

Scottish Natural Heritage

# Climate change and nature in Scotland



Updated 2016



# Chairman and Chief Executive's Foreword

Climate change is one of the most serious threats facing the world. Continuing increases in ocean acidification, sea-level rise, global temperatures and more extreme weather events demand not only a national but a global response.

In December 2015 the first-ever universal, legally binding climate deal was adopted by 195 countries at the United Nations Paris Climate Conference. Crucially the agreement aims to limit global warming to below 2°C above pre-industrial levels, and to strengthen society's ability to adapt to the impacts of climate change. The Scottish Government have already begun to lead the way by setting an interim target of 42% greenhouse gas emissions reduction by 2020 and by publishing the first Scottish Climate Change Adaptation Programme.

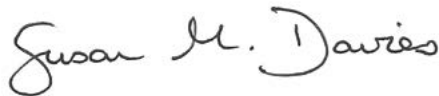
Scottish Natural Heritage published a climate change action plan in 2012. Since then we have worked hard to secure carbon stocks in peatland, as the loss of carbon to the atmosphere from degraded peatlands is a contributor to climate warming. We also developed adaptation principles which have been particularly well received. These provide a framework for making land management decisions that help nature adapt, as demonstrated on our National Nature Reserves. The adaptation principles are also embedded in Scotland's Biodiversity Route Map to 2020. Healthy ecosystems are vital to helping Scotland cope with climate change, and sustain its productive soils, clean water and wildlife. In many cases nature-based solutions can also provide solutions to tackle flooding and land erosion.

We are also working hard to reduce CO<sub>2</sub> emissions from our buildings, land and day to day operations. In 2015 we reached and exceeded our 2020 emissions reduction target (42%) five years ahead of schedule. But we won't stop there; we aim to make further emission savings of 12% over the next three years, keeping us on track to meet the 2050 target of 80% carbon reduction.

We are all stewards of nature, whether we manage land, freshwater or the sea, or influence them through our lifestyle choices. Nature plays an incredibly important part in helping us cope with climate change – it stores carbon in our soils, trees, saltmarshes and other marine environments. If we work together with nature's assets and services we can begin to realise a sustainable future. We must continue to work with nature to make it more resilient, and reduce the adverse impacts of climate change on all of us.

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Ian Ross  
Chairman

A handwritten signature in black ink, appearing to read 'Susan M. Davies' in a cursive script.

Susan Davies  
Chief Executive







# Summary

Ministers regard tackling climate change to be essential if we are to achieve sustainable economic growth. Climate change has major social and economic implications for people in Scotland and elsewhere. The Scottish Government's economic, land use and other strategies outline how we should move forward.

Climate change also presents one of the biggest challenges for Scotland's nature and landscapes. In Part 1 of this Action Plan, we offer suggestions on the role nature could play in tackling climate change. Additionally, we include ideas on how we can help nature itself cope with change. Part 2 explains what SNH intends to do next.

**We have written this Action Plan principally for those involved in preparing and taking forward strategies and plans related to tackling climate change – local authorities, land managers, engineers and policy makers.**

Nature helps us cope with climate change by:

- storing carbon, and so reducing the effects of carbon dioxide emissions; and
- sustaining ecosystems which, if kept healthy, will provide our food and water, and help control floods, diseases, pests and pollutants.

We can help nature cope with climate change by:

- reducing pressures on habitats and species;
- making space for natural processes through strengthening habitat networks; and
- planning for change.

# Summary of action for tackling climate change

## Carbon

Ensure that, through effective management of the sea and land, we 'lock up' carbon by:

- Promoting land management practices that reduce carbon loss and increase the amount of carbon stored in vegetation and soils. In support of this we should:
  - restore peat-forming habitats which have been drained or damaged;
  - increase Scotland's forest cover in ways that promote net carbon storage and biodiversity benefits; and
  - manage agricultural soils to protect and enhance organic matter.
- Improving methods for calculating carbon loss, and greenhouse gas accounting.
- Planning and managing marine and coastal activities to safeguard carbon sinks.

## Healthy ecosystems

Develop approaches which secure healthy ecosystems\* so that they can help us adapt more easily to the effects of climate change, and in doing so sustain productive soils, clean water and wildlife. We should:

- Apply Adaptation Principles (p19) to land and water management and land-use plans.

- Enhance the natural capacity of soils, vegetation, river floodplains and wetland habitats to reduce flood risk as part of a catchment approach to flood risk management planning.
- Enhance the use of natural landforms and processes to maintain resilience in coastal areas and encourage coastal realignment in response to rising sea levels and increased wave energy.
- Use trees, shrubs and other plants around buildings and in public open spaces to provide shade and reduce energy demands for cooling and insulating purposes.

## Help nature adapt

Identify the priority actions which will help Scotland's key habitats and species adapt to climate change. We should:

- Reduce other pressures on nature, including invasive non-native species, agricultural and forestry intensification, unsustainable use of species, grazing and pollution.
- Strengthen habitat networks, especially where habitats are highly fragmented.
- Embrace planning for change to help Scotland's habitats and species adapt to climate change, such as improving wetland resilience to drought, and reducing the isolation of protected areas in the landscape.

\* In this document ecosystems includes geodiversity dependent on natural processes, such as soils and geomorphological features in rivers, coasts and mountains.



# Part 1: How nature helps us cope with climate change

## Introduction

Responding to climate change is a key Government priority – both to reduce greenhouse gas emissions (mitigation) and to prepare for a changing climate (adaptation).

SNH is committed to working with others in response to climate change<sup>1</sup>. This document updates and replaces the SNH climate change action plan published in 2012<sup>2</sup>.

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1. We published a joint statement of our commitment and roles in *Action on Climate Change* with Historic Scotland, SEPA and Forestry Commission Scotland

2. *Climate Change and the Natural Heritage: SNH's approach and action plan*. Scottish Natural Heritage. July 2009.

## Climate change and what it means for Scotland's nature

Climate change is not a new phenomenon; there have been periods of extremes in the distant past.

What is unusual now is the rate and scale of change, and the underlying cause of such changes – the growing emissions of greenhouse gases associated with human activity.

The latest information on projections in UK climate change for this century is in the *UK Climate Projections 2009*<sup>3</sup> (UKCP09). This is based on climate modelling undertaken by the Met Office, UK Climate Impacts Programme and other organisations. The projections present

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3. More information on the UK Climate Projections from <http://ukclimateprