly likely to impact all aspects of biodiversity in terrestrial, freshwater and marine environments, with negative changes to species distributions and abundance only increasing over time (Burns et al., 2023).

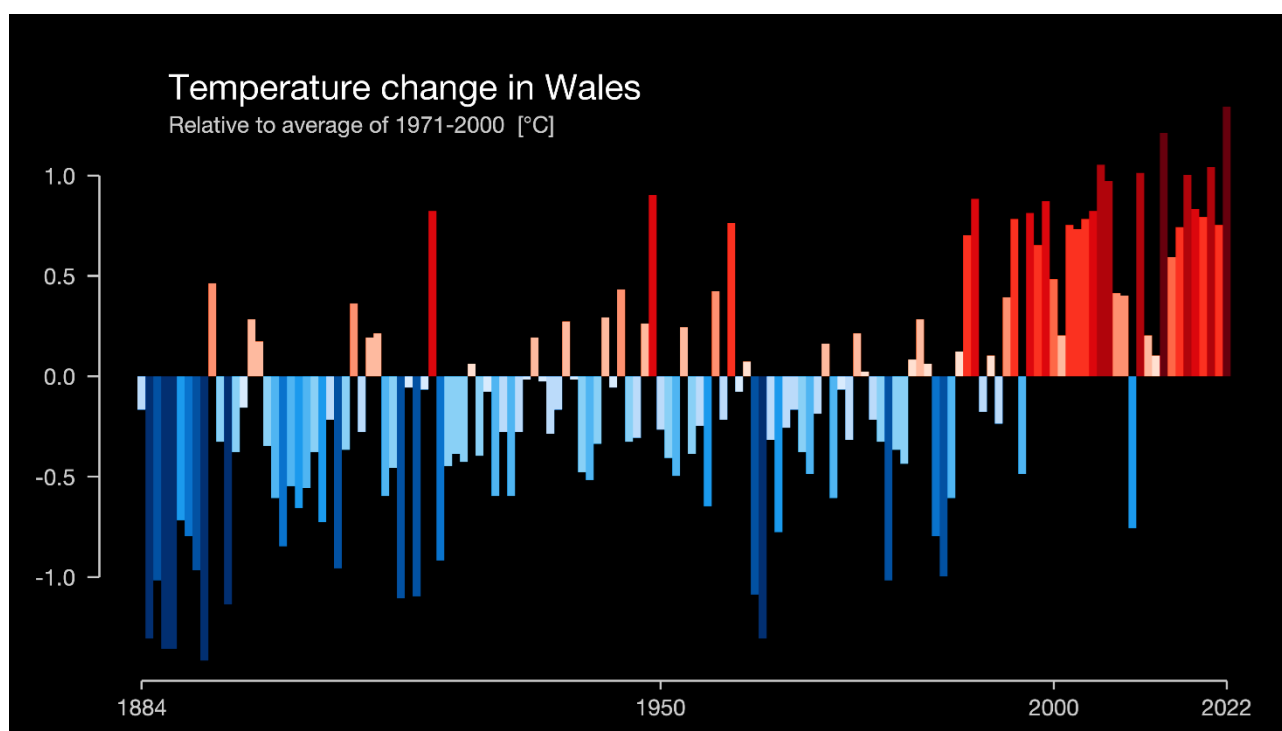


Figure 2: Temperature change in Wales since the start of the industrial revolution. Image from [#ShowYourStripes](#) Date accessed: 29/08/2023.

Given NRW's national remit, climate change across Wales needs to be considered for adaptation planning and action. Information covering larger geographical areas is also needed where decisions involve migratory species and highly connected habitats such as the marine environment. The Met Office Hadley Centre's UK Climate Change Projections 2018 (UKCP18) are used as the primary source of climate change information, which provide the most up-to-date projections for the UK. Four scenarios are available within UKCP18, which

reflect international standardised Representative Concentration Pathways (RCPs) that describe atmospheric concentrations of greenhouse gases based on a range of economic, social and environmental assumptions. Our climate change adaptation plan is based on the highest scenario, in which GHG emissions continue to grow unmitigated (RCP8.5) as per the precautionary principle. The RCP 8.5 scenario represents an estimated global average temperature rise of 4.3°C by 2100. The below section provides an overview of climate change trends and impacts for the RCP8.5 scenario.

## **Expected climate change trends and impacts from the UKCP18's highest scenario (RCP8.5) for the UK and Wales**

### **Climate variable: air temperature**

- Change in temperature by 2081-2100 of 4.3°C (3.2°C-5.4°C) compared to the baseline period of 1981-2000. In summer, hot spells, meaning at least 2 consecutive days of maximum temperatures exceeding 30 °C, will spread northwards from southern England and begin to occur in Wales. For example, around Cardiff, hot spells increase in frequency, by 2061-2080 ranging between approximately 3 and 17 per year.

### **Climate variable: sea level**

- Southern regions of the UK will experience more sea level rise than northern regions. Mid to North Wales coastlines experience a mean 0.7m rise by 2100 and Mid to South Wales coastlines experience a mean 0.75m rise. This will result in increased frequencies and magnitudes of coastal extreme water levels. Within the RCP8.5 scenario there are a range of potential sea level rises. E.g. Sea level around Cardiff is projected to increase between 51cm and 113cm. NRW flood maps already account for sea level rise to 2100 so it is possible to begin visualising the repercussions of this.

### **Climate variable: extreme weather**

- Increase in severity for all seasons for daily maximum surface temperature, hourly precipitation, daily precipitation and 5 day accumulated precipitation.

### **Climate variable: precipitation**

- Precipitation will most likely increase on west facing coasts although summers will become drier, more so in southern Wales. Rainfall will likely be more intense due to the higher moisture content of warmer air. Winters will be wetter (due to heavy rainfall rather than more days of rain). Snow will be near absent by 2080.

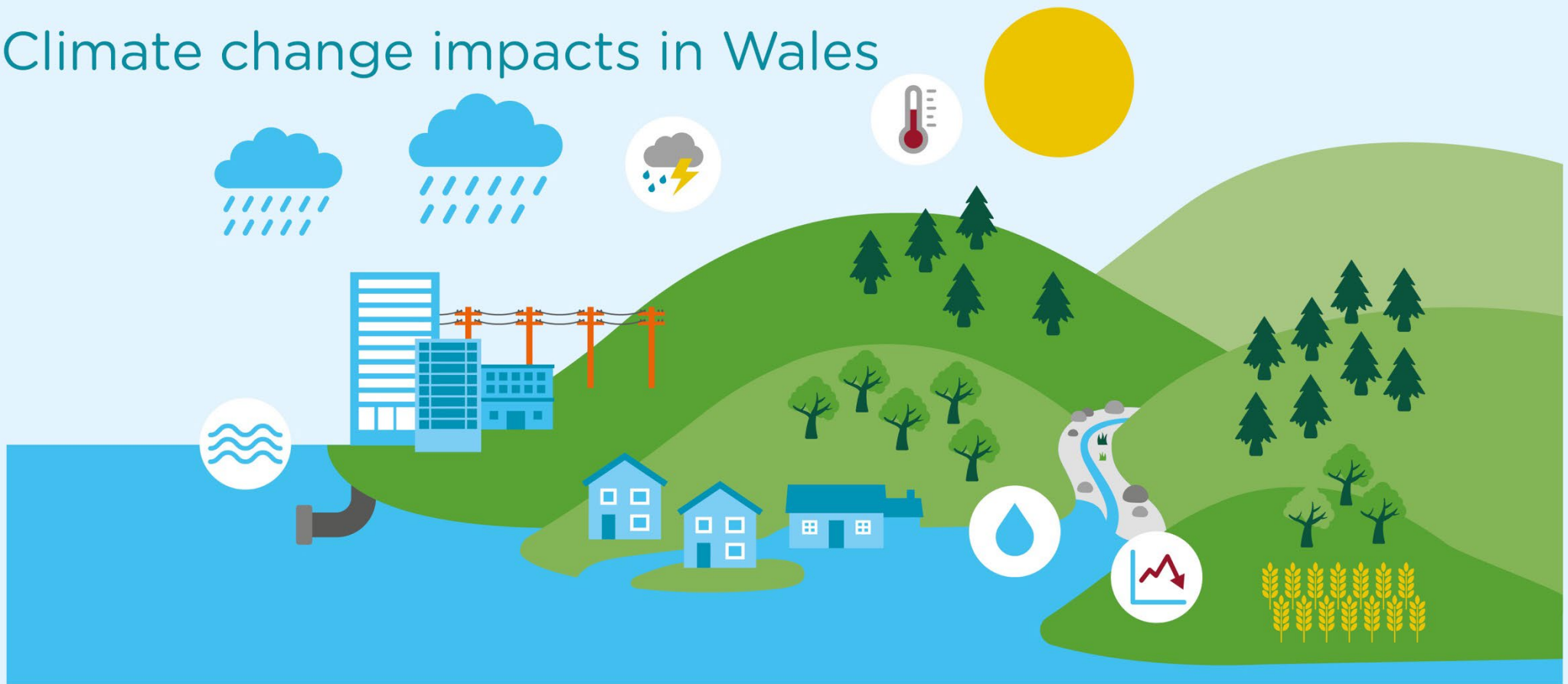
## Climate variable: wind speeds

- Maximum wind speeds may increase in winter and decrease in summer, although there is greater uncertainty around wind projections.

## How will Climate Change Impact NRW?

Due to our broad remit, there are numerous ways in which climate change will have an impact. This section outlines examples of different categories of impact, taken from the ISO 14090 'Adaptation to climate change: Principles, requirements and guidelines' standard, and will assist in understanding the breadth with which climate change adaptation needs to be considered within the organisation. In our assessment of future risks and opportunities, we have used the highest scenario (RCP8.5) unless explicitly mentioned otherwise. This is because it is important to prepare for, and be aware of, the risks posed by this unmitigated GHG scenario.

# Climate change impacts in Wales



## Sea level rise

Sea-level rise is predicted to increase between 10-30cm by 2050 and 55-80cm by 2080. This will increase the chance of coastal flooding, erosion and damage from storm surges on coastal settlements, infrastructure and the natural environment.

## Extreme weather

Increases in extreme weather events are predicted for all seasons under future projections, with greater occurrences of heatwaves and high intensity rainfall. This is likely to lead to a greater incidence of heat-related illness and flash flooding events.

## Flooding

Total winter rainfall is predicted to be 5% wetter by 2050 and 10% wetter by the end of the century. Instead of more rainy days, this increase in precipitation is likely to fall as intense, potentially stormy events, with heavy rainfall likely to see a 50% increase under worst case scenarios by 2080. This could lead to a greater risk of flash flooding and more record-breaking floods.

## Drought

Total summer rainfall is predicted to decrease by about 10% by 2050 and 30% by 2080, with warmer periods also becoming drier. The natural environment is likely to experience a greater prevalence of drought, water scarcity and low river levels alongside increasing water temperatures. This will increase pollution stress on habitats and impact water quality.

## Systemic risks

In a globalised, interconnected world the effects of climate change in far-away places can have severe impacts closer to home, which are often difficult to predict, e.g., from food crises impacting prices of goods to water crises leading to political instability and associated knock-on impacts.

Figure 3: Selection of expected climate change impacts for Wales. Data used are from UKCP18, in particular projections for 2050 use the combined low to mid emissions scenarios (RCP 2.6, 4.5 and 6) whilst those for 2080 use RCP 8.5

## Impacts on employee health, safety and productivity

- Flood risks to buildings, utilities and infrastructure, including transport; with implications for working from home, commuting and work travel and potential supply chain issues.
- Increase in the need for cooling to ensure thermal comfort in buildings requiring mechanical cooling, which could increase electricity usage, costs and greenhouse gas emissions unless the increased electricity demand is supplemented by renewable energy.
- Increase in the risk of ventilation and cooling equipment acting as a vector for existing and new diseases/disease vectors due to changing climatic conditions (warmer wetter weather). Additional filtration may be needed.

## Damage to assets and business disruption

- We manage a diverse array of assets: these include flood defences, pumping stations, visitor centres and nature reserves. Especially where these are coastal, sea-level rise poses significant risk while projected increases in riverine flooding may also impact inland assets.
- Tree-felling operations and incident response will be impacted by a range of impacts, particularly increased flooding as highlighted in our [2020 February Floods Flood Incident Management Review](#).
- Our infrastructure such as EV charging points and hydrological telemetry assets damaged by flooding and other implications of power outages associated with extreme weather.
- There is growing recognition of people suffering from climate anxiety and depression as the impacts of climate change on communities and the environment grow both globally and locally, and this could potentially affect our colleagues dedicated to maintaining their environment and communities.

## Loss of coastal infrastructure and habitat

- Sea-level rise will in some cases cause loss of habitats and land, where managed retreat or no active intervention are undertaken as prescribed in shoreline management plans. Contingency planning is needed to decide where infrastructure and habitat can be lost, and where it may require replacing, and where loss needs to be carefully managed to avoid issues such as pollution. The issue of coastal squeeze and compensatory habitat creation is included in this category.

## Disruption to supply chains and distribution networks

- There could be impacts of flooding and other extreme weather on timber harvesting, which may have knock on impacts for timber sales.
- Wider disruption to supply chains may impact our ability to purchase some goods and services when needed. In a worst case scenario, some products may not be available or become cost prohibitive.

## Changes in the provision of ecosystem services

- Flooding and heatwaves have consequences on recreation and thereby recreational sites that we manage; increased algal blooms impact water recreation and our work on water quality (monitoring and regulation).
- Food production will be impacted by increased rainfall in winter (more erosion without cover crops) and increased drought in summer (lower yields, heat stress, etc.). This could impact on land management practices that influence biodiversity.
- Ecosystems and habitats will be impacted by changes in temperatures and weather patterns resulting in changes in species distributions, with consequences to human wellbeing and ecosystem function. This could undermine the management of biodiversity and features on protected sites.

## Water scarcity impacts on operations

- While we may not experience direct impacts of water scarcity, as a regulator overseeing drought planning and advising water company plans for future supply; increased water scarcity will impact both on environmental implications of low flows and customer demand and consumption that will need to be considered
- Similarly, low flows can compound issues of increased temperatures with consequences for the regulation of fishing permits, e.g. with salmonid heat stress and algal blooms.

## Changing productivity of forestry

- Timber production will be impacted by changes in weather conditions, increases in the likelihood of wildfires and INNS with consequences to planting and forest management undertaken on our estate. However, there may be opportunities to explore different tree species which are more resilient to climate change and INNS whilst still ensuring production targets are met.

## Impacts on business opportunities

- We function as a business when it comes to forestry, and also receive income from some recreational and tourism sites. There may be new opportunities in different areas of Wales including to develop forestry, and recreation and tourism during the shoulder seasons.

## Changes in customer requirements

- We are already responding to flood risk through the flood warning service/flood alerts and enabling the public to check the flood risk of their property. It is plausible that increased flooding will increase people's interest in receiving flooding information.

# Climate change adaptation



## Early warning systems

Flood and drought alerts are some of the most effective measures when adapting to extreme events. NRW is planning to expand Wales's flood alert system for 100% nationwide coverage and is actively improving drought monitoring. Moreover, by fulfilling our role as educator and advisor, we improve societal preparedness in other sectors, e.g., by helping PSBs develop local climate adaptation plans.



## Marine

Rising sea levels will exacerbate coastal flooding, erosion and the impact of storm surges. Adaptation measures include 'grey' and 'green' infrastructure from seawalls to wetlands, with the latter often providing multiple co-benefits to biodiversity and public health. In reality a hybrid approach often combines the benefits of both.



## Built environment

By retrofitting existing buildings and adopting high standards for new buildings, we can be more resilient in the face of increased temperatures and extreme weather. For instance, installing sustainable drainage systems (SuDS) such as green roofs, rain gardens and permeable paving, can reduce the impact of flooding, provide shading and cooling effects as well as boosting biodiversity.



## Trees and woodlands

In new forests, planting a diversity of trees in terms of species, structure and age, can increase resilience to pests, diseases, invasive-species, temperature changes and extreme events. Besides larger reforestation efforts, planting tree corridors on riverbanks can reduce localised temperatures by up to 8°C, positively impacting freshwater species such as salmon. In urban areas, tree-lined streets and parks reduce urban heat-island effects and improve wellbeing!



## Land management

Healthy soil is foundational for climate-resilient crops. Adopting good soil management practices, such as no-tillage in agriculture or reduced clear-cut felling in forestry, helps look after soil health. Such practices have multiple benefits, including increased moisture retention in droughts, sequestering carbon, and increasing the uptake of nutrients.

Figure 4: Selection of current and planned adaptation actions from different sectors in NRW





# Climate Risk Baseline Assessment

In order to assess the climate risks that we face as an organisation and identify key priorities for the adaptation plan, a baseline assessment of climate risk across all business groups and directorates was completed.

For this assessment, metrics were developed to capture the level of climate risk, current actions to reduce risk and adaptation readiness (Figure 5). These in combination provided a priority score that expresses the total risk minus current actions to reduce risk, thereby helping identify priority areas for action. All available service plans were used to provide information on work activities for business groups and directorates which were then scored using the metrics set out below to produce a priority score for each service plan activity. Subject matter experts/leads were consulted to complete or review the scoring.

The assessment also analysed urgency, which incorporates; the importance of the action, the lead time of implementation of the action, and agency, which explores; the level of resourcing and the availability of useful evidence.

