



Natural England's climate change risk assessment and adaptation plan (2021)

Climate change adaptation reporting: third round

December 2021

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Chair Foreword

COP 26 in Glasgow recognised the extent to which we urgently need to adapt to protect both the natural environment and people from climate change. In many parts of the world people and nature are living with the devastating impacts of climate change and some of the most compelling voices at the conference came from those living on the frontline of the climate crisis.

Climate change has the potential to have disastrous impacts on our natural environment and wildlife. Even if we make the progress required to reduce our global emissions, change is already happening, and more is inevitable. We must make sure that the natural world can adapt to change as far as possible if we are to avoid the worst potential impacts. The degradation of the natural environment is increasing the vulnerability of both people and nature to climate change. For example, soil degradation and the loss of wetlands and natural river systems increases flood risk. Healthy natural environments are better at protecting us from flooding and extreme weather events. Expansive natural areas, with locally cool microclimates and scope for species to move, provide more opportunities for species to survive than fragmented patches of habitat with small, isolated populations.

Climate and nature are fundamentally connected and one of the positive aspects of COP 26 was the demonstration of how much more integrated the climate change and environmental agenda are than in the past. There is a growing understanding that our ambitions on nature recovery and climate change are interlinked. Reversing the destruction of nature is crucial to reducing emissions and reaching net zero as well as enabling us to live with the impacts of climate change. We will be unable to limit climate change without addressing the degradation of the natural environment and cannot halt the degradation of the natural environment without preventing the growing impact of climate change.

For this reason Natural England plays a central role in developing our response to the climate crisis and this adaptation plan demonstrates what an integrated response to the nature and climate crises looks like in real terms. The targeted recovery of natural ecosystems on land and sea will enable bigger, more resilient, and connected habitats, which support the persistence of species in landscapes and allow them to move as conditions change. Our work on trees, peatlands and coastal ecosystems will store carbon, while reducing flood risk and contributing to the development of the Nature Recovery Network. The Government's 25 Year Environment Plan and reforms to agricultural also provide the opportunity to transform the way we manage the countryside for nature. Natural England has the relationships with land managers and the scientific expertise to support farmers in shaping the future of farming. The pandemic has also showed us the importance of nature to maintain our well-being and provide wider benefits to society. We have a responsibility to develop more nature-rich spaces in urban and rural areas to ensure everyone can connect to nature and adapt to climate change. Investing in nature is one of the most cost-effective ways of achieving adaptation. We will need to make difficult decisions and factor climate change into all our planning as we go forward,

but there is an opportunity to become 'nature positive' and contribute to achieving net zero at the same time as helping people and nature adapt to a changing world.

A handwritten signature in black ink, appearing to read 'Tony Juniper', with a stylized, flowing script.

Tony Juniper

Chair

Executive Summary

This is the third adaptation report Natural England has produced under the Climate Change Act. Our understanding of the risks to the natural world have grown significantly since our first report in 2012. These ongoing threats pose major challenges in our role as the government's advisor on the natural environment. Climate change is altering our landscapes, habitats and protected sites, which exacerbates existing pressures on the natural world. These changes will only increase as warming continues and species move, sea levels rise and the composition of ecosystems continues to change.

A major priority of Natural England is to facilitate nature recovery, which will help build resilience to climate change. Adaptation will also increasingly mean developing management practices that understand and seek to accommodate the inevitable changes that will occur. There is significant scope to help nature adapt to a changing world and significant opportunities for a nature-rich future, particularly if global temperatures can be kept below or close to 1.5 degrees. As an organisation we are building capability and taking a science-led approach to integrate adaptation planning within all our work areas.

Developing our approach

Climate change adaptation will form an increasing part of our work and our report outlines the following themes in developing our response to the biodiversity and climate crises in an integrated way:

- We will plan climate change adaptation with the aim of restoring ecological process at a landscape scale as part of nature recovery to enhance resilience and accommodate inevitable change.
- Our work on adaptation can deliver multiple benefits, including integrating climate change mitigation, biodiversity and enhancing the quality of life for people.
- We recognise the benefits of local level adaptation and our Area Teams have a key role to play in delivering adaptation in a place-based way.
- Using a natural capital and ecosystem approach to account for the multiple benefits that nature provides to society
- Developing adaptive management that takes account of change in the natural world both in the policy advice and delivery space.
- We will ensure our different work programmes have a joined-up approach to adaptation.
- Developing the evidence base to support practical adaptation, including monitoring and evaluation of adaptation actions.
- Developing a joined-up approach to Nature-based Solutions which deliver mitigation and adaptation with measurable benefits for nature and people.

Our risk assessment and adaptation plan

Our risk assessment updates the overarching risks of climate change to our aims and objectives, which are outlined in our Building Partnerships for Nature Action Plan. We

have also referred to the risks and opportunities to the terrestrial, freshwater, coastal and marine natural environments as detailed in the Independent Assessment of UK Climate Risk. Our risk assessment demonstrates the growing risks and opportunities to all aspects of our business. Depending on future emission pathways we expect to see moderate to major impacts on our aims and objectives in the medium to long term. An outline of key elements of our Adaptation Plan across our six corporate programmes is as follows:

Resilient Landscapes and Seas

We will build adaptation planning into the development of the Nature Recovery Network and Local Nature Recovery Strategies, increasing the resilience of the natural environment at a landscape scale and taking account of unavoidable change in our planning and management. We will continue to integrate adaptation into our management plans for National Nature Reserves. We will assess climate vulnerability as part of our plans for species recovery and will develop our approach to the management of the network of Sites of Special Scientific Interest in response to climate change. We will also ensure our efforts on adaptation are aligned including across marine, coastal, woodland and peat policy areas.

Sustainable Development

We will work with local authorities to implement the Green Infrastructure Framework to ensure high quality green and blue infrastructure is part of the response to climate change. We will also integrate climate change adaptation principals within Biodiversity Net Gain projects, which can improve habitat connectivity and diversity and buffer protected sites. We will also encourage these approaches through our statutory roles in land use planning and wildlife licensing.

Greener Farming and Fisheries

We are providing technical advice on climate change mitigation and expanding our farm advice programme in response to agricultural reforms. We will develop our farm advice to provide guidance on developing the ecological resilience of farm systems. We will promote sustainable fisheries management to protect biodiversity, enable nature recovery and marine ecosystems that are resilient to climate change.

Connecting People with Nature

We are working to ensure that people have access to nature in the face of climate change. This includes roll back measures on the England Coast Path and planning adaptation for access in response to extreme events such as flooding and wildfire. Our planning and engagement work will also consider the response to climate change explore how our work on adaptation can contribute to our aims of connecting people with nature.

Managing the Organisation

We will develop an overarching climate change strategy including a framework for assessing success in implementing our adaptation plan. Climate change mitigation and adaptation are key parts of the Defra Group Sustainability Strategy. Adaptation will also continue to be part of the management of our National Nature Reserves and wider estate.

Science and Evidence

We will undertake research to support climate change adaptation and mitigation to address key evidence gaps; a particular priority is the assessment of the effectiveness of adaptation measures. We will work to share and embed climate change evidence across the organisation to ensure our people can use climate evidence in their work. We will also develop best practice approaches for the implementation of Nature-based Solutions for adaptation and mitigation, so they deliver for both biodiversity and people.

Introduction

This is the third Natural England adaptation report produced under the climate change adaptation reporting power of the Climate Change Act 2008. Our understanding of the risks of climate change has continued to develop significantly since our climate change work programmes started in 2006 and since our first adaptation report produced in 2012¹. Climate change is also now much more prominent in both public and political space.

Risks to the Natural World are a central part of the UK Climate Change Risk Assessment (CCRA3)², there is a chapter dedicated to the natural environment and it plays a significant part in many of the other sector chapters. The Climate Change Committee's (CCC) CCRA Advice Report identifies 'risks to the viability and diversity of terrestrial and freshwater habitats and species from multiple hazards' as the first of eight high risk areas, which require adaptation planning by government within the next two years³. Natural England supports this assessment. Overall, four of the eight highest priority risks are related to biodiversity, soil, water protection, land management and farming and forestry. Furthermore, in the CCC's progress report to government in 2021, it found that no sector is yet scoring highly in lowering its level of risk⁴.

We are therefore living at a time of change and the impacts of climate change pose major risks to Natural England's vision and statutory purpose. Adapting to climate change is essential if we are to do our job properly. There are considerable challenges to integrating adaptation across the breadth of our work, due to the scale of changes required, both now and as part of our long-term planning. It will also involve some difficult decisions. However, many of the actions we need to take to adapt will also bring wider benefits both to people and nature. The importance of protecting and restoring nature as part of the solution to climate change was also recognised at COP 26. The [Glasgow Climate Pact](#): 'Emphasises the importance of protecting, conserving and restoring nature and ecosystems to achieve the Paris Agreement temperature goal, including through forests and other terrestrial and marine ecosystems'. Over 140 countries have now [signed a declaration](#) to halt and reverse forest loss and land degradation by 2030. The need to transition towards sustainable agriculture was also recognised through the [COP26 Policy Dialogue to Accelerate Transition to Sustainable Agriculture](#).

The twin crises of biodiversity loss and climate change are interlinked and need to be addressed in an integrated way. Natural England is encouraged that the government is supporting the 30by30 target and has committed to halt the loss of species by 2030. Although in the UK this also means protecting landscapes, achieving 30by30 and halting species loss could significantly help the protection and expansion of more natural habitats to help them adapt to climate change. A major work area for the organisation is the formation of a [Nature Recovery Network](#) (NRN) that can provide benefits to both people and nature. [Nature Positive 2030](#), published alongside the other four statutory nature agencies of the UK, is a bold call for much greater action to recover nature across all parts of society stating that: 'Our actions for nature and climate change need to work hand-in-hand, in line with the scientific consensus that we need to tackle the biodiversity loss and the climate change crises together, or we will solve neither'⁵. This means taking larger-

scale and transformative actions now. Climate change adaptation is part of this action and we need to develop our response to protecting nature under a changing climate. Natural England's work will not be sustainable either now or in the future if climate change is not at the heart of our work.

We are not starting from scratch in adapting to climate change, Natural England has worked on it since our establishment in 2006. We have developed a strong evidence base to inform decision-making, publishing both scientific papers and practical advice for conservation practitioners, such as the Climate Change Adaptation Manual we published with the RSPB⁶. We have also integrated risk assessment and adaptation planning into some areas of our work, such as in managing our National Nature Reserves (NNRs). There is however a long way to go and the risks are growing; this report includes an ambitious adaptation plan to respond to these risks over the next 5 years.

The reality of a changing climate

The UK's climate is changing; recent decades have been warmer with more intense storms than the past⁷. Overall, as warming increases climate projections indicate that we will experience:

- warmer, wetter winters and hotter, drier summers
- more extreme weather events and increased risks of drought, flood and wildfire
- increased coastal erosion and saltwater intrusion
- new pests and diseases
- increased sea level rise

Coastal areas, wetland and montane habitats and cold adapted species are all more vulnerable to these changes, which will have [major impacts on the natural environment](#) and the benefits it provides⁸. For example, species distributions are changing, and some species are occurring further north as well as shifting to higher altitudes. Species populations and habitats are also being affected by year-to-year variations in rainfall and extreme weather. The way society responds to climate change will also have significant impacts on nature, potentially exceeding the direct impacts of a warming climate. These include changing global markets for agricultural products; the impacts of mitigation strategies, including biofuels, tree planting and renewable energy; and the risk of adaptation responses that can harm biodiversity and exacerbate existing pressures, such as increases in hard flood defences in response to the increased risk of flooding.

The [CCCs recent progress update](#) on national adaptation reports that adaptation has not yet been adequately integrated into the overhaul of policy for the natural environment, stating that: 'Without this integration, the aims of the Government's 25-Year Environment Plan are unlikely to be met because climate change will reduce habitat condition, soil and water quality and quantity, threatening further the health of ecosystems and the natural environment, which are already in serious decline'. The 25 Year Environment Plan (25 YEP) also lacks a specific target for adaptation, which limits the incentives for delivery

mechanisms such as [Environmental Land Management Schemes](#) (ELMS) to focus on adaptation.

We understand these challenges and the resultant risks to our organisational aims. We are seeing the impacts of climate change on our landscapes and protected sites. Rapid changes in the composition of some protected communities have resulted in a shifting or loss of features that affects the ability of management to achieve and/or maintain favourable condition and meet protected site conservation objectives. This has implications for meeting the 25 YEP target of achieving 75% of protected areas in favourable condition by 2042. As outlined in our adaptation plan, we are looking at how the site designation system can be developed to ensure it supports the best possible outcomes for conservation in a changing climate. However, we will not always be able to prevent change. For example, sea level rise and coastal change are happening now and further changes are inevitable, even with effective control of global emissions. There is a concentration of protected areas for both wildlife and landscape at the coast and it is therefore inevitable that we will lose interest features in some coastal sites. With appropriate management, new habitats and species may be established, but we will have to embrace change to a much greater extent than in the past.

We must also acknowledge the existing pressure facing the natural world and understand the way these interact with climate change. Many of our ecosystems are experiencing chronic degradation and stress, which makes them more vulnerable and less able to adapt to a changing climate. Addressing the totality of these multiple pressures is beyond the remit and scope of Natural England alone, but we have a crucial role to play. Depending on the outcome of global efforts to limit global heating, adaptation may mean making difficult decisions in the future to protect vulnerable species as we adapt to the realities of a changing climate. Take for example the mountain ringlet, which is England's only true montane species of butterfly found on high fells in the Lake District. The species is now found in fewer sites than recent decades, likely due to climate change. The Lake District population is at risk under present warming and this threat will increase in the coming decades. One solution to [conserve the unique genetic diversity of the Lake District population](#) could involve translocating mountain ringlets to higher altitudes and good habitat management may relieve the pressure, but a point may come when the species is no longer viable in some locations⁹. Landscapes and habitats are changing and some that we have known now, and in the past, will not recover in their present form. However, if we adapt, there is still a huge potential and opportunity for a nature-rich future, particularly if global temperature rise can be kept below or close to 1.5 degrees. Natural habitats can continue to support abundant species, albeit potentially different species to today, but only if we manage them in a way that is appropriate to our changing climate. Some currently threatened species could thrive in new places, but we will need to ensure they can establish there. Landscapes may change, but still support nature and bring huge benefits to people.

How Natural England is responding to the climate crisis

As the [government's advisor for the natural environment](#) and a key delivery body, climate change impacts will be felt throughout our business. Natural England's role in climate change is shaped by our purpose 'to conserve, enhance and manage the natural environment for its intrinsic value and for the benefit of current and future generations, thereby contributing to sustainable development'.

Natural England's [Action Plan for 2021/2022](#) outlines our vision of **thriving Nature for people and planet** through **building partnerships for Nature's recovery**. This vision and mission is underpinned by our six five year-aims as set out in the action plan, which also contribute to the Defra group's priority outcomes and align with the [Government's 25 YEP](#).

Our Five-Year Aims

- 1) **A well-managed Nature Recovery Network** across land, water and sea delivering resilient ecosystems rich in wildlife and character, enjoyed by people and widely benefitting society.
- 2) **People connected to the natural environment** for their own and society's wellbeing, enjoyment and prosperity.
- 3) **Nature-based Solutions** contributing fully to tackling the climate change challenge and wider environmental hazards and threats.
- 4) **Improvements in the natural capital** that drives sustainable economic growth, healthy food systems and prospering communities.
- 5) **Evidence and expertise** is used by a broad range of partnerships, organisations and communities to achieve Nature recovery and enable effective regulation and accreditation.
- 6) **Being a values-led organisation** which delivers excellent service standards to all partners, organisations and communities engaged in achieving Nature's recovery.

As an organisation we are working to increase the resilience of the natural environment to cope with climate change. We are also developing and advising on the opportunities for the natural environment to help other sectors adapt, alongside supporting opportunities to mitigate against the causes of climate change. These five-year aims have explicit links to climate change adaptation. For example, NbS are essential to reducing greenhouse gas emissions as well as reducing risks to people through Ecosystem-based Adaptation (EbA). NbS can support a wide range of outcomes such as Natural Flood Management (NFM), improved air quality and wellbeing. To do this they need to be deployed at scale, with early implementation and a long-term plan for their maintenance. They also need to be designed, managed, and evaluated to ensure that they will continue to be effective in a future which is warmer and subject to changes in rainfall, including more extreme events such as droughts and floods.

Natural England Programmes

In 2020 Natural England developed the following four strategic programmes to deliver our five-year aims up until 2025:

- Resilient Landscapes and Seas
- Sustainable Development
- Greener Farming and Fisheries
- Connecting People with Nature

They are underpinned by two supporting programmes:

- Science and Evidence
- Managing the Organisation

Natural England programmes are designed to ensure join up on cross cutting issues by linking strategy, policy, evidence and delivery. As such embedding adaptation to climate change throughout the organisation will be a key responsibility of the programmes. The Resilient Landscapes and Seas Programme is the largest of the four strategic programmes and has over-arching responsibility for delivering our climate change ambitions. One of the aims of the Resilient Landscapes and Seas Programmes is to re-establish functioning, resilient ecosystems on land and sea to contribute to net zero. This also complements nature recovery, which is a major focus of the programme through the development of the NRN and related Local Nature Recovery Strategies (LNRS). The programme also has an aim to ensure that the SSSI network can adapt to climate change. The Sustainable Development Programme includes our regulatory role through planning and licensing, which includes planning for climate change adaptation such as for development and infrastructure projects. The Programme also aims to develop the implementation of net gain and to promote natural capital planning and urban greening, all of which can make significant contributions to climate change adaptation. Our licensing activity also seeks to complement species conservation strategies to aid nature recovery. The Greener Farmer and Fisheries Programme encompasses our work on contributing to sustainable farming and fisheries, which includes the need to address climate change and environmental degradation through our advisory and regulatory role. The Connecting People with Nature Programme aims to improve people's opportunities enjoy and have access to nature. This includes providing areas to protect people from environmental harm.

Developing our approach

Despite the challenges we face, it is important to recognise that there is significant scope to adapt the natural environment to climate change, alongside developing opportunities for both people and the natural world. We need to be bold and forward looking as we adapt to a changing world. As an organisation we recognise this will mean developing our approach in response to the climate and ecological crises. As such, we are building capability and taking a science-led approach to tackling climate change. We also have a

leadership role to play as both a statutory nature conservation body and a leader in climate change adaptation and mitigation evidence. We have a strong focus on partnership-working at a local and national level and play a role in convening the wider conservation and environmental land management community, alongside providing accessible, science-based advice and a reliable, independent evidence base to inform decision making.

The impacts of climate change will be felt across all areas of the whole organisation and, to be most effective, adaptation planning needs to be integrated into all work areas. This is recognised by our plans to develop a framework to evaluate the success of implementing this adaptation plan.

This third-round report identifies the following themes in developing our organisational approach:

- Plan climate change adaptation for the natural environment, with the aim of restoring ecological processes at a landscape scale to enable nature recovery, enhance resilience and accommodate inevitable change.
- Deliver multiple benefits through our work on climate change adaptation for the natural environment, including integrating climate change mitigation, biodiversity and enhancing the quality of life for people.
- Recognising the benefits of local level adaptation, which we have a key position to showcase and develop through the work of our Area Teams as showcased in Appendix 1.
- Using a natural capital and ecosystem approach to account for the multiple benefits that nature provides to society.
- Developing adaptive management that takes account of change in the natural world both in the policy advice and delivery space.
- Ensuring we have joined-up working between our different specialists and work programmes.
- Developing the monitoring and evaluation of adaptation, including NbS, to provide the strongest possible evidence base for good decision-making.
- Develop a joined-up approach to Nature-based Solutions which delivers mitigation and adaptation with measurable benefits for nature and people.

Our third-round report

We have updated our risk assessment and adaptation plan to reflect Natural England's organisational shifts including the work across our six corporate programmes. This report outlines how key work areas of the organisation are adapting to climate change. We have consulted across the organisation and the plan includes changes that are being and will be made so that we can adapt to climate change. Our assessment of climate risk from the second-round report has been updated to reflect Natural England's updated aims. We have also reviewed the second-round climate change action plan to assess progress made under the previous adaptation plan. We have achieved many of our planned adaptation actions, however, further work is needed across work areas.

Our climate change risk assessment

Climate change poses significant risks to our aims and strategic objectives. Natural England has undergone significant changes since our previous risk assessment and so we have updated the assessment based on our Action Plan for 2021/2022. However, it is important to note that the risks and potential opportunities to our objectives have not changed significantly from the eight overarching risks outlined in our second-round adaptation report¹⁰. In many cases the evidence underpinning these risks has strengthened.

Our work is intimately linked to the state of the natural environment. In assessing the risks and opportunities to Natural England's aims, we have therefore referred to the 18 key risks and opportunities for terrestrial, freshwater, coastal and marine natural environments, as well as for agriculture and forestry and the landscape which have been comprehensively outlined in CCRA3. The links between our organisation risk assessment, CCRA3 and the previous risk assessment from the second-round report is provided in Appendix 2.

The 10 overarching risks and opportunities below are designed to capture the climate risks to our overall aims and objectives, including our long-term key performance indicators. Many of these risks are interlinked and this is reflected in the actions outlined in our adaptation plan.

1. Risks to the viability of the Nature Recovery Network and the recovery of threatened species and habitats.

This risk relates to our aim of a well-managed NRN with landscape and seas that are more resilient to environmental change. Delivery of this aim is through LNRS and is a key work area of the Resilient Landscapes and Seas Programmes. This risk encompasses threats to species and habitats in the marine, terrestrial and freshwater environment, which may impede nature recovery. This includes risks due to changing climatic conditions and extreme weather events including drought, wildfire and flooding. This risk also captures changes to species distributions and interactions caused by range shifts due to changing temperatures as well as risks from the introduction and spread of pest, pathogens and invasive non-native species.

2. Risks to the status of protected sites for biodiversity and geodiversity.

A well-managed NRN includes protected sites as core areas for nature. This risk also includes the delivery of the 25 YEP goal of 75% of SSSIs in favourable condition by 2042. The impacts of climate change as outlined under the risks to the viability of the NRN will also affect the status of our protected sites. These sites were established prior to the threats of climate change and designations are not currently designed to account for a changing climate, which may result in the loss of designated features.

3. Risks to the ability of the SSSI network, Marine Protected Area (MPAs), NNRs and protected landscapes to adapt to climate change.

We aim to ensure the protected site network can adapt to climate change. Consideration of this risk includes progress in the SSSI reform programme and the new landscape designations programme in addition to our work on the marine environment. This includes that our marine advice and regulation is contributing to providing Good Environmental Status (GES) of the MPA network and wider seas alongside sustainable fishing and environmental improvements from fisheries our advice. The scale and pace of climate change impacts may present risks for the ability of the marine and terrestrial protected site network to be able to adapt to climate change. For example, through tipping points, which may lead to sudden changes in site condition. This includes designated landscapes, which could be subject to significant changes in landscape character and loss of certain landscape features such as from coastal erosion and sea level rise. Marine ecosystems will be affected by temperature changes and acidification from high carbon dioxide concentrations in the atmosphere. These changes will alter the abundance of different species groups, which may also interact with fishery pressures.

4. Risks to natural capital and its contribution to agriculture, fisheries and sustainable development including farm advice and net gain.