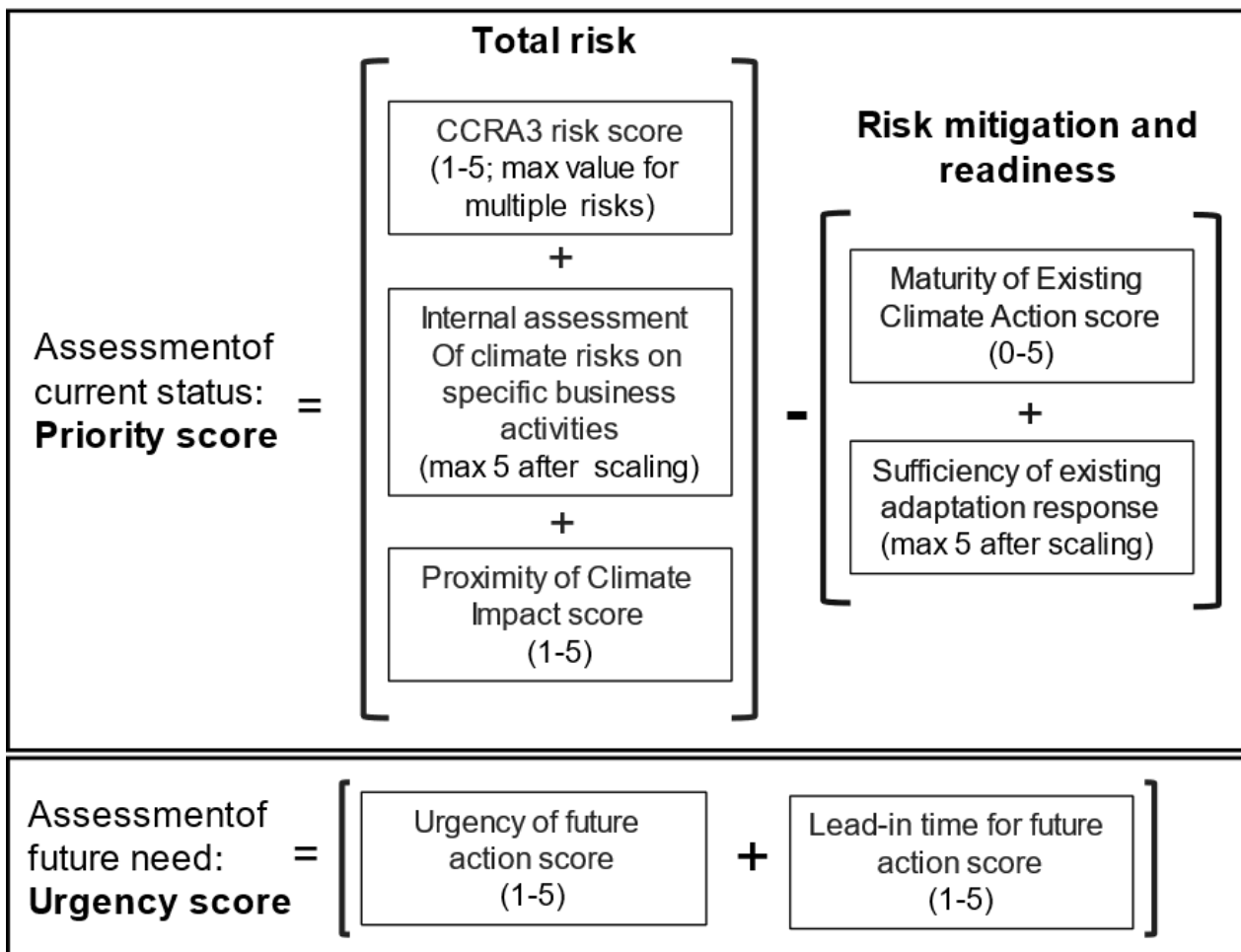


Figure 5: Equations used to calculate climate risk for each service plan activity showing the components of the priority and urgency score calculations.

## Headline findings

The outcome of the scoring exercise showed that many of our activities have a high risk of climate change impacts and require adaptation action (see below section). Medium-to-high priority scores were distributed across directorates and business groups. The widespread high priority scores suggest that all business groups and directorates need to consider adaptation actions to mitigate risks. Some risks occur in multiple work areas and activities across NRW, where it would be beneficial for business groups and directorates to collaborate on shared risks (see Figure 6). The current capacity across NRW to adapt to climate change is mostly medium-to-low, with a lack of suitable resources indicated as a key barrier. Areas with lower priority scores, such as within the marine sub-group of the natural resources management business group, indicates that knowledge of likely climate change risks and required adaptation actions are recognised and are in large part being planned.

## Number of activities/actions from NRW service plans with climate risk relevance per Business Group/Directorate

- Commercial, 3
- Corporate Strategy and Development, 3
- Evidence, 5
- Finance and Corporate Services, 6
- Flood Risk Management, 14
- Incident Management, 3
- Land Stewardship, 16
- Natural Resources Management, 48
- Regulatory, 9

# Distribution of CCRA3 risks and opportunities across NRW

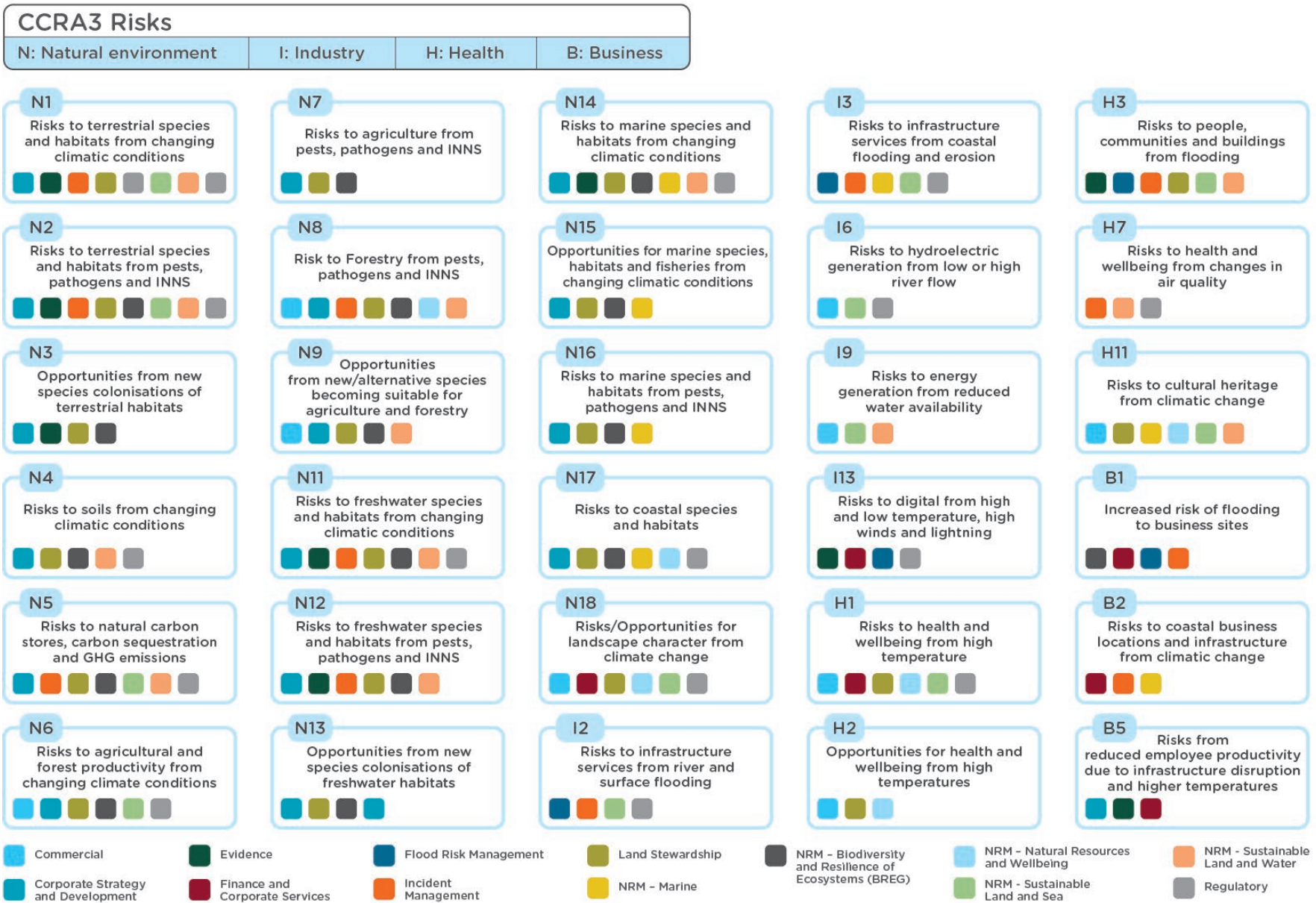


Figure 6- The distribution of CCRA3 risks and opportunities across NRW’s business groups and directorates. Risks shown here (#30) include only those applicable to 3 or more business groups.