We aim to facilitate improvements in natural capital, which supports sustainable economic development. This includes net gain contributing to nature recovery, the contribution of agri-environment schemes and our farm advice reducing the impact of farming on nature alongside delivery of the peat action plan and future land management schemes. Climate change presents considerable risks to agricultural production through extreme weather events including water scarcity, wildfire and flooding. Changing climatic conditions also risks soil health as well as the risk of pest, pathogens and invasive non-native species. There are also risks of maladaptation and lock-in depending on wider policy, market and stakeholder responses in relation to development and agriculture. For example, if increased flooding events lead to an increase in hard flood defences at the expense of biodiversity and the wider environment, or if reductions in agricultural yields leads to a push for greater production and agricultural intensification.

5. Risks to the viability of natural areas for people to access and connect with nature.

This risk relates to our aim of people being connected to the natural environment and we are seeking to ensure a positive trend in levels of nature connection. We expect to see the provision of natural green space to increase especially for people within deprived areas. This includes progress in delivery of the England Coast Path and for nature to be embedded within the Social Prescribing National Delivery Model. In common with risks outlined above, changing climatic conditions and extreme weather events including water scarcity, wildfire and flooding may adversely impact the provision of natural habitats for people to access nature. In addition, increased erosion and coastal change could lead to loss of access routes. Extreme events such as flooding or increased risk of wildfire on open access land may also reduce access to natural areas.

6. Risks and opportunities for Natural England's role as a leader in nature recovery and climate change.

We are a science and evidence led organisation and have a key role in making clear evidence available for effective decision making. Much of our work is also delivered through partnership working such as through local authorities, land managers and collaboration with our partner agencies. For example, partnership working is critical in the establishment of the NRN. This presents opportunities to provide our evidence and expertise in accessible formats and shape the response to the climate crisis. However, there are also risks to our organisational aims if our response does not keep pace with the emerging risks and our partners do not trust us as a reliable leader in our plans to respond to the climate crisis and deliver nature recovery.

7. Risks and Opportunities for different species and habitats under changing climatic conditions.

Changing climatic conditions presents risks and opportunities to the NRN and protected sites as species move. This may include rare and threatened species, which may have the opportunity to colonise new locations. Risks and opportunities to species from climate change are species specific and are also influenced by existing threats to conservation status such as habitat fragmentation. There are also risks from altered species interactions, which may change competition, predation-prey dynamics and disease.

Opportunities and co-benefits from adaptation

Responding to climate change has clear synergies with some of our key aims. As acknowledged by CCRA3: 'Many generic actions for nature recovery, such as creating bigger, better, more and more connected areas of semi-natural habitats (Lawton Review, 2010), contribute to adaptation in that they build the resilience of ecosystems and can enable species to respond better to climate change'.

8. Opportunities for landscape scale measures to tackle climate change that enhance the natural environment.

9. Opportunities for nature recovery and nature-based solutions to help nature and society adapt to climate change.

10. Opportunities for nature-based solutions to provide additional space for people to connect with nature and cope with climate change.

We aim to ensure that NbS are making a significant and measurable contribution to nature recovery and public needs, including climate change. NbS provide significant potential to help both nature and people adapt to the climate crisis, including through providing more nature rich spaces and green infrastructure for people to connect with nature and cope with the impacts of climate change. NbS as part of climate change mitigation also provide the opportunity to improve natural capital to contribute to nature recovery and adaptation. We also have the opportunity to improve our existing management of nature to increase resilience to climate change. These opportunities require positive action to realise the potential benefits as part of adaptation planning. For example, to facilitate landscape scale

change and engage with agriculture and the planning sector to influence adaptation for people and nature. There are also opportunities to provide more nature rich areas for people and engage with different communities and stakeholders as part of the response to the climate crisis.

Risk ratings

The overall scoring of the current risks and opportunities to our overall aims and objectives is provided below. This includes the Impact (I) and Likelihood (L) ratings. We have provided an assessment of medium- and long-term risks using two horizons of 2030 and 2050. To follow CCC advice of assessing risks to 4°C and planning adaptation to 2°C; we have used UKCP18 projections considering RCP 2.6 as a low emissions scenario and RCP8.5 as a high emissions scenario. Our full risk assessment methodology is provided in Appendix 2.

Risks	Medium term risk		Long term risk	
	RCP 2.6	RCP 8.5	RCP 2.6	RCP8.5
Risks to the viability of the Nature Recovery Network and the recovery of threatened species and habitats	9 moderate I – moderate L – possible	12 major I – major L – possible	16 major I - major L - likely	20 severe I – major L – almost certain
Risks to the status of protected sites for biodiversity and geodiversity	12 major I - moderate L - likely	16 major I - major L - likely	16 major I - major L - likely	20 severe I – major L – almost certain
Risks to the ability of the SSSI network, MPAs, NNRs and protected landscapes to adapt to climate change	12 major I - moderate L - likely	16 major I - major L - likely	16 major I - major L - likely	20 severe I – major L – almost certain

Risks to natural capital and its contribution to agriculture, fisheries and sustainable development including farm advice and net gain	12 major I - moderate L - likely	16 major I - major L - likely	16 major I - major L - likely	20 severe I – major L – almost certain
Risks to the viability of natural areas for people to access and connect with nature	3 minor I - minimal L - possible	6 moderate I - minor L - possible	12 major I - moderate L - likely	16 major I - major L - likely
Risks and opportunities for Natural England’s role as a leader in nature recovery and climate change.	3 minor I - minimal L - possible	6 moderate I - minor L - possible	12 major I - moderate L - likely	16 major I - major L - likely
Risks and opportunities for different species and habitats under changing climatic conditions.	10 major I – minor L – almost certain	15 major I – moderate L – almost certain	15 major I – moderate L – almost certain	20 severe I – major L – almost certain

This overall risk assessment demonstrates the significant impacts we expect in the medium term, on a pathway for stabilising global warming below 2°C by 2100. Our adaptation plan actions outlined in the next section are designed to be the first step to dealing with these risks over the next five years. However, the plan will require regular reappraisal in response to the developing risks and impacts of climate change on our work. Many of these risks are interrelated due to the nature of climate change impacts on the natural environment. Addressing these risks and opportunities in an integrated way is also reflected in our adaptation actions.

If international efforts to limit global temperatures rises are not successful and we continue on a pathway to 4°C global warming at the end of century we are likely to experience severe impacts to our aims in both the medium and long term. Adapting to these impacts is beyond the scope of this adaptation plan, which would require more urgent and significant action.

Our adaptation plans up until 2026

A review of our progress against our previous adaptation priorities is provided in Appendix 3. The adaptation priorities outlined in this plan reflect how our current work is addressing adaptation alongside the plans we are implementing over the next five years. We have grouped these actions to align with the four strategic and two underpinning programmes. However, there is considerable crossover between work areas, which reflects the need for a joined-up approach to adaptation planning.

Resilient Landscapes and Seas

This includes work on NNRs, species management and protection, protected sites, woodlands, marine, landscapes, AONBS and National Parks and heritage sites.

Nature Recovery Network

- We will enhance the resilience of the natural environment and its biodiversity to climate change through the NRN, in which we play a key role. The NRN will support the restoration of 75% of terrestrial sites to favourable condition by 2042 alongside the creation or restoration of 500,000 hectares of wildlife rich habitat outside of protected sites. Habitat creation and restoration will expand existing sites and provide corridors and stepping-stones to help species grow and move. We will also establish up to 25 new catchment or landscape scale Nature Recovery Areas to significantly expand wildlife habitat; these will play an important role in supporting adaptation across the network. The NRN will provide improvements in ecosystem health to enhance ecosystem services along with the landscape's resilience to climate change. For example, through providing natural ecosystem function to sequester carbon and manage flood risk. We will incorporate climate change adaptation into all our planning for the NRN and enable partners to do likewise by providing evidence and advice.
- A well-managed NRN is one of our overall five year aims and will contribute to wider ecological transformation to make ecosystems more resilient and many work areas covered in our climate change adaptation plan. This includes, NNRs as core areas of the NRN, protected sites for biodiversity and geodiversity, species recovery, landscapes and the historic natural environment, in addition to the provision of new green infrastructure and increased access to nature.
- We will ensure our NRN and LNRS advisors have the necessary skills and knowledge to facilitate climate change adaptation. The NRN is a national programme based on strong partnership working with a wider range of stakeholders. NRN Advisors leading this approach at a local level have undertaken initial training on climate change adaptation. They will continue to apply adaptation principles, including for the need to accommodate change, as part of the roll out of the NRN. This includes applying the approaches outlined in the Climate Change Adaptation Manual and the Nature Networks Evidence Handbook.

- We will support the integration of adaptation planning within the delivery of the LNRS. LNRS are expected to include the wider environmental benefits of nature recovery, including nature-based solutions to contribute to climate change adaptation, such as natural flood management. The ongoing LNRS pilots have demonstrated the potential of integrating land use planning and land management. For example, the pilots have identified woodland to store carbon, reduce flooding and cool urban areas.
- LNRS have significant potential to contribute to local level adaptation planning by bringing together planners, Local Nature Partnerships, farmers, protected areas, the public, Non-Governmental Organisations (NGOs), Arm's Length Bodies (ALBs) and more to establish locally led collaborative processes. As spatial strategies they will map and coordinate action and investment for nature recovery and will explore how the climate and biodiversity crises impacts people at a local level to enable them to develop specific actions in response.
- Our climate change specialists and advisors will share adaptation principles, information and expertise with our partnership network who are developing their own adaptation responses to climate change.
- We also plan to advise on the development of LNRS as they are periodically reviewed. This will provide an opportunity to assess how adaptation planning is being integrated as the LNRS are delivered.

National Nature Reserves

- We will continue to include an assessment of climate change vulnerability within our NNR management plans to ensure the remaining 32 NNR management plans assess climate risks by the end of 2022.
- We have initiated assessments of carbon stocks and flux for NNRs within Natural England's estate based on the [carbon storage and sequestration by habitat report](#)¹¹. This work will inform a process of identifying carbon as a feature within management plans, which will be aligned to the existing work on climate change risks and adaptation to increase the resilience of these carbon stores.
- We will continue to increase site resilience. For example, by restoring lowland raised bogs such as undertaken at [Bolton Fell and Walton Mosses](#), which was declared a new NNR in 2019. Natural England manages over 5,500ha of lowland raised bog. We have recently acquired an additional 150 hectares including an entirely new reserve.
- We will continue to incorporate adaptive management alongside traditional conservation practices of NNRs. This will include how to manage change on our NNRs. For example, considering future climate suitability when replanting woodland stands on the Derbyshire Dales NNRs and other affected sites due to ash dieback.
- We are making significant changes to our strategies to manage wildfire risks on NNRs and commencing a new programme of wildfire resilience plans and interventions for our 21 highest risk reserves to reduce the likelihood of wildfires occurring and the severity of their impacts if they do. This programme will be

completed by the end of 2023 and has been initiated partly in response to major fire events we have experienced in recent years.

- We will continue to use NNRs as demonstration sites for climate change adaptation and exemplars of nature recovery. We will also explore the use of innovative techniques to implement adaptation. For example, using GPS collars for cattle to encourage small-scale habitat heterogeneity and sphagnum application to restore peatlands.
- We will seek to advance landscape scale conservation by creating bigger and more connected NNRs such as achieved at [Purbeck Heaths NNR](#) in 2020. We are undertaking a very significant expansion of [NNRs, and other designations across England](#), using government funds to purchase new reserves where strategically important, cementing partnerships with other conservation organisations and private bodies by joining up separate landholdings to create larger reserves, and promoting the NNR designation as a standard of excellence with climate change adaptation as one of its core attributes.
- We will continue to make the most of opportunities on our NNRs for species to expand their range under a changing climate. For example, great white egret, which now breeds at Shapwick Heath and Ham Wall NNRs in Somerset.
- We will continue to monitor changes in invasive species on our reserves including because of species movement due to climate change.

SSSI Reform

- We are undertaking investigations into the requirement for a significant reform of our approach to managing SSSIs. The SSSI Futures Reform Project will assess whether current SSSI designation and monitoring frameworks enable species, habitats and geological features to adapt to climate change. We are exploring the extent to which the statutory framework needs to evolve and flex, to maintain protections for an increasingly dynamic natural world. The project also aims to give conservation staff and site managers the confidence to either prevent or embrace change. The project will run until 2025 and has been accelerated by the Environment Bill and the need to deliver under the 25 YEP. There are four main components to the project as outlined below, all of which are planned for completion by the end of 2024. This outline is subject to change depending on the outcomes as the work progresses.
- We will undertake an evidence building programme to understand how SSSI condition is likely to respond to climate change and support species and habitat adaptation both within and outside of the SSSI. This will include a vulnerability study of SSSIs and monitored features to climate change impacts to be completed by the end of 2022. These assessments will lead to a framework for adaptive management of SSSIs, including a training plan for site managers.
- Working with our stakeholders we will explore the potential requirement to reform the designation of SSSIs to enable them to evolve and adapt to support resilient, naturally functioning landscapes, allowing natural processes to begin to work more effectively and for sites to respond to climate change. This aspect of the project will

also consider how sites are currently adapting, and the legal obstacles to the natural world's adaptation to climate change. For example, how a site can meet Favourable Conservation Status (FCS) under changing climate conditions. We will also consider climate change within the processes to expand or designate new sites.

- Building on work carried out by the NRN and the 25 YEP Indicator D1, which will measure changes in extent, condition, connectivity and function of terrestrial and freshwater habitats in England. We will develop and apply indicators to assess when our landscapes become resilient and the role SSSIs play. This will include trialling a methodology for rapidly assessing natural ecosystem function and recording climate change impacts occurring on protected sites. We will also train our staff to undertake these assessments and implement adaptive management as part of this process.
- We will support trials of new monitoring technologies such as Earth Observation, DNA, low-cost sensors and UAVs (drones) in the context of monitoring protected site features and landscape-scale metrics across the emerging Nature Recovery Network. This will help to support the monitoring and evaluation of adaptation actions.

Landscape and Heritage

- We will continue to engage with partners to encourage adaptive management of landscapes to climate change. For example, the [farming in protected landscapes programme](#) running from July 2021 for March 2024 will include both climate mitigation and adaptation outcomes including carbon storage and sequestration, reduced flood risks and increased landscape resilience.
- We will continue to input into the National Park and Areas of Outstanding Natural Beauty (AONB) Management Plans and support aligning these plans with national targets. National Parks England's (NPE), The National Association for AONBs and NE have developed a [joint commitment](#) to work more effectively on shared challenges including climate change. The agreement includes three overarching themes comprising climate change and carbon, nature recovery and landscapes for all. Climate change adaptation is a shared priority within the commitment, which includes the development of a climate change and carbon plan by April 2022.
- NPE, The National Association for AONB and NE will jointly develop new Management Plan Guidance that signposts how designated landscapes can contribute NbS to tackle climate change challenges and contribute to achieving net zero by April 2022.
- We will raise awareness of climate change adaptation opportunities and benefits as part of the ongoing and new designation projects for AONBs, comprising extensions to the Surrey Hills and Chilterns AONBs and the new Yorkshire Wolds AONB and the new Cheshire Sandstone Ridge AONB.
- By the end of 2022 we will have completed a national mapping exercise – the All England Assessment - to consider future landscapes designations, including future climate suitability, in relation to the nature recovery network.

- We will update the [National Character Areas profiles \(NCAs\)](#) and make the NCA Atlas available on an online platform by the mid-2022. This online platform will allow updates to the NCAs, including for information on climate change. These updates are planned to be completed by the end of 2023. We will be working with Historic England to ensure the sections on Historic environment character and environmental opportunities take climate change into account.
- We will also develop a landscape change database. This update will support the Defra 25 YEP - Outcome Indicator G1: Changes to Landscape and Waterscape Character. Climate change is one of the landscape themes and the database indicators will include the vulnerability of characteristic habitats to change. We plan to report change at different scales including national, regional, and designated landscape level.
- In reviewing landscape tools, [such as the Landscape Character Assessment Guidance](#), that we make available to assist individuals and organisations manage landscapes across England, we will use latest available information to provide more guidance relating to climate adaptation needs.
- We will explore alternative landscape approaches that help address climate change adaptation needs, for example, to green urban landscapes.
- We are recruiting specific roles to provide landscape support within our area teams. These posts will include a remit on engaging with partners on landscape change, including the need to embed climate adaptation principles. For example, by promoting participatory planning in landscape change projects and contributing to evidence building and understanding of landscape and coastal change due to climate change. These roles will also work with National Park and AONB partnerships to review designated landscape management plans, so they embed climate change ambitions.
- We will continue to work with [Historic England](#) to share knowledge and advice on climate change adaptation in relation to the historic environment. For example, we will utilise the data developed by Historic England alongside the [National Trust to map climate threats to their historical places](#).
- We will continue to ensure an understanding of the historic environment is considered within our work related to climate change adaptation and mitigation. For example, we have advised on green infrastructure schemes and planting within our NNRs estate in relation to the historical landscape. We are also working to ensure that lessons from the historic environment are applied as part of LNRS. For example, to consider historical planting when developing street tree planting schemes to promote urban cooling.
- We are part of the Historic Environment Forum, working with partners from the heritage sector to share guidance and case studies on conservation of the historic environment. For example, we inputted into the [Heritage Responds](#) project, which highlights climate change adaptation actions for the historic environment.
- We are undertaking the NNR Heritage at Risk Project to integrate archaeological features and the historic environment in NNR management plans. Risks from climate change are therefore included within the assessments of threats to these

features alongside management responses. This project is currently being developed and we anticipate will be completed by 2025.

- We have included an historic environment standard within the [Nature for Climate Peatland Grant Scheme](#), to contribute to the restoration of English peatlands.
- We will also continue to engage with archaeologists at a local level within our area teams to inform our understanding on climate change risks as part of our work on historic landscapes. We are seeking to include the consultation with local authority archaeologists within other work areas such as green infrastructure and nature recovery to identify opportunities for works to benefit the historic environment and biodiversity adaptation and resilience.

Species recovery, protection and reintroduction

- Our Species Recovery Programme will include considerations of changing climatic conditions and sea level rise, alongside other pressures and threats as it expands its remit to all GB red-listed taxa that occur in England. We plan to complete this update by the end of 2022, which will be a key resource to underpin our plans for species recovery.
- These new action plans will help us identify species where multiple landscape-scale pressures/threats make species recovery extremely challenging, or where climatic conditions may prevent the long-term viability of certain populations within England. This will allow us to develop specific actions for climate sensitive species such as translocation to reinforce or establish populations. For example, such as the [assisted colonisation of the lichen, *Flavocetraria nivalis*](#) from the high Cairngorms in Scotland. Increasing our understanding of specific species recovery needs and constraints will also help us to target conservation actions for those species with the greatest recovery potential.
- We are piloting a classification system to group species by their recovery needs. This will contribute to wider nature recovery aims and ecosystem resilience by spatial planning of species recovery. The method allows the breakdown of long lists of notable species from landscape-scale projects, to inform both habitat restoration planning and the development of multi-taxa projects. For example, species that are likely to respond to landscape scale changes in habitat creation and restoration require a less targeted approach than specialist species with poor dispersal. The pilot is due to be completed in 2022 and if successful could be adopted more widely.
- Extinction-risk assessment in the form of [International Union for Conservation of Nature \(IUCN\) Red Lists](#) help us to shape our species recovery priorities and provide a means of tracking the impact of climate change on species. We will continue to support and produce new and updated GB Red Lists to inform our approach to climate change adaptation.
- We will consider how climate change impacts should be incorporated within definitions of Favourable Conservation Status (FCS) and the specific pressures and threats facing habitats and species. Climate change adaptation will also be

considered as part of the strategies developed to achieving FCS for species and habitats.

- We will develop our approach to protection for species that are likely to undergo range shifts due to changing climatic conditions. This will also consider how we manage species that become newly established within the UK due to a warmer climate. In our response to the government's upcoming Green Paper, we will advise that climate change be considered within any future legal framework for the protection of habitats and species in the terrestrial and marine environment.
- Climate change adaptation will be built into the Strategy on species recovery and reintroduction, which we plan to produce by mid-2022.
- Alongside Defra, we have produced [a code and guidance document](#) for stakeholders on reintroduction and other conservation translocations of animals, plants and fungi. Within the code, there are a series of principles and considerations, which highlight the need to consider the impacts and assessment of climate change, include future climate projections, throughout the initial concept and planning stages, prior to application. For example, climate change impacts have been considered as part of the Red-backed Shrike Reintroduction Feasibility Study currently ongoing this year.
- As outlined within the reintroduction code we will also consider the potential for climate change to provide an exceptional justification for introducing certain new species to the British Isles, particularly to Great Britain.
- We will assess all reintroduction proposals and applications against the principles in the code, which also covers out-of-range conservation translocations to support climate vulnerable species. For example, we are supporting an assessment of a potential assisted colonisation of Natterjack toads undertaken by Amphibian and Reptile Conservation (ARC), which are threatened by coastal squeeze driven by climate change. We are also supporting an assessment undertaken by ARC, due to be completed mid-2022, of climate change impacts on reptiles and amphibians within the UK.
- We have granted 20 licences to keep beavers in enclosures in England and one licence for a wild release (on the River Otter in Devon). As ecosystem engineers' beavers can restore natural processes and create a mosaic of diverse riparian habitats, which support improvements in catchment water storage, flood regulation and water purification, which have potential benefits for adaptation. Natural England and Defra have worked closely, over the past few years, in making the necessary preparations to reintroduce beavers more widely into the English landscapes. Pending government decision on whether further wild beaver releases will be permitted in England, Natural England is making the necessary preparations to carefully consider and licence appropriate beaver reintroduction and management. Whilst we foresee significant societal benefits from beaver reintroduction, we also recognise there will also be challenges, particularly in certain sectors that we will need to consider very carefully. In addition to its regulatory role, Natural England is keen to work closely with partners and stakeholders locally and nationally to support suitable reintroduction projects and promote good practice.

- We will continue to ensure consideration of climate change effects is hard-wired into the planning and prioritisation of projects run under our partnership with RSPB – ‘Action for Birds in England’. [‘A Climatic Atlas of European Breeding Birds’](#) provides an evidence base underpinning the likely effects of climate change on birds.
- We are contributing to research led by the University of Exeter to assess the impact of climate change on UK bat species. This research will assess potential future distribution changes of UK bats and their contribution to ecosystem services of the UK agricultural and forestry sectors through the provision of pest control.
- We will continue supporting Butterfly Conservation led reintroductions and habitat management for several butterfly and moth species. which will also support climate change adaptation. We will continue to look at ways of building resilience for species, for example by increasing natural function and structural diversity in habitats to address abundance declines, especially for invertebrates.

Invasive species

- We will continue to work closely with other agencies in our advisory and regulatory role to ensure a joined-up response to newly established invasive species that may enter the UK partly because of climate change. This will include working with the newly established Invasive Non-Native Species (INNS) Inspectorate led by the Animal and Plant Health Agency (APHA). We also continue to emphasise the importance of good biosecurity and pathway management to try and prevent the establishment of INNS.
- We will continue to manage invasive species on our NNR estate and the wider protected sites network, which will include monitoring whether any INNS become newly established or extend their range.
- We will continue to fund work on the use bio control agents, for example with the Centre for Agriculture and Biosciences International ([CABI](#)), as a long-term solution to control invasive plant species, including established non-natives that might spread more easily under a warmer climate.
- We will contribute to the development of DNA-based detection and monitoring tools for invasive species and pathogens that may enter or become established in the UK as a result of a changing climate through the [Defra DNA Centre of Excellence](#)
- We contributed to the [horizon scan led by the UK Centre for Ecology and Hydrology \(UKCEH\)](#) for invasive species that may become newly established in the UK. Over the next five years we plan to assess the potential of existing non-natives to extend their range or become more established due to a warming climate. For example, we are currently undertaking an evidence assessment to determine whether common carp can start breeding within southern England under warmer conditions.