## Adaptation Plan Consultation

Using the results of the baseline climate risk assessment, further consultation was carried out with subject matter experts across all business areas. This sought to determine what adaptation actions are being carried out to reduce the impacts of the priority climate change risks and activities, whether there were or should be future actions planned and the potential constraints on delivering climate change adaptation action. Feedback received from consultees was used as evidence in developing the climate change adaptation actions that are being taken and/or need to be prioritised in future to reduce our climate change risk.

In such an organisation-wide exercise it is likely that there will be gaps and uncertainties regarding the actions that need to be taken and some may have been missed in the consultation. However as this is our first adaptation plan, its purpose is to start our journey towards adapting to climate change. Future consultations will be refined to address any gaps.

## Adaptation Action Prioritisation

### Business Group Prioritisation

A simple multi-criteria analysis (MCA) was used to prioritise adaptation actions according to a set of criteria developed by the climate change and decarbonisation team. Multi-criteria analysis is often used in decision-making under uncertainty, such as adaptation planning, as a structured approach for assessing alternative options whereby those options accomplish several objectives. In MCA, desirable objectives are specified, and corresponding attributes or indicators are identified based on the information elements compiled. The actual measurement of indicators is based on quantitative analysis through scoring, ranking and weighting.

In this prioritisation, three criteria to assess each adaptation action were used:

- Priority (risk) scores from the baseline climate risk assessment as a measure of the level of risk that each adaptation action addresses;
- Urgency scores from the baseline climate risk assessment as a measure of that risk's immediacy and need for urgent action;
- the number of corporate plan actions covered by that action as a proxy for synergistic action within the organisation.

Scores for each of the three criteria were standardised on a 1 to 5 scale and compiled to give an overall priority score, with a maximum of 15. Scores towards the higher end of this scale thus reflect adaptation actions that should be considered a high priority, most often because they address a service plan

activity that is at high risk to climate change, requires urgent action, and meets multiple corporate plan objectives.

The top scoring actions up to five for each business group were then compiled. In some cases, there were more actions jointly ranked so all are shown. For each business group the heads of service or equivalent lead were consulted to sense check the priority actions resulting in some rephrasing, inclusion of additional priorities and changes to the prioritisation order to provide a more comprehensive set of agreed actions.

## Organisational Prioritisation

The same methodology as provided in the above section was followed to identify organisational priorities from the adaptation priority themes. In addition to these, the sum of the number of business groups included within each adaptation priority theme was included to highlight the cross-NRW impact.

Both the number of adaptation actions within a theme and the number of involved business groups or sub-groups were standardised using a 1 to 5 scale. The sum of these led to an overall maximum score of 10, with the highest calculated score being eight. A higher score indicates the following:

- A larger number of adaptation actions within that theme that are addressing a high urgency and priority risk, or a number of risks.
- The adaptation theme meets multiple corporate plan actions and is managing risk in more than one business group.

Even if a theme has a low priority score, it is still the case that there is a significant risk associated with that theme, and those actions within it are important. In other words the prioritisation is about relative priority rather than providing an absolute list of priorities and non-priorities. The thresholds used for adaptation priority themes and actions are detailed in the following section.

## Thresholds used for adaptation priority themes

### Priority score: 7 to 10 (higher priority)

- These themes contained consultation responses that were of the highest priority and urgency in relation to climate risk and are related to a high number of corporate plan activities across multiple adaptation themes. Despite being a 'red' theme and containing high priority actions, this does not mean that work is not being done or that any work is not of a high standard. This just means that any activities in these themes by the relevant business groups and sub-groups are of high importance in relation to reducing climate risk and becoming a more resilient and adaptive organisation to climate change.

## Priority score: 4 to 6 (medium priority)

- These themes contained consultation responses that were of a mid-priority and urgency in relation to climate risk and related often to multiple corporate plan activities across more than one adaptation theme.

## Priority score: 1 to 3 (lower priority)

- These themes often had a fewer number of consultation responses and/or contained responses that were not ranked as a high priority or urgency and/or did not relate to many corporate plan activities. While these themes may not be of the highest priority for this plan, they should be considered to still be at significant risk from climate change.

There are some key assumptions associated with this methodology that must be considered:

- Adaptation priority themes with a larger score are more likely to have a greater number of business groups and sub-groups associated with those themes and it is also likely that there were a greater number of relevant consultation responses in that theme.
- A theme with a low score could indicate a lower, but still present, climate risk or could indicate a low number of consultation responses. A low score does not mean that this area has no climate risk.
- For three adaptation priority themes there were no associated consultation response so these were not included in the scoring.
- A high score does not indicate a lack of action currently or planned. It simply indicates an area that should be prioritised for targeted climate change adaptation work, as there is a high climate risk associated with these actions.
- Even though adaptation priority themes are presented in a ranked scale, the themes at the bottom of the scale have significant climate risk. These actions and activities are still required and relevant, but this exercise suggests that they are not of the highest priority relative to others in this iteration of the adaptation plan.

# Priority adaptation actions - prioritisation results

Based on the prioritisation exercise detailed above organisational and business group priority adaptation actions are set out in the following sections.

## Organisational Adaptation Priorities

This section lists the adaptation priority themes in order of score and relevant areas of NRW involved in their delivery.

### Theme 1: Building climate resilience into planning, communities and regulated facilities

- Priority score: 8
- Organisational areas involved in delivery: Biodiversity, Finance, Flood Risk, Incident Management, Land and Water, Marine, Regulation, Wellbeing

### Theme 2: Ensuring the right development in the right place to avoid harm to nature

- Priority score: 8
- Organisational areas involved in delivery: Biodiversity, Commercial, Finance, Flood Risk, Land and Water, Land Stewardship, Marine, Regulation, Wellbeing

### Theme 3: Building resilience of sites on land in our care

- Priority score: 7
- Organisational areas involved in delivery: Biodiversity, Commercial, Flood Risk, Land and Water, Land Stewardship, Wellbeing

### Theme 4: Enhancing the resilience of communities

- Priority score: 7
- Organisational areas involved in delivery: Biodiversity, Commercial, Flood Risk, Incident Management, Land and Water, Marine, Wellbeing

### Theme 5: Reducing risks at, and improving condition of, protected sites

- Priority score: 7



- Organisational areas involved in delivery: Biodiversity, Incident Management, Flood Risk, Land Stewardship, Marine, Regulation

## **Theme 6: Reducing climate risks to the land in our care and water supply**

- Priority score: 6
- Organisational areas involved in delivery: Biodiversity, Flood Risk, Land and Water, Land Stewardship, Marine

## **Theme 7: Restoring, maintaining and improving habitats across Wales**

- Priority score: 6
- Organisational areas involved in delivery: Biodiversity, Land and Water, Land Stewardship, Marine, Wellbeing

## **Theme 8: Achieving collective action across the public sector**

- Priority score: 6
- Organisational areas involved in delivery: Biodiversity, Flood Risk, Incident Management, Land and Water, Marine, Regulation, Wellbeing

## **Theme 9: Leading community engagement through applying behavioural insights and sustained communications**

- Priority score: 6
- Organisational areas involved in delivery: Commercial, Finance, Flood Risk, Incident Management, Marine, Wellbeing

## **Theme 10: Delivering nature recovery at landscape-scale**

- Priority score: 5
- Organisational areas involved in delivery: Biodiversity, Land and Water, Land Stewardship, Marine

## **Theme 11: Making smart business decisions**

- Priority score: 5

- Organisational areas involved in delivery: Commercial, Finance, Flood Risk, Incident Management, Land and Water

## **Theme 12: Improving condition and resilience of protected sites and at the landscape-scale through restoration**

- Priority score: 5
- Organisational areas involved in delivery: Biodiversity, Land and Water, Land Stewardship, Marine, Regulation

## **Theme 13: Implementing nature-based solutions and building connectivity**

- Priority score: 4
- Organisational areas involved in delivery: Biodiversity, Flood Risk, Land and Water, Land Stewardship, Marine, Wellbeing

## **Theme 14: Minimising harm from pollution on land in our care**

- Priority score: 4
- Organisational areas involved in delivery: Incident Management, Land and Water, Land Stewardship, Regulation

## **Theme 15: Embedding nature recovery in NRW's work**

- Priority score: 4
- Organisational areas involved in delivery: Biodiversity, Flood Risk, Land and Water, Land Stewardship, Marine

## **Theme 16: Minimising environmental pollution of land and water**

- Priority score: 4
- Organisational areas involved in delivery: Land and Water, Land Stewardship, Marine, Regulation

## **Theme 17: Reducing the risk to life from flooding and asset damage**

- Priority score: 4
- Organisational areas involved in delivery: Flood Risk, Incident Management, Land Stewardship