Marine environment

- We are developing a number of Highly Protected Marine Areas (HPMAs), where no extractive or damaging activities will be permitted. The designation of these sites

will consider a wide range of environmental factors, including carbon sequestration, recoverability and vulnerability to climate change. Pilot HPMA sites will be designated in 2022.

- We will develop our plans to support nature recovery outside the protected sites network to ensure Good Environmental Status for the marine environment. We will also seek to learn lessons from the SSSI futures reform project to understand whether any of the outcomes of this project can inform how marine site designations may need to change to adapt to the impacts of climate change. For example, considering a whole system approach and developing a potential framework for delivering management advice outside of protected areas.
- We will continue to engage with partners including Defra, Joint Nature Conservation Committee (JNCC), Environment Agency (EA), Marine Management Organisation (MMO) and Centre for Environment, Fisheries and Aquaculture Science (Cefas) on climate change adaptation. For example, we will feed into work led by JNCC on sensitivity of marine habitats to climate change and potential indicators of climate vulnerability as part of [UK Biodiversity 2021](#).
- As Steering Group members of the Marine Climate Change Impacts Partnership (MCCIP), we will continue to provide co-ordinated advice on climate change impacts and adaptation around the UK coast and seas.
- We will use the evidence developed by the [Climate Smart MPAs](#) initiative developed by JNCC, to inform our management advice for MPAs
- We will continue to work proactively with the MMO and Inshore Fisheries and Conservation Authorities (IFCAs) to provide advice to support management of MPAs and the wider seas, which can contribute to marine recovery and resilience to climate change. For example, we supported Sussex IFCA on the development of a new bye law to ban bottom towed gear in the Sussex coast, to encourage restoration of the seabed to a more natural state and thus encourage the recovery of kelp habitat.
- We will continue to provide funding towards the [MarClim project](#) to assess changes in marine species distributions as a result of climate change. This includes changes in invasive non-native species.
- We will seek to expand our marine monitoring programme to assess changes in marine designated sites. We will explore the potential to use existing data from our marine monitoring programmes to assess changes in site conditions potentially due to climate change.

Woodland policy

- We will continue to play a key role in delivering an evidence led approach to woodland management to increase biodiversity recovery and woodland resilience in the face of climate change. Our adaptation approach is to achieve an expansion of the native woodland habitat network and develop resilient woodlands by: i) using native species to increase woodland cover in key locations; ii) encouraging adaptive management to augment existing woodlands stocks, diversify woodland structure and replace species lost due to disease such as ash dieback; and iii) addressing

other threats such as pests, pathogens, invasive species and deer browsing pressure.

- We support the delivery approach of the **right trees**, comprising native species where nature recovery is the primary objective, in the **right place**, to ensure the greatest gains for biodiversity and ecosystem coherence. In doing so we will take account of changing climate and the need to ensure species are likely to be able to thrive in future as well as present climates. We will also emphasise the importance of establishing trees and shrubs in the **right way** to achieve the best result for biodiversity and woodland resilience. For example, considering the appropriateness of planting strategies using native trees and shrubs on a site level basis and favouring natural establishment to enable the greatest resilience to local and future conditions.
- We are advocating that these approaches to woodland management and creation are encompassed in the guidance and scheme criteria developed for the [England Woodland Creation Offer](#). By doing so we help ensure establishment of the biodiverse resilient woody habitats which form a key component to ensuring nature recovery as part of the 25 YEP.
- We will play a role in the delivery of [The England Trees Action Plan 2021-2024](#) and will be contributing to the Woodland Resilience Implementation Plan to be produced as part of the Action Plan by the end of 2022.
- We will continue to provide guidance on commercial forestry operations to support biodiversity and woodland resilience as well as for trees outside woodlands, such as wood pastures and hedgerows within agricultural land and urban areas. This includes exploring use and uptake of agroforestry systems.
- We will continue to work with Forestry Commission (FC), such as within the review of [The UK Forestry Standard](#), to design woodland creation schemes that maximise nature recovery and climate resilience. We will also continue to promote increasing woodland connectivity to enable bigger, more joined up woodlands that boost habitat resilience.
- We are recruiting specific roles within our area teams to work on tree establishment and woodland creation schemes. These roles will include a focus on considering climate change adaptation as part of new woodland creation schemes.

Peat Policy

- We will continue to play a key role in implementing peat policy working with partners and landowners who manage both upland and lowland peat. Our priorities are to protect and expand designated peatlands, and manage priority habitats, supporting the restoration of hydrologically intact peatland at scale, advocating for appropriate water level management and moorland management and advising on the responsible management for areas of lowland peat. This work will contribute to both climate change mitigation and adaptation. For example, through building the long term eco-hydrological resilience of peat to increased drought and fire risks associated with climate change.

- We are playing a lead role in the delivery of the [England Peat Action Plan](#). As part of the action plan, we will develop a Peat Implementation Plan by the end of 2023 to provide a detailed trajectory for peat recovery with 5 year stretch targets set out in the 25 YEP.
- We manage the [Nature for Climate Peatland Grant Scheme](#), which aims to bring 35,000 hectares of peatland under restoration management to deliver 9Mt carbon secured by 2050. The grant will run until 2025.
- We also have a key advisory role in managing wildfire risks on peatlands. We provide guidance through the [Heather and grass burning code](#), which includes a licensing and enforcement role.
- We will also develop land management options for lowland peat restoration to prevent further degradation and support responsible management. For example, through appropriate water level management for lowland peat. We will also work with partner agencies through the Lowland Agricultural Peat Task Force.

Coastal erosion, water resources and natural flood management

- We will take a whole system approach, on a landscape scale - from catchment to coast – to manage sea level rise, resulting coastal erosion and flood risk management. This includes ensuring we have active coastal processes to create the structural diversity required by coastal habitats and the species they support. For example, we identified [Coastal Change Management Areas](#), with opportunities for sustainable solutions in locations subject to coastal change.
- We will proactively support coastal flood protection schemes that support functioning intertidal systems. A high proportion of England’s NNRs, SSSIs and landscape designations are found within coastal areas and we will continue to ensure designated sites are considered within the scheme design. For example, as was achieved by the [Medmerry coastal realignment project](#).
- We inputted into the [National Flood and Coastal Erosion Risk Management \(FCERIM\) Strategy Action Plan](#) as a member of the steering group. The use of NbS as a means of improving flood and coastal resilience is a strategic objective within this action plan. The design of new habitats will consider a site’s eco-hydrology and seek to optimise the extent of shared benefits for drought resilience, flood risk and biodiversity. For example, as was achieved by [putting the bends back into Swindale Beck](#).
- We will provide input to [Shoreline management plans \(SMPs\)](#) through our area teams to encourage a sustainable approach to managing the flood and coastal erosion risks at the short, medium and long term. These plans will consider long term risks from climate change including sea level rise and provide an opportunity to develop approaches such as managed realignment that will increase nature.
- We will continue to work with partners including the EA, FC, Association of Drainage Authorities (ADA), Internal Drainage Boards (IDBs), local authorities and coastal and catchment partnerships to contribute to a long-term, systems led approach to optimise gains for climate change adaptation and biodiversity. For

example, by considering natural flood management and nature restoration as a means of reducing flood risk.

- We will explore how the importance of ecohydrology for biodiversity alongside drought resilience and flood management is spatially considered within the design of environmental land management scheme tiers and options, including to support Natural Flood Management.
- We will continue working with water companies, EA and The Water Services Regulation Authority (OFWAT) at a local and national level to consider environmental resilience and climate change adaptation as part of [the national framework for water resources](#) and long-term water supply contingency planning. In addition to this, we will continue to input into the Regional Water Resource Plans which will be developed through this process, and endeavour to weave climate change adaptation into these plans.
- We are also inputting into the update for the [Water resources planning guideline](#) to emphasise the importance of adaptation alongside actions for biodiversity as part the development of water resource management plans (WRMP). We plan to develop our partnership working with the EA, for example to consider ecosystem function and adaptation to climate change within catchment improvement plans.
- We will continue to input into the National Drought Group, convened by the EA, to ensure that ecosystem recovery following drought events is considered alongside the recovery of water supplies.
- We will integrate our work on nature recovery alongside drought resilience and NFM. For example, we will encourage LNRS to consider risks from climate change and optimise habitat measures that can benefit adaptation including water resource management. This includes increased attenuation, storage and infiltration, where this is beneficial for the ecology, flood risk and water resource management.
- We will also work to integrate our expertise on coastal erosion, flood risk management, drought resilience, water quality and the risks of low flows into other work areas that will become increasingly exposed to these risks, such as woodland policy, access to nature, farm advice, sustainable development and protected sites.

Sustainable Development

This includes work on green and blue infrastructure, net gain, land use planning and wildlife licensing.

Green infrastructure

- We are currently working alongside Defra and other partners to develop the [Green Infrastructure Framework \(GIF\) – Principles and Standards for England](#), a commitment within 25 YEP. Planned for launch in 2022, the Framework will contribute to the delivery of new green infrastructure, which can make a significant contribution to climate change adaptation for people as well as biodiversity. For example, through urban trees sequestering carbon and providing shade and evapotranspiration that can help reduce daytime temperatures in urban areas and

provide health benefits by cooling during heat waves; developing green spaces to provide shade and enable urban cooling or through green and blue infrastructure that manages water and reduces flood risk. As part of the GIF, we have developed the Why, What and How Principles of good Green Infrastructure. One of these principles is on developing green infrastructure that makes places more resilient and adaptive to climate change as well as providing climate change mitigation benefits.

- We will work with local planning authorities and other partners as part of the implementation of the GIF, including what they mean for making the built environment climate resilient. For example, local authorities have been involved in trialling and developing the GIF and following the launch in autumn 2022, we will be working with local authorities to help them assess their green infrastructure against the framework. We are also working with the Landscape Institute to integrate the principles within the GIF within the training programme for parks and greenspace managers and we co-hosted the recent Town and Country Planning Association [green infrastructure conference](#), to explain how to practically deliver good green infrastructure, including for climate change adaptation.
- As part of the GIF are also developing a Green infrastructure mapping database to provide a baseline of green infrastructure across England with multiple data sets, including relevant existing climate change spatial data, that assist in planning green infrastructure strategically at different scales and targeting investment where it is most needed. We are also producing a Green Infrastructure Design Guide, with a specific chapter on designing green infrastructure for climate change adaptation and mitigation. The Design Guide will link to the National Model Design Code and help our advisors incorporate green infrastructure into local design codes. We will also be collating case studies to demonstrate the successful implementation of green infrastructure projects.
- As part of our response to the Glover Review, we are developing a National Urban Landscapes project to recognise urban areas across England that reach a standard for their green space provision. For example, as was achieved by London in becoming the world's first [National Park City](#). This is likely to be an accreditation or formal definition of a green urban landscapes, such as used to [accredit country parks](#) or [define heritage coasts](#). The project will aim to enhance the quantity and quality of biodiversity and green infrastructure within towns and cities, and the urban fringe and contribute to the NRN. The principle of green infrastructure that makes urban areas more resilient and adaptive to climate change will form an element of the recognition criteria.
- We will work to ensure the provision of green infrastructure is considered in areas where existing green space is limited, such as in areas of deprivation where climate change impacts are likely to exacerbate existing inequalities. For example, as part of the GIF, we are producing national maps of green infrastructure across England. The development of these maps includes an update to [the accessible natural greenspace standards](#) to map green and blue infrastructure at various spatial scales. This will help local authorities decide where to target green infrastructure provision.

- We will work to map green infrastructure functionality against community needs (demand) for selected ecosystem services/functions. This will include consideration of how green infrastructure is functioning to enhance climate change resilience and adaptation such as through flood regulation, carbon storage and urban cooling.