## **Theme 18: Preventing species extinctions and establishment of INNS**

- Priority score: 4
- Organisational areas involved in delivery: Biodiversity, Land Stewardship

## **Theme 19: Ensuring social and environmental goals and evidence strengthen decision-making for climate change**

- Priority score: 4
- Organisational areas involved in delivery: Finance, Flood Risk, Marine, Wellbeing

## **Theme 20: Strengthening ecosystem resilience and protection**

- Priority score: 3
- Organisational areas involved in delivery: Biodiversity, Flood Risk, Land and Water, Land Stewardship, Marine

## **Theme 21: Ensuring justice, equity and inclusion inform pollution minimisation**

- Priority score: 3
- Organisational areas involved in delivery: Incident Management, Land and Water, Regulation, Wellbeing

## **Theme 22: Evaluating the effectiveness of our nature restoration**

- Priority score: 3
- Organisational areas involved in delivery: Biodiversity, Finance, Flood Risk, Land Stewardship, Marine

## **Theme 23: Engaging with people to take action through education and behaviour change**

- Priority score: 3
- Organisational areas involved in delivery: Biodiversity, Commercial, Flood Risk, Land and Water, Land Stewardship, Marine, Regulation, Wellbeing

## **Theme 24: Scaling up nature-based solutions to support pollution minimisation**

- Priority score: 3
- Organisational areas involved in delivery: Biodiversity, Flood Risk, Land and Water, Land Stewardship, Marine

## **Theme 25: Collaborating with a wide range of stakeholders and partners**

- Priority score: 3
- Organisational areas involved in delivery: Biodiversity, Incident Management, Flood Risk, Land and Water, Land Stewardship, Marine, Regulation, Wellbeing

## **Theme 26: Providing an effective response to flooding and drought**

- Priority score: 3
- Organisational areas involved in delivery: Incident Management, Flood Risk

## **Theme 27: Creating new woodlands and restoring ancient woodlands**

- Priority score: 2
- Organisational areas involved in delivery: Biodiversity, Land and Water, Land Stewardship

## **Theme 28: Minimising harm from pollution by responding effectively to incidents**

- Priority score: 1
- Organisational areas involved in delivery: Incident Management

## **Theme 29: Embedding climate adaptation into the organisation**

- Priority score: 1
- Organisational areas involved in delivery: Biodiversity, Commercial, Finance, Flood Risk, Incident Management, Land and Water, Land Stewardship, Marine, Regulation, Wellbeing

### **Strategic organisational climate change risks and adaptation actions**

There are several organisation-wide corporate risks and adaptation actions that need to be managed strategically and holistically. These are detailed below in the following section. Actions relating to ICT and telecommunications and buildings and visitor attractions have been taken from consultation responses received from finance and corporate services, with development through conversations with relevant experts and heads of business.

#### **Business area 1: ICT (IT and telecommunications infrastructure)**

Actions currently being taken to reduce risk:

- 75-80% of all ICT infrastructure is cloud-based, reducing the climate-related risks posed by physical data centres.

Planned actions to reduce risk:

- All our ICT infrastructure systems, including flood warning, to be 100% cloud-based, reducing climate-related risks posed by physical data centres.
- Establish a climate resilience-based evaluation of the cloud-based regional locations to reduce and minimise risks of climate-related failure.

#### **Business area 2: Adfwyio and Commercial (Buildings and visitor centres)**

Actions currently being taken to reduce risk:

- Introducing a hybrid working model to adapt to the risks of requiring working to be from specific buildings and/or locations that may be impacted by climate related events e.g. high temperatures, flooding, storms, power outages.

- For both new and existing buildings, we have adopted a set of guiding principles which will ensure we plan for climate change resilience and adaptation actions at our sites.

Planned actions to reduce risk:

- A survey of our estate to understand the climate resilience of buildings and steps to improve this, including retrofitting, changing leases, working practices etc.
- Developing and implementing an organisation-wide scenario-based testing of building resilience.

### **Business area 3: Contract Management Support Service (CMSS) / Supply chain**

Actions currently being taken to reduce risk:

- No current actions at time of writing

Planned actions to reduce risk:

- Assessing the risk of supply chain disruption due to extreme weather and developing contingency plans.
- Ensuring that leases and service agreements recognise the need to consider future impacts and adaptation needs

### **Business area 4: Communications**

Actions currently being taken to reduce risk:

- No current actions at time of writing

Planned actions to reduce risk:

- Future actions to review and improve our communications in relation to climate risk and adaptation action needs.

### **Business area 5: People Management**

Actions currently being taken to reduce risk:

- No current actions at time of writing

Planned actions to reduce risk:

- Gaining a greater understanding of how temperature extremes are/will affect colleagues working from homes, offices or in the field to ensure health, wellbeing and productivity is maintained.
- Ensuring appropriate guidance and support relating to the impacts of temperature extremes or other impacts is provided for all colleagues whether working from homes, offices or in the field.

## Business Group Adaptation Priorities

The following section reveals the adaptation priorities for each business group (listed in alphabetical order) based on the top adaptation actions arising from the consultation and subsequent amendment following discussion with heads of service for each group. The timescales used are defined as follows:

- Current: adaptation action already being carried out
- Planned: adaptation actions already planned in the next two years
- Future: adaptation actions planned for future years.

Actions are ranked according to perceived importance but this does not imply that one action should be completed or developed before another. For any business group or sub-group table with actions that are not ranked, all actions are of equal importance.

### Commercial

Adaptation priorities for commercial business group.

Rank 1 adaptation action:

- Assessing and addressing the risks from high temperatures to opportunities for delivery of tourism and recreation due to reduced demand and wellbeing
- Timescale: future

Rank 2 adaptation action:

- Understanding how current and future climate-related impacts and issues may impinge on commercial opportunities on a site-by-site basis
- Timescale: planned

### Flood Risk Management

Adaptation priorities for flood risk management business group.

Rank 1 adaptation action:

- Develop and deliver catchment approaches, including nature-based solutions to reduce flooding and contribute to ecosystem resilience, working with partners and stakeholders where possible and appropriate.
- Timescale: planned

Rank 2 adaptation action:

- Develop and deliver Coastal Adaptation Programme pilot sites in most vulnerable locations to build evidence base for longer-term adaptation strategies. Analysis of initial outcomes of this Programme through the Assesses Facing Coastal Change Project.
- Timescale: current/planned

Rank 3 adaptation action:

- Extending and continuously improving the flood warning service coverage within Wales, including our understanding and communication of current and future flood risk.
- Timescale: future

Rank 4 adaptation action:

- Increasing resilience of flood risk management assets by reviewing and maintaining the asset base to allow for greater operability under more extreme weather scenarios.
- Timescale: planned

Rank 5 adaptation action:

- Provide effective planning advice on flood risks and consequences to reduce inappropriate development in areas at risk of flooding e.g. making space for water.
- Timescale: planned

## Incident Management

Adaptation priorities for incident management business group.

Rank 1 adaptation action:

- Updating our Incident Management plans to better include incidents and disruptions that are increasingly likely due to climate change e.g. national power outages, and include consideration of new and unusual incidents not yet experienced
- Timescale: planned

Rank 2 adaptation action:



- Ensuring that NRW meets appropriate levels of service and flexibility through the Resilient Response to Incidents project to deal with increased occurrence of prolonged and cascading hazards, e.g. flood and wildfires. This can ensure that NRW is better placed to deal with increased incidence and severity of incidents, and able to respond to new and unusual risks not experienced previously
- Timescale: current

Rank 3 adaptation action:

- Updating the Wales Incident Reporting System to better capture information relating to both the climate and nature emergencies
- Timescale: planned

Rank 4 adaptation action:

- Reviewing and adjusting our Incident Management plans and public guidance to reflect our growing understanding of risk from climate change
- Timescale: future

## Land Stewardship

Adaptation priorities for land stewardship business group.

Rank 1 adaptation action:

- Adapting current and future forests to cope with wildfires by utilising open spaces, selecting suitable species for fire breaks, and working closer together with fire and rescue services.
- Timescale: planned

Rank 2 adaptation action:

- Undertaking a long-term programme to survey and address risks with forest infrastructure assets such as bridges, culverts, reservoirs, waste tips and forest roads to assess condition and risk from extreme weather, and improving the use of Central Asset Management Programme systems.
- Timescale: planned

Rank 3 adaptation action:

- Adaptation of the woodlands in our care through the thinning of trees to reduce the risk from drought, disease and windthrow. A move to a thinning model of management from more traditional clear-fell and restocking.
- Timescale: future

Rank 4 adaptation action:

- Adapting to drought through reducing reliance on core species, especially Sitka spruce, and diversifying tree species through restocking and natural regeneration.
- Timescale: future

Rank 5 adaptation action:

- The adaptation of high nature value areas through the strategy for nature on the land in our care, such as restoration of degraded peatlands.
- Timescale: current

## Natural Resource Management: Biodiversity and Resilient Ecosystems

Adaptation priorities for biodiversity resilience and ecology sub-group.