Biodiversity Net Gain

- We will integrate climate change adaptation principles within the delivery of Biodiversity Net Gain (BNG) projects to ensure schemes are ecologically resilient. Habitat creation from the BNG Credits Scheme has some potential to contribute towards climate change adaptation and nature recovery. The Biodiversity Credits Scheme Pilots are currently in progress to inform the final scheme design. The pilots comprise habitat creation, restoration and enhancement at a range of scales. For example, wetland creation, peatland restoration and woodland and hedgerow planting to improve habitat connectivity and diversity and buffer protected sites.
- NE will lead on the development of habitat management plan templates and will input into guidance developed by Defra and advise for the need to consider adaptive management, including to the impacts of climate change.
- We will ensure the investment criteria for the BNG Credits Scheme consider the impacts of climate change and the need for adaptation to prevent future loss of the investment. Investment criteria will be finalised by the end of the 2022.
- We will explore how the credit scheme can deliver intertidal habitat that can contribute to adaptation in coastal areas through managed realignment.
- Our work developing the beta version of the [Environmental Benefits from Nature](#) tool is helping developers and planners capture the wider environmental benefits from BNG and demonstrate how nature can deliver a range of ecosystem services, including those that are important in the mitigation and adaptation to climate change for nature and people. The tool provides a common and consistent means of considering the direct impact of land use change across the full range of services that nature delivers. It focusses on ecosystem services such as recreation, air and water quality regulation, and includes climate benefits such as cooling and shading, flood regulation and carbon storage. The tool indicates relative change in ecosystem service provision associated with habitat change and is intended to 'start a conversation' around wider benefits to people and to reduce the losses and enhance the gains in ecosystem services from development.

Land use planning and wildlife licensing

- We will support local authorities to ensure strategic plans take account of climate change impacts on the natural environment. We will continue to promote the vulnerability mapping tool and Adaptation Manual to partners and local staff. Adaptation to climate change is a consideration when responding to planning consultations as part of our statutory role. This includes consultation on development plans, high risk or high opportunity developments and Nationally Significant Infrastructure Projects (NSIP) or other infrastructure proposals. We

promote the value of green infrastructure, BNG and the NRN to contribute to climate change adaptation.

- We will explore how a shift to strategic approaches to wildlife licensing can contribute to our wider aims for nature recovery and climate change adaptation. This includes applying a landscape scale approach to species regulation to address habitat fragmentation pressures through targeted habitat creation and improvement, which can also help species adapt to climate change. For example, we have developed district level licensing for great crested newts, which aims to improve habitat connectivity between great crested newt populations through the licensing process. We will seek to extend strategic approaches to other species including water voles, hazel dormice and common reptile species (slow worm, grass snake, adder and common lizard) to ensure our regulatory powers complement wider conservation strategies, including for species vulnerable to climate change.

Greener Farming and Fisheries

This includes work on ELMs, farm advice and fisheries.

Future farming and farm advice

- We will provide technical advice to Defra on the development of Sustainable Farming Incentive, Local Nature Recovery and Landscape Recovery schemes to ensure that climate change adaptation, as well as mitigation, is delivered by these schemes. We are expanding our farm advice programme to respond to the significant reforms to agriculture and contribute to the 25 YEP. A major and growing component of our advice relates to reducing carbon emissions from agriculture and storing carbon within farming systems through nature-based solutions. We will also develop our advice in the context of improving the ecological resilience of farm systems and respond positively to the requirements of farmers as they adapt to climate change. For example, to provide advice on hazard planning and recovery following extreme weather events and impacts such as flooding. We will also continue to provide advice in relation to protected sites in line with our statutory duties and considering the impact of climate change. Our farm advice in relation to SSSIs will also be updated in line with the outcomes from the SSSI Future Reforms Project.
- We will continue to engage with farmers and listen to their feedback to tailor our farm advice service as they respond to environmental change and ongoing agricultural reforms. We will also learn lessons on how we can adjust our advice through the formal evaluation of the programme due by the end of 2024. These adjustments will include how we deal with climate change adaptation within our programme remit.
- We will extend the learning and development programme for our farm advisors to include specific training on the risks of climate change to nature and farming businesses and the potential adaptation responses required. This will help us provide practical advice on adaptation measures at a farm level.

- Climate change mitigation and adaptation will be incorporated within our national farm advisor accreditation programme. Pilots for the programme are currently ongoing. The demand and accessibility to quality advice is expected to increase as farmers tackle the impacts of climate change and the industry responds to government reforms. We will seek to expand our engagement work with partners and the private sector to share knowledge and understanding, whilst it builds capability and capacity.
- Our advice to farmers and land managers will continue to contribute to environmental resilience at a landscape scale. For example, through farmer cluster groups or working at scale with water companies. We will also continue to work with partners to provide adaptation advice to farmers. For example, we supported the [Farming in the Extremes conference in 2020](#) with the Soil and Water Management Centre. A follow up conference on Tillage, Traffic and Soil Carbon is planned in January 2022.
- We will continue to work closely with EA to ensure regulation and enforcement of farming practices also contributes to environmental resilience.

Fisheries management

- We will continue to work with Defra and partners including the EA, MMO, Cefas and IFCA to consider climate change adaptation within emerging fisheries policy areas.
- We will continue to explore how fisheries management can help vulnerable fisheries adapt to climate change and contribute to wider climate change policy including net zero through the development of offshore wind energy. For example, we have applied a natural capital approach to the sand eel fishery in the North Sea and its impact on seabird populations, which are also impacted by the construction of offshore wind infrastructure. We plan to undertake a similar assessment for other fisheries vulnerable to unsustainable management over the next five years.
- We will continue to promote sustainable fisheries management to protect biodiversity, enable nature recovery and marine ecosystems that are resilient to climate change. For example, we are developing understanding of how climate change and barriers to migration have impacted the [critically endangered European eel](#) within English waters. This work will help develop appropriate responses to conserve and restore the population.
- We will continue to fund monitoring of the [Lyme Bay Fisheries and Conservation Reserve](#) MPA, [undertaken by the University of Plymouth](#), to demonstrate the importance of whole site protection of marine habitats.
- We will adjust our advice on the management of non-native fisheries where climate change is influencing populations.
- We will develop a joined-up approach up between fisheries management and climate change adaptation within coastal areas. For example, to assess how managed realignment impacts fisheries.

Connecting People with Nature

This includes work on connecting people with nature and access and engagement.

Access and Engagement with Nature

- We will consider the impact of climate change on public rights of way and access routes. We plan for climate change in the delivery of the England Coast Path via adaptive roll-back measures to accommodate coastal erosion. The wider National Trail network and associated structures are constructed and managed to high quality standards which provide resilience, and we are increasingly taking the predicted effects of climate change into account when planning provision and maintenance. We also promote adaptation measures, detailed in the Climate Change Adaptation Handbook, to public rights of way and access managers.
- Our Open Access restrictions work includes provision, informed by the Fire Severity Index, for the closure of access land to help manage the threat of wildfires. The forthcoming Open Access Mapping review will provide opportunities to review current risks and the index itself will be refined with the future implementation of the UK Wide Fire Danger Rating System.
- We will look to identify and embed climate change adaptation throughout our people and engagement work to help engage and inform people visiting the outdoors and the management of any impacts on protected sites, access networks and accessible areas. Our proactive messaging in this area includes the recently refreshed Countryside Code. We will seek to learn lessons from the increased use of green spaces and access networks during Covid19 lockdowns and how this can inform our visitor management planning for the potential increased access that might occur due to drier and hotter summers from climate change. We will consider how increased visitor pressures might exacerbate current threats to biodiversity but also look to promote the health and wellbeing opportunities that visiting the outdoor environment provides.
- We are recruiting specific roles within our area teams to focus on inclusion and local engagement. Engaging diverse communities with the natural environment will entail messaging around behaviours and creating positive behaviours/attitudes in these early experiences. Engagement on climate change adaptation as well as nature recovery is likely to form a component of these roles. For example, understanding the climate change impact on landscapes and locally loved natural places.
- For over ten years we have been gathering evidence on how people engage with nature as part of the [Monitoring Engagement with the Natural Environment Survey \(MENE\)](#) and now the [People and Nature Survey](#). We have also been gathering evidence on how behaviours have changed during Covid and will be using this insight to support our future work to engage more people with nature. We will ensure that our work on people' engagement with nature links up with wider work on access and recreations such as through the rights of way and protected sites network and their potential vulnerability from the impacts of climate change.

- We continue to work closely with Defra, the EA and other agencies and government departments in relation to access and recreation issues, including in relation to climate change.
- We will also explore how our work on green infrastructure can contribute to our aims for equitably connecting people with nature. For example, to explore how we can improve the quantity and quality of green space and address barriers to people using green space, particularly in areas of high environmental deprivation. We will work through our green social prescribing project to support community led actions and nature-based activities such as tree planting, walking and cycling, local food growing, which can contribute to climate resilience and adaptation as well as supporting health and wellbeing.

Managing the organisations

This includes work on our corporate approach to managing the risks of climate change including our estate.

- We will develop an overarching climate change strategy, which will outline how we develop our approach to climate change. This will include how we mainstream adaptation and mitigation across the organisation including the four strategic and two underpinning programmes. As part of this strategy, we will also develop a framework for how we measure the success of our adaptation plan to ensure the actions outlined in this plan are delivered for different work areas. We will also develop a framework or standard for adaptation and mitigation outcomes to be considered as part of our Building Partnerships for Nature's Recovery Action Plan.

Our estate

- We continue to input into the Corporate Sustainability Leadership group planning alongside the wider Defra Group to ensure climate change mitigation and adaptation are key parts of our Defra Group sustainability strategy and accompanying action plan.
- We have continued to update our emergency response plans within Business Continuity/Organisation Resilience planning to reduce the risk of extreme weather events. This includes how we maintain business critical activities if extreme weather or other incidents restrict staff availability, travel, access to offices or communications.
- We will explore ways to integrate adaptation alongside improving carbon efficiency on our NNR built infrastructure, in addition to adaptive management of the reserves, to showcase best practice in adapting to climate change in a holistic way.
- As well as adaptation efforts, through our sustainability accounting we ensure we have a good understanding of our entire carbon footprint whilst continually improving our own emissions data quality, completeness, and transparency. We also use this data to identify our own emission reduction opportunities.

Science and evidence

This includes how we will support monitoring of climate change impacts and continue to expand knowledge and awareness of the impacts of climate both within and outside the organisation.

- We will continue to carry out research, review and monitoring to support climate change adaptation and mitigation and contribute to addressing the following key evidence gaps:
 - Developing understanding of how climate change impacts species and community structure, including changes in interactions between species.
 - Ongoing monitoring of climate change impacts on biodiversity and ecosystem services. For example, how changes in species and communities affect the benefits they provide to people.
 - Likely patterns of change of communities and ecosystem function, determining what “good” looks like along these trajectories and where and how to influence or accommodate them.
 - Increase understanding of risks from extreme events such as droughts, wildfires and floods to biodiversity, ecosystem services and landscapes.
 - Potential tipping points in ecological responses to climate change. For example, in wetland or open water habitats.
 - How climate change driven changes in the scale and distribution of habitats affects species. For example, within wetland or coastal habitats.
 - The effectiveness of interventions to help species and habitats adapt to climate change.
 - The most effective role of protected areas in supporting the resilience of the natural environment under during change.
 - How microclimates and microrefugia can practically contribute to maintaining species in places.
 - Interactions between acidification and warming on species in the marine environment.
 - Better understanding of impacts of climate change on the historic environment, landscapes and human perception of change.
 - Likely changes in societal perception of the need for adaptation and the role of the natural environment as an effective response.
 - Quantitative understanding of the role green infrastructure in urban environments can play in helping people to adapt to climate change.
 - The risks, trade-offs and synergies in interventions within and between sectors.
 - How climate change mitigation measures in the natural environment affect biodiversity and people.
 - Quantitative understanding of the effects of habitat condition on carbon storage and sequestration to better understand this interaction and future resilience to climate change. This includes the impact of industries on habitat condition, as well management and climate change.