Rank 1 adaptation action:

- Ongoing site management to enhance biodiversity of protected sites through land management agreements and specific projects, leading to greater climate resilience
- Timescale: current

Rank 2 adaptation action:

- Creating corridors of good quality habitat linking the National Nature Reserves in our care and the wider landscape to reduce the impacts of habitat fragmentation, and increase dispersal and diversity through the development of Nature Recovery Networks.
- Timescale: current

Rank 3 adaptation action:

- Ensuring ongoing site monitoring and risk based targeting considers relevant climate risks to site features.
- Timescale: current

Rank 4 adaptation action:

- Implementing actions within the delivery of the Natur am Byth and National Peatland Action Programmes that contribute to climate change adaptation.
- Timescale: planned

Rank 5 adaptation action:

- Develop strategic decision making mechanisms to manage the desired future state of Welsh natural resources (habitats, species and geodiversity) in the light of climate change impacts.
- Timescale: future

## Natural Resource Management: Marine

Adaptation priorities for marine sub-group.

Rank 1 adaptation action:

- Advise Welsh Government on implementation of the Welsh National Marine Plan and future direction of marine planning, to better reflect the need for climate change adaptation.
- Timescale: future

Rank 2 adaptation action:

- Deliver the Integrated Coastal Management Programme to join up delivery of coastal projects through for example; implementing Shoreline Management Plans, developing nature-based solutions, influencing the Sustainable Farming Scheme to support adaptation at the coast, and engaging with communities around coastal change.
- Timescale: current

Rank 3 adaptation action:

- Advise on marine and coastal adaptation to climate change pressures, including through adaptation of the Marine Protected Area Network and its management, and on maximising blue carbon benefits for Wales.
- Timescale: planned

Rank 4 adaptation action:

- Identify marine and coastal evidence needs and opportunities and develop the evidence base according to a prioritised marine and coastal evidence programme.
- Timescale: current

## Natural Resource Management: Natural Resources and Well-Being Integration

Adaptation priorities for natural resources and well-being integration sub-group.

Rank 1 adaptation action:

- Providing and developing a framework for PSBs to help improve their understanding of climate risk in their localities; contributing towards an assessment of the risks as they relate to people and their natural environment.
- Timescale: current

Rank 2 adaptation action:

- Influencing the education sector through providing advice to ensure current and future generations are well equipped to understand and respond to the impacts of climate change through adaptation.
- Timescale: current

Rank 3 adaptation action:

- Develop new ways to engage with and support communities to be resilient to climate change through presenting impactful messages to stimulate collaboration and action.
- Timescale: current

Rank 4 adaptation action:

- Providing advice to Welsh Government concerning proposed access reform for coastal regions, and working on climate for the Wales Coast Path in context of SMPs and coastal change.
- Timescale: current

Rank 5 adaptation action:

- Enhance our ability to clearly evidence and present future climate risks and scenarios including integrated models and behavioural science.
- Timescale: current

## **Natural Resource Management: Planning, Landscape and Energy**

Adaptation priorities for planning, landscape and energy sub-group.

Adaptation action (unranked):

- As statutory adviser, develop Management Plan Guidance for Designated Landscape authorities to ensure that the statutory management plan process adequately addresses climate risk and climate adaptation.
- Timescale: current

Adaptation action (unranked):

- Embed SMNR tool with climate adaptation actions into Trydan Gwrydd Cymru wind farm projects (WG's renewable energy developer).
- Timescale: current

Adaptation action (unranked):

- Scope and deliver guidance to support our role as statutory consultee for Sustainable Urban Drainable Systems (SuDs) Approval Body applications.
- Timescale: planned

Adaptation action (unranked):

- Contributing to the work of the Historic Environment Group on the risks and opportunities of climate change for the historic environment of Wales and the actions needed to adapt to the impact of these changes.
- Timescale: current

Adaptation action (unranked):

- Continuing the landscape and nature recovery in a changing climate programme, and developing an all Wales approach to develop climate risk and adaptation actions for landscapes through place-based projects.
- Timescale: current

## Natural Resource Management: Sustainable Land and Water

Adaptation priorities for sustainable land and water sub-group.

Rank 1 adaptation action:

- Assisting the development of the Sustainable Farming Scheme (SFS) to embed adaptation, e.g. in woodland planting and inclusion of shelter belts and the creation of buffer zones for drought and flood management.
- Timescale: current

Rank 2 adaptation action:

- Developing the creation of natural flood management measures such as floodplain reconnection, wetland 'scrapes', and backwaters.
- Timescale: current

Rank 3 adaptation action:

- Implementing action to restore natural features and processes to freshwaters that build climate resilience, particularly restoration of riparian zones along rivers including tree planting to cool water temperatures.

- Timescale: current

Rank 4 adaptation action:

- Urban green infrastructure including Sustainable Urban Drainage Systems (SuDs) in built up environments with consideration of water quality and quantity management.
- Timescale: current

Rank 5 adaptation action:

- Reduce the risks to nature and people from droughts through preparing for and responding to events, by scrutinising and advising on water companies' drought plans and water resources management plans to maintain security of water supply to customers and build climate resilience by providing advice to ensure that NRW and others use water resources efficiently.
- Timescale: current

## Regulatory

Adaptation priorities for regulatory business group.

Rank 1 adaptation action:

- Influencing, permitting and regulating those we work with to deliver adaptation through existing permitting and Environmental Management Systems. This links with current work ongoing within the land and water sector to regulate activities through Environmental Permitting Regulation permits that include climate change adaptation.
- Timescale: current

Rank 2 adaptation action:

- Understanding the significance of climate risk in activities and installations that we regulate, for example, water resource availability in industrial clusters. This can include impacts on water quality and quantity, the increased risk of fires and subsequent emissions, and management of waste effluent and nutrient addition.
- Timescale: future

Rank 3 adaptation action:

- Actions to ensure communities at high risk regulated sites have their own risk assessments and that these take into account new information e.g. flood risk maps, to guide adaptation. This can include updating existing permits to cover impacts from extreme weather events.



group/directorate, so for ease of analysis similar responses were grouped into the following overarching categories: Funding, Capacity, Feedback/steer, ICT, Skills, Access to NRW estate, Equipment, Modelling, Governance, Knowledge and Prioritisation. Each category represents a lack of that particular resource. Figure 8 shows that the top three adaptation barriers were: a lack of capacity, lack of funding and a lack of skills.

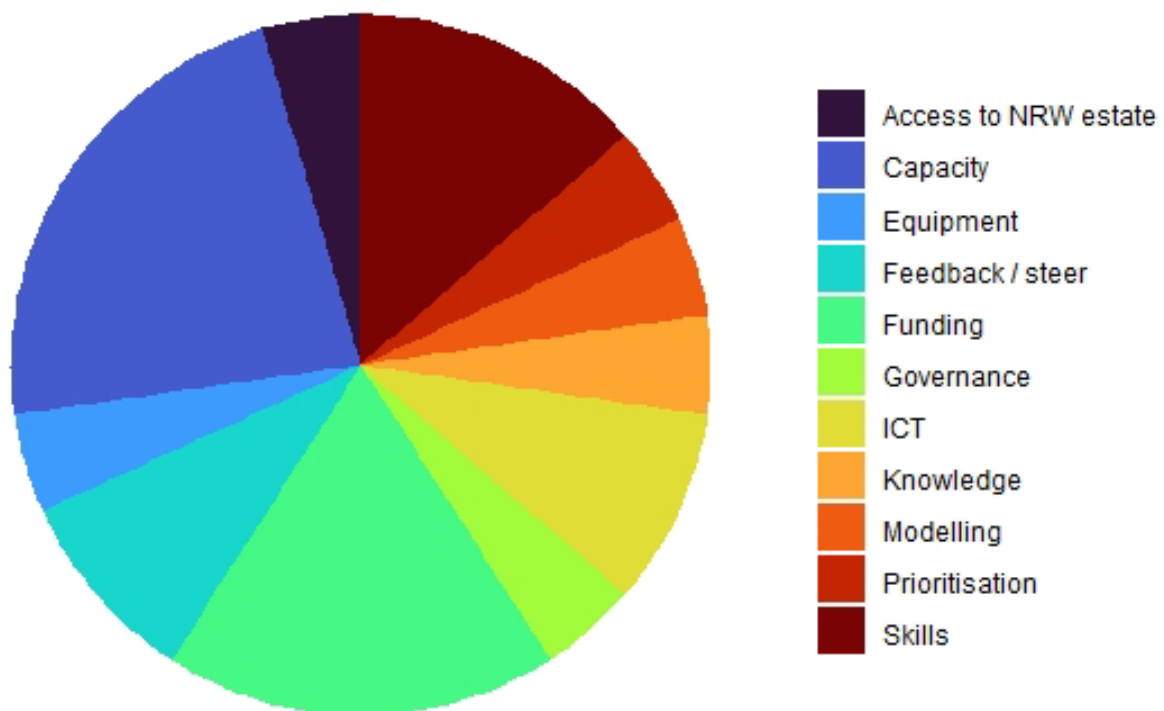


Figure 8: Barriers to adaptation in NRW. Each category represents a lack of that particular resource. The larger segments refer to the number of business groups or directorates that mentioned that specific barrier during consultation.

To illustrate the top three barriers, regarding capacity, it was noted in marine that it is difficult for operational colleagues to find capacity to progress proactive adaptation work around action within SMPs locally.

As for funding barriers, it was noted that sometimes funding for adaptation is tied up in Welsh Government capital funds. In addition, some business groups mentioned that adaptation action was currently being funded through other policy measures, such as nature or habitat funding, as no dedicated funding exists.

With respect to skills, it was reported several times across multiple business groups that teams lack the technical expertise or experience, e.g. dedicated analysts, to effectively deal with adaptation priorities. On top of that, softer skills such as community and stakeholder engagement skills, were found to be limiting. These skills are significant because much adaptation action takes place at the local level.



More generally, two significant organisational barriers to successful adaptation were apparent from the consultation. Firstly, that some business groups do not see themselves as a priority area in terms of climate risk and thus not responsible for adaptation. Whilst the result of this plan demonstrates clearly that all areas of NRW are and will be affected by climate change impacts, this speaks to the need for better communication of climate risk. Second, it was acknowledged by a few business groups that current adaptation action was reactive rather than proactive. This lends support to the idea that more integrated, informed adaptation planning is crucial for successful adaptation.

Moreover, the key message mentioned by several business groups as a solution to some of the barriers to adaptation was that integrated action was necessary. When asked specifically if climate change adaptation needed to be addressed in an integrated manner across NRW, all respondents agreed. Many pointed out that the existing governance structures, i.e. business groups and sub-groups, within NRW were sufficient for the integration of climate action. Some suggested that new working groups would be necessary, e.g. establishing a business continuity steering group as a sub-group of the incident management business group. Particular existing programmes, such as the Integrated Coastal Management Programme were flagged as a critical example as to how future climate adaptation projects could proceed.



# Monitoring, Evaluation and Reporting

## Climate Risk Baseline Assessment

The baseline climate risk assessment will be updated to reflect the feedback received ahead of the next iteration of the climate change adaptation plan in 2027 (Figure 9). The purpose will be to highlight any new and emerging climate risks and their impact on our operations, particularly any that arise from the 2<sup>nd</sup> Welsh NAP and CCRA4. Additionally, the prioritisation will be revised by the climate change and decarbonisation team in consultation with subject matter experts to account for any changes.

## Adaptation Plan

The publication of our first adaptation plan soon after the new corporate plan, is so that it is both informed by and able to integrate with it. We then propose to fully revise this plan on a five-yearly basis in line with the timeframe for revision of the Welsh NAP and CCRA4. However, our adaptation plan should be very much a live document that advises and informs our annual business and service planning, business continuity plans and risk management activities. A light touch review of the plan will follow the publication of the upcoming Welsh NAP, the climate resilience strategy, in 2024 and the 4<sup>th</sup> UK Climate Change Risk Assessment (CCRA4) in 2026 (Figure 9).

Measuring change and action comes in many different formats from vulnerability-level metrics to 'red, amber, green' output status assessment of actions. We recognise that it is important to attempt to quantify the success, or otherwise, of adaptation actions in order to understand the steps that have been taken and the adaptive capacity and resilience of a team or the organisation. The climate change and decarbonisation team will undertake monitoring of the progress of delivery of adaptation actions but it will also be important that monitoring is addressed in our corporate performance framework that is currently being revised following publication of the new corporate plan. Given that so much of the delivery will need to be integrated into the service plans of business groups and directorates it will be crucial that key actions are also monitored through those plans.

The ISO14090 standard that provides guidance to organisations in the development and implementation of an adaptation plan, includes useful guidance on monitoring and evaluation. Five key principles for monitoring and evaluation from the standard are set out below:

- Document results of monitoring and evaluation and determine whether the adaptation and its implementation plan are still valid;
- Update policies and strategies and plans using the outcomes of the evaluation;

- Adopt a formal structure to capture learning from monitoring and evaluation to inform current and subsequent policies, strategies and plans;
- Determine the periodicity of monitoring and evaluation according to policies, strategies and plans;
- Evaluate the outcomes of monitoring at appropriate stages during the implementation cycle.

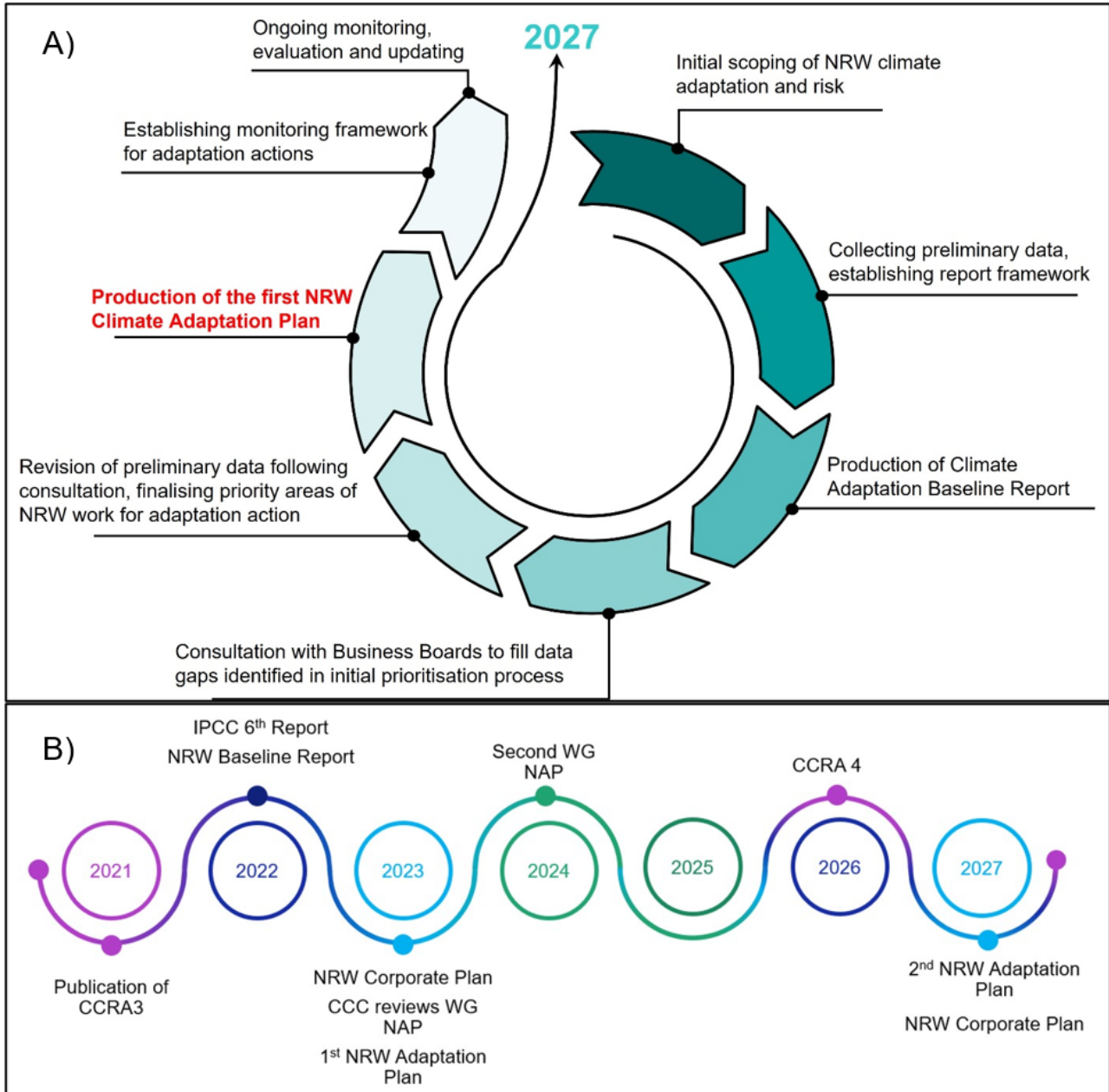


Figure 9: A) The NRW adaptation planning cycle highlighting the process, B) The key policy and evidence reports timeline leading to the second NRW adaptation plan in 2027.

Following publication of this plan, we will develop a monitoring and evaluation process as the adaptation cycle continues over the coming years, which will help us feed into the monitoring of the Welsh NAP too. The adaptation plan

monitoring and evaluation framework will be developed after we have greater clarity on the forthcoming corporate plan performance framework and its performance metrics. The adaptation plan monitoring and evaluation framework will also demonstrate the best practice principles, such as those set out above from the ISO14090 standard.