- Linkages between carbon cycling in terrestrial, coastal and marine habitats and how nutrient rich contaminants from erosion, fertiliser runoff and sewage effluent threats influence carbon sequestration and storage. This can also include how NbS on land will affect these habitats and if there are carbon storage benefits by reducing terrestrial nutrient inputs and improving habitat condition.
- We will continue to provide climate change expertise to assist colleagues, and the organisation, to integrate climate change within our work. We are expanding our internal Climate Change Network to ensure expertise is cascaded across the organisation and within different work areas. Building understanding of how climate change will impact our objectives and remit is a priority for the organisation. We will explore ways to expand and develop our climate change communications both internally and externally to make them more accessible. For example, we produced a series of introductory webinars, which are available on YouTube and our internal intranet. We will also plan to develop additional resources such as infographics, storyboards, and technical information notes from key resources such as the Climate Change Adaptation Manual or our Carbon Storage and Sequestration by Habitat report.
- We will ensure new and existing staff working in all roles get introductory resources/training on climate change and in roles where adaptation is critical receive practitioner level training in climate change principles and tools/action.
- We will produce a theory of change to outline how the organisation will develop our approach in to responding to the climate crisis.
- We will continue to work proactively with Defra and the wider academic and policy community. We seconded a specialist to Defra as part of planning for COP 26 and have seconded a specialist to CCC. We will also continue to support our external partners in evidence development and communication in relation to climate change and the outputs we produce.
- We will develop best practice approaches for the implementation of NbS for adaptation and mitigation, so they deliver for both biodiversity and people. We will also develop how we assess the success of projects using NbS to ensure they deliver for both biodiversity and people. For example, we have trialled the IUCN NbS tool on existing case studies and are planning to publish the report next year.
- We will continue to maintain and develop our Long-Term Monitoring Network (LTMN) to support the detection and understanding of climate change impacts and the development of adaptation strategies

Appendix 1 – Integrating adaptation at Area Team level

This appendix provides examples of projects and approaches, which showcase our approach to adaptation in two of our Area Teams. We have [12 Area Teams](#) covering the entire country, including up to 12 nautical miles from the coast. Area Teams are responsible for key aspects of our delivery, including protected sites casework and land use planning and farm advice as well as managing our NNRs and designated landscapes. Adaptation requires planning and capacity at a local level to be effective. Our Area Teams understand the specific geographical and ecological context of their region and have longstanding relationships with key stakeholders such as landowners, farmers and local authorities. This appendix is not an exhaustive list of the climate change work being undertaken within Area Teams but provides some examples of adaptation planning and action undertaken at a local level.

Thames Solent Team

The Thames Solent Team have taken a strategic approach to considering the implications of climate change in relation to their statutory responsibilities and main work areas. This includes the following projects:

- Developing guidance on specific actions that local planning authorities can take to embed climate change adaptation and mitigation in their local development plans. For example, through encouraging the provision of green infrastructure and NbS as well as identifying opportunities to protect and restore peatland and increase tree and woodland cover
- Undertaking an assessment of designated sites within the area and identifying how they are already being impacted by climate change and how they are vulnerable to further impacts. These insights have informed our work on protected sites, such as NNR management planning and have been used in Natural England's SSSI Futures Reform project.
- Conducting an assessment of the habitat and species vulnerability across the Thames Solent area and identifying regional scale adaptation priorities. We are using this assessment to inform our work on NRN and LNRS.
- Identifying the likely implications of net zero on land use and the natural environment across the Thames Solent area, for example the scale of additional woodland cover and bioenergy cropping and considering how these can be aligned with our ambitions for nature's recovery.
- Thames Solent have also established an internal climate change network to share ideas and learning and thereby to build understanding of how to integrate climate change within delivery, including on adaptation priorities. Through this group the team have identified future actions to reduce our own GHG emissions and to work on adaptation, such as using Natural England's Landscape Scale Adaptation

Assessment Tool to identify locally appropriate adaptation priorities for farmer cluster groups.

Devon Cornwall & Isles of Scilly

The Devon Cornwall & Isles of Scilly are involved in several projects that are related to adaptation of the marine and coastal environment:

- The [ReMEDIES](#) (Reducing and Mitigating Erosion and Disturbance Impacts affecting the Seabed). LIFE funded project, led by Natural England, in partnership with Royal Yachting Association (RYA), The Green Blue, Marine Conservation Society, Plymouth City Council, Ocean Conservation Trust and Tamar estuaries consultative forum. ReMEDIES is a four-year project that focuses on habitat restoration and responsible recreation, in particular for Seagrass and Mearl beds which are highly important for Carbon sequestration.
- The [Growing Goss project](#) is part funded by the European Regional Development Fund to create an ecologically resilient landscape, restore ecosystem services & wildlife value, and provide enhanced access, recreation and engagement opportunities for people on Goss Moor National Natural reserve.
- The [Dynamic Dunescapes project](#), supported by the National Lottery Heritage Fund and the EU LIFE Programme, is a partnership between Natural England, Plantlife, National Trust, Natural Resources Wales and the Wildlife Trusts. The project aims restore sand dunes across England and Wales to benefit coastal protection as well as wildlife and local communities.
- Devon and Cornwall Team also supported Devon Wildlife Trust in their decision to work with natural processes and manage Horsey Island as a realignment site, which has provided new opportunities for intertidal habitat such as saltmarsh.
- The team are also part of the Technical Advisory Group for the Climate Adaptation Scilly project, which aims to help the Isles of Scilly adapt to the impacts of climate change.

Appendix 2 – Our overarching risks and opportunities in relation to our second-round report and CCRA3

Risk or opportunity	Equivalent risk(s) from 2015 report	Relevant CCRA3 risk
Risks to the viability of the Nature Recovery Network and the recovery of threatened species and habitats	i. Threats to conservation and recovery of priority threatened species and habitats	N1, N2, N4, N11, N12, N14, N16, N17
Risks to the status of protected sites for biodiversity and geodiversity	ii. Threats to the condition of protected sites (Sites of Special Scientific Interest (SSSI), NNRs, MPAs and Natura 2000 sites)	N1, N2, N4, N11, N12, N14, N16, N17
Risks to the ability of the SSSI network, MPAs, NNRs and protected landscapes to adapt to climate change	ii. Threats to the condition of protected sites (Sites of Special Scientific Interest (SSSI), NNRs, MPAs and Natura 2000 sites) iii. Threats to the conservation and enhancement of landscape character	N1, N2, N4, N11, N12, N14, N16, N17, N18
Risks to natural capital and its contribution to agriculture, fisheries and sustainable development including farm advice and net gain	iv. Threats to sustainable land and sea management v. Threats to the protection of the natural environment through incentive schemes vi. Threats associated with working with partners and local communities	N1, N2, N4, N5, N6, N7, N8, N10, N11, N12, N14, N16, N17

	vii. Threats to our delivery of planning and sustainable land use responsibilities	
Risks to the viability of natural areas for people to access and connect with nature	viii. Threats to access and engagement work	N1, N2, N11, N17
Risks and opportunities to Natural England's role as a leader in nature recovery and climate change	<p>vi. Threats associated with working with partners and local communities</p> <p>Climate change highlights the importance of a healthy natural environment and leads to a better understanding of ecosystem services by our partners and society. This means that measures to reduce current pressures on biodiversity, soil, water and the coast become higher priorities. This provides greater opportunity for Natural England to influence planning and agricultural land use and to deliver socio-economic adaptation and the development of better habitat networks and habitat creation, supporting a more joined approach.</p>	
Risks and Opportunities for different species and habitats under changing climatic conditions.	<p>i. Threats to conservation and recovery of priority threatened species and habitats</p> <p>Some priority species habitats might thrive under increasingly warmer and drier conditions, particularly</p>	N1, N2, N3, N4, N9, N13, N15, N17

	<p>those on drier heathland and grassland habitats</p> <p>Some priority species and habitats may thrive through changes in interspecific interactions, for example increased competitive advantage</p> <p>The opportunity to conserve rare and threatened species colonising new locations. These are likely to be those with southerly distributions.</p>	
<p>Opportunities for landscape scale measures to tackle climate change that enhance the natural environment.</p>	<p>There is an opportunity to facilitate landscape change in ways that create valuable new landscapes that are more resilient to climate change and deliver improved benefits for society (sense of place, biodiversity and other ecosystem services).</p>	<p>N17, N18</p>
<p>Opportunities for nature recovery and nature-based solutions to help nature and society adapt to climate change.</p>	<p>Opportunity to develop advice and incentives for land managers to support sustainable management of the soils and water that underpin both ecosystem services and agricultural production.</p> <p>Opportunity to develop advice and support for farmers and marine stakeholders (e.g. fisheries, coastal tourism) seeking to adapt their business in a sustainable way.</p>	<p>N3, N13, N15, N17, N18</p>

Opportunities for nature-based solutions to provide additional space for people to connect with nature and cope with climate change.	Increased opportunities to engage with society to help people understand that landscapes are inherently dynamic and to identify the best ways to accommodate future changes.	N17, N18
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Risk Assessment Methodology

Our assessment of risks to our aims and objectives uses the cross members risk matrix provided by the APR3 template as outlined below. We assessed to two horizons of 2030 and 2050 to provide an assessment of medium and long-term risks to our aims and objectives. We have referred to UKCP18 to assess the risks at 2°C and 4°C. We have used RCP 2.6 to represent a low emissions scenario and RCP 8.5 to represent a high emissions scenario. These projections are typically considered in line with a global average of 2°C of warming, while the high emissions scenario is considered consistent with 4°C of warming.

Horizons: 2030, 2050		Impact				
		Minimal	Minor	Moderate	Major	Catastrophic
Likelihood	Almost Certain	5 / moderate	10 / major	15 / major	20 / severe	25 / severe
	Likely	4 / moderate	8 / moderate	12 / major	16 / major	20 / severe
	Possible	3 / minor	6 / moderate	9 / moderate	12 / major	15 / major
	Unlikely	2 / minor	4 / moderate	6 / moderate	8 / moderate	10 / major
	Highly Unlikely	1 / minor	2 / minor	3 / minor	4 / moderate	5 / moderate

We have also used the following impact and likelihood ratings provided by the APR3 template as outlined below to develop our overall assessment of risk.

Impact

Rating	Definition
Catastrophic	It would result in catastrophic events and result in failure of the aim or objective.
Major	It would result in significant disruption to the objective. In the extreme, it may result in failure of the aim or objective.
Moderate	It would result in disruption that would exceed existing contingencies, leading to significant changes to the overall aim or objective.
Minor	It would result in some disruption to the stated objective that could be contained with existing contingencies.
Minimal	It would result in negligible changes or disruption.

Likelihood

Rating	Definition
Almost certain	The risk is in the process of materialising and may already be under active management as an event.
Likely	Past events have not been fully resolved, effective mitigations not yet identified, control weaknesses are known and are being managed.
Possible	Past events satisfactorily resolved, mitigations are in place or are on track to be in place, control improvements are under active management.
Unlikely	Events are rare, required mitigations in place, controls are effective.
Highly unlikely	No known event or if known extremely rare, extreme industry-wide scenarios.

Appendix 3 – Review of progress on our adaptation priorities from the second-round report

Our last adaptation plan indicated a list of adaptation priorities that we would focus on from 2015 to 2017. Progress achieved on these priorities is outlined below.