It is important to develop indicators as a way of measuring progress and understanding how the organisation is adapting to climate change. Indicator development should contain quantitative and qualitative aspects to understand the narrative alongside numerical data. These indicators might include benchmarking against other relevant organisations, performance tracking over time and comparisons to a baseline, including our baseline climate risk assessment.

This adaptation plan must be owned by the organisation as a whole. The climate change and decarbonisation team are responsible for reporting overall progress made in adapting to climate change and the success of the adaptation plan, while business groups and teams within NRW will be responsible for delivering most of the actions through their service plans, and will also be responsible for providing updates into the monitoring and reporting process. The internal climate emergency group will have organisation-wide oversight of the adaptation plan and progress will be reported to this group.

# Conclusions

Climate change and its impacts are affecting our work today and will increasingly have greater impacts, with a likelihood of increasing severity. Whilst the steps we take to mitigate climate change and reduce our greenhouse gas emissions are incredibly important, it is also vital that the organisation undertakes climate change adaptation action to ensure the way we work, our remit and the organisation as a whole is resilient to climate change. We are a leading public sector organisation and the wider Welsh public sector will look to us to be a leader in integrating adaptation into our work.

This adaptation plan clearly demonstrates that addressing climate risk supports and is essential to the aims of our corporate plan, its wellbeing objectives and priority actions. All of the adaptation priority themes indicate how the delivery of the wellbeing objectives are being or must be supported by adaptation action.

The adaptation plan consultation has shown that many adaptation actions are already ongoing and that there is a desire to go further as well as the need to address gaps in adaptation. The plan illustrates that all areas of the organisation have a responsibility for climate change adaptation and there are actions that all business groups can take to improve, and further adaptation actions to plan and deliver. There is a clear need to increase action across the whole organisation.

The plan suggests five adaptation priority themes need to be prioritised in the short term over the next 1-2 years:

- Building climate resilience into planning, communities and regulated facilities.
- Ensuring the right development in the right place to avoid harm to nature.
- Building resilience of sites on land in our care.
- Enhancing the resilience of communities.
- Reducing risks at, and improving condition of, protected sites.

The three biggest barriers highlighted in the consultation to taking climate change adaptation action are a paucity of funding, capacity and skills. It is vitally important that these barriers are addressed at an organisation-wide scale to ensure that adaptation actions can be scaled up and delivered effectively. Further work is required to investigate these barriers to increase the adaptive capacity of colleagues and the organisation. The bespoke NRW one-day climate change training course that has been trialled and is now being rolled out is a starting point for addressing the capacity and skills issues at a generic level.

This is our first climate change adaptation plan and is considered a living document, particularly due to the scale of NRW and our remit such that it is likely that current or required adaptation actions have been missed. The plan is iterative and will be updated as and when new policy, evidence and best practice becomes available.

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# Appendix 1: Glossary

AONB - Area of Outstanding Natural Beauty

AP - Adaptation Plan

BG - Business Group

CCC - Climate Change Committee

CC&D - Climate Change and Decarbonisation team

CCRA2 - 2<sup>nd</sup> Climate Change Risk Assessment

CCRA3 - 3<sup>rd</sup> Climate Change Risk Assessment

CCRA4 - 4<sup>th</sup> Climate Change Risk Assessment

CEG - Climate Emergency Group

CMSS - Contract Management Support Service

DEFRA - Department for Environment, Food and Rural Affairs

DMS - Document Management System

EV - Electric Vehicle

GB - Great Britain

GHG - Greenhouse Gas

ICMP - Integrated Coastal Management Programme

IMBG - Incident Management Business Group

INNS - Invasive Non-Native Species

IT/ICT - Information Technology/Information Communication Technology

ISO - International Organization for Standardization

LIFE -EU's funding instrument for the environment and climate action

MCA - Multi-Criteria Analysis

MPA - Marine Protected Area

NE - Natural England

NNR - National Nature Reserve

NPAP - National Peatland Action Programme

NRM - Natural Resources Management

NRW - Natural Resources Wales

PSB - Public Service Board

RA - Reporting Authority

RAD - Resist-Accept-Direct adaptation pathway framework

RCP 8.5 - Representative Concentration Pathway 8.5

SFS - Sustainable Farming Scheme

SLR - Sea Level Rise

SMNR - Sustainable Management of Natural Resources

SMP - Shoreline Management Plan

SoNaRR - State of Natural Resources Report

SSSI - Special Site of Scientific Interest

SuDS - Sustainable Drainage Systems

UKCIP - UK Climate Impacts Programme

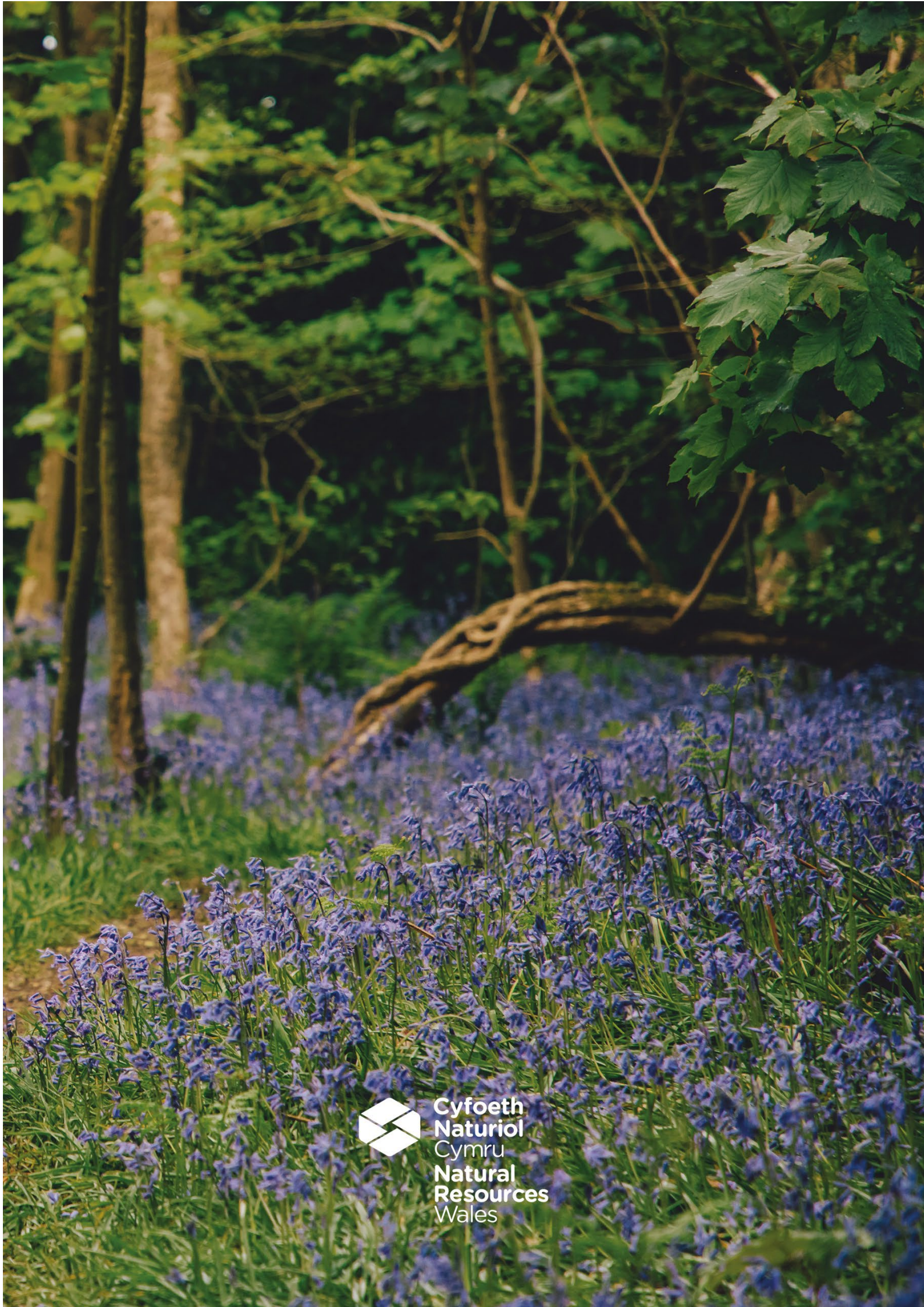
UKCP18 - UK Climate Projections 2018

UNFCCC - United Nations Framework Convention on Climate Change

WCP - Wales Coast Path

WG - Welsh Government

WGWE - Welsh Government Woodland Estate



**Cyfoeth  
Naturiol  
Cymru**  
**Natural  
Resources  
Wales**