Action to be achieved by 2017	Progress update
Biodiversity	
<p>We will continue to incorporate measures to address climate change risks into the rollout of our National Nature Reserve (NNR) Management Plans</p>	<p>Significant progress has been made in identifying the risks of climate change to NNRs and then incorporating these risks into NNR management plans. A climate vulnerability assessment was completed for 61 NNRs in England. Climate change vulnerability has now been incorporated into 95 of 132 NNR management plans.</p>
<p>We will ensure climate change is factored into the review of the National Nature Reserve estate and future acquisition plans.</p>	<p>We are undertaking significant expansion of NNRs, and other designations across England. Climate change is currently considered within the designation process and our SSSI reform programme is recommending 'Adaptive Priorities' for designations.</p>

<p>We will design, implement and promote agri-environment scheme options which deliver climate change adaptation benefits.</p>	<p>An assessment of agri-environment schemes was undertaken to develop a methodology to assess the impact of schemes on adaptation. Published in 2018 the review developed a set of adaptation indicators and recommendations for integrating adaptation into agri-environment schemes. We also completed a project with the Countryside and Community Research Institute (CCRI) to assess whether AES design were sufficiently flexible for holder to respond to the impacts of climate change.</p> <p>Delivery of the recommendations and methodology developed is challenging due to the inherent complexities of scheme design. These schemes are due to be replaced by the new ELM scheme to be operational by 2024. We will seek to ensure that climate change adaptation, as well as mitigation, is considered within the delivery of ELMs. Further details are provided in the updated adaptation plan.</p>
<p>We will develop our understanding and further support projects around farm resilience to the impacts of climate change, whilst also linking to relevant initiatives such as Catchment Sensitive Farming (CSF).</p>	<p>Farm resilience plans were developed as a way of raising awareness among farmers of climate change threats and opportunities for farming and land management systems. We have continued to provide advice on farm resilience and biodiversity protection as part of the delivery of countryside stewardship schemes and our catchment sensitive farming programme.</p> <p>In addition to water quality improvements, CSF has contributed to a range of benefits to natural capital and farm resilience. Concepts from farm resilience planning were incorporated into CSF. Further plans to incorporate adaptation within our advice to farmers and land managers are included within the updated adaptation plan.</p>
<p>We will work to help deliver Biodiversity 2020, in particular Outcome 1d: restoring at least 15% of degraded ecosystems as a contribution to climate change mitigation and adaptation</p>	<p>Natural England made several contributions related to climate change mitigation and adaptation as part of the Biodiversity 2020 strategy. For example, contributions to the Biodiversity 2020 evaluation report and developing datasets for Biodiversity 2020: Outcome 1D. Outcomes from this work continue to feed into ongoing work such as nature recovery.</p>

<p>We will build appropriate climate change adaptation into our conservation objectives for marine, biological and geological protected sites (e.g. for SSSI favourable condition tables, and European Site Conservation Objectives).</p>	<p>We have developed the SSSI Future Reforms Project to explore how the SSSI network will need to adapt to climate change. This programme is covered within the adaptation plan.</p>
<p>We will ensure that climate change is considered in the designation of new biological and geological SSSIs and in the review of SSSI boundaries and citations.</p>	<p>Climate change is currently considered within the designation process. We plan to develop 'Adaptive Priorities' within the processes to expand or designate new sites.</p>
<p>We will ensure that climate change vulnerability is used to inform the conservation status of species and their subsequent management.</p>	<p>The updated NE and RSPB Adaptation manual was published in 2020. The manual is a valuable resource to support practical decision making in an accessible format.</p>
<p>Landscape and geology</p>	
<p>We will ensure that climate change threats and opportunities are reflected within our landscape and landscape character work</p>	<p>The National Character Area Profiles (NCAPS) were promoted as a means of understanding landscape character at a regional level, which can contribute to understanding the changes in landscape character caused by climate change.</p>
<p>We will continue our proactive partnership work with the National Parks, Areas of Outstanding Natural Beauty (AONBs) and Nature Improvement Areas (NIAs), to share knowledge and expertise on climate change adaptation</p>	<p>We have continued to engage on climate change issues with National Parks England and AONB and National Park Management plans. For example, running workshops on climate change adaptation. This partnership will continue although Natural England no longer input into NIAs. A Joint Agreement between National Parks England (NPE), the National Association for AONBs (NAAONBs) and NE is outlined in the updated adaptation plan.</p>

<p>We will assess how we can build climate change adaptation planning into landscape scale conservation, translating that into action on the ground.</p>	<p>We have published research work in relation such as the Climate change refugia for the flora and fauna of England (NECR162).</p> <p>Research on microclimatic buffering funded by Natural England and the Natural Environment Research Council.</p> <p>We have developed practical advice based on our research work on landscape scale conservation. Further details on our landscape work are outlined in the updated adaptation plan.</p>
<p>Marine</p>	
<p>We will seek to consider and develop indicators of climate change where issues overlap with our statutory marine monitoring programme, to assess condition of features in Marine Protected Areas (MPAs). These include changes in salinity, sea temperature and acidity where highlighted as important supporting processes to features</p>	<p>We have continued to fund the MarClim project to assess changes in marine species distributions as a result of climate change. MarClim provides one of the longest biological time-series datasets in the world for the marine environment. The data gives valuable insights on the effects of climate change on species range distribution in around 150 locations along the UK coast, and are used to inform national marine monitoring and MPA condition assessments.</p>
<p>We will ensure that climate change adaptation principles are factored into the management of Marine Protected Areas by considering ways to increase resilience of climate-sensitive species and habitats.</p>	<p>We have continued to expand the MPA network through the MPA designation programme to support marine recovery and resilience. This expansion was undertaken considering JNCCs Ecological Network Guidance to contribute to the creation of an ecologically coherent network of MPAs. English inshore waters (0-12nm) now contain 157 MPAs covering 51% of this region, which are designated for a range of habitats and species of conservation importance.</p>
<p>Access and Engagement</p>	

<p>We will work with our local partners to ensure that the implications of climate change are factored into the maintenance and infrastructure plans for the management of National Trails and Coastal Access.</p>	<p>The updated NE and RSPB Climate Change Adaptation Manual includes access and recreation sections.</p> <p>We have considered climate change adaptation as part of the development of the English Coast Path.</p>
<p>We will work to gain a better understanding of the implications of climate change on our partners' management of greenspace and access infrastructure, directly and through the changes in visitor and recreational patterns and disseminate research findings to support the work of partners.</p>	<p>The updated NE and RSPB Climate Change Adaptation Manual includes access and recreation sections.</p> <p>We have gathered evidence on how people engage with nature as part of the Monitoring Engagement with the Natural Environment (MENE) Survey.</p> <p>Further details on how our access and engagement work considers the implications of climate change is provided in the adaptation plan.</p>
<p>Land use planning</p>	
<p>We will support local authorities to ensure strategic plans take account of climate change impacts on the natural environment.</p>	<p>The updated NE and RSPB Climate Change Adaptation Manual includes sections that will help LPAs. Further details are provided in the adaptation plan regarding how we to build climate change into LNRS.</p>
<p>We will work with our partners to deliver sustainable approaches to coast and flood management which showcase the value of natural interventions to deliver adaptation.</p>	<p>We commissioned a report to understand more about the barrier and enablers in the delivery of NFM. Further updates on are approach to promoting NFM are provided within the adaptation plan.</p>

<p>We will build and promote the value of Green Infrastructure in supporting climate change adaptation by working with partners to share good practice.</p>	<p>The updated NE and RSPB Climate Change Adaptation Manual includes a section on green infrastructure. The GIF is making a substantial contribution to delivery of new green infrastructure as outlined in the updated adaptation plan.</p>
<p>Research, evidence and monitoring</p>	
<p>We will continue long term programmes that monitor the impacts of climate change on ecosystems, habitats and species; and how people engage with the natural environment.</p>	<p>Climate change is one of the drivers of our LTMN, which continues to monitor representative sites of our most valuable habitats.</p> <p>The MENE programme was completed and has fed into the new Connecting People with Nature Programme. The People and Nature Survey is an online survey relating to people’s enjoyment, access, understanding of and attitudes to the natural environment.</p>
<p>We will continue to build an evidence base to inform ourselves and our partners to changes in ecosystems, species distribution and abundance caused by climate change</p>	<p>We have made a significant contribution to developing the evidence in relation to climate change. For example, we contributed to the development of the Condatis tool developed by Liverpool University to model National Habitat Network connectivity.</p> <p>We have also supported a climate change interest group with the British Ecological Society (BES). For example, through the impacts of extreme climatic events conference in 2019 and contributing to the British Ecological Society report on nature-based solutions.</p>

<p>We will continue to maintain strong relationships with the climate change research community and contribute to the marine and terrestrial biodiversity report cards</p>	<p>Our climate change team is active in climate research. For example, outputs in the last 2 years include 6 journal publications and contributing to the Intergovernmental Panel on Climate Change (IPCC) sixth assessment report and the UK Climate Change Risk Assessment.</p> <p>The terrestrial biodiversity report card was published in 2015. As part of MCCIP we will continue to collate and synthesise evidence on climate change impacts and adaptation. For example, we lead authored the MCCIP's Climate Change and Marine Conservation: Supporting management in a changing environment cards for saline lagoons, maerl and seagrass.</p>
<p>Corporate services, learning and development, estates</p>	
<p>We will provide basic training on climate change and develop practitioner level training appropriate for roles.</p>	<p>We have a dedicated section on climate change within NE's development directory. This includes a series of introductory webinars produced in 2020, which are also available on our YouTube channel. Building an of awareness climate change and how climate change impact will influence our work is a priority of the organisation as outlined in the adaptation plan.</p>
<p>We will develop and work through our internal climate change network to support knowledge transfer and delivery</p>	<p>We have an active climate change network within the organisation. More formal knowledge transfer on climate change occurs through training and induction material for new roles across the organisation. Examples of this are provided in the adaptation plan.</p>
<p>We will ensure resilience planning for key parts of the Natural England NNR estate to enable us to cope with disruption from extreme weather events.</p>	<p>We have continued to update our emergency response plans within Business Continuity. Organisation Resilience planning to the risk of extreme weather events (e.g. flooding and wildfire protocols).</p> <p>We have developed our management of wildfire risk on the NNR estate. An update to the wildfire risk management plans is provided in the updated Adaptation plan.</p>

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List of abbreviations

ALBs - Arm's Length Bodies

ADA – Association of Drainage Boards

AONBs - Areas of Outstanding Natural Beauty

APHA – Animal and Plant Health Agency

ARC - Amphibian and Reptile Conservation

BNG – Biodiversity Net Gain

CABI - Centre for Agriculture and Biosciences International

CCC - Climate Change Committee

CCRA3 - Independent Assessment of UK Climate Risk

CCRI - Countryside and Community Research Institute

Cefas - Centre for Environment, Fisheries and Aquaculture Science

COP 26 – 26th UN Climate Change Conference of the Parties

CSF - Catchment Sensitive Farming

EbA - Ecosystem-based Adaptation

ELMS - Environmental Land Management Schemes

EA - Environment Agency

FC – Forestry

FCERM - Flood and Coastal Erosion Risk Management

FCS - Favourable Conservation Status

GIF – Green Infrastructure Framework

GEF – Good Environmental Status

HPMAs - Highly Protected Marine Areas

IDBs – Internal Drainage Boards

IFCA - Inshore Fisheries and Conservation Authorities

INNS – Invasive Non-Native Species

IPCC - Intergovernmental Panel on Climate Change

IUCN - International Union for Conservation of Nature

JNCC – Joint Nature Conservation Committee

LNRS - Local Nature Recovery Strategies

LTMN – Long Term Monitoring Network

MENE - Monitoring Engagement with the Natural Environment Survey

MMO - Marine Management Organisation

MPAs - Marine Protected Areas

NCAs - National Character Areas

NbS – Nature-based solutions

NFM – Natural Flood Management

NGOs - Non-Governmental Organisations

NNRs - National Nature Reserves

NPE - National Parks England's

NSIPs - Nationally Significant Infrastructure Projects

OFWAT - The Water Services Regulation Authority

RCP – Representative Concentration Pathway

RSPB – Royal Society for the Protection of Birds

SMPs – Shoreline Management Plans

SSSI – Sites of Special Scientific Interest

25 – YEP 25 Year Environment Plan

UKCEH – UK Centre for Ecology and Hydrology

WRMP - Water resource management plans

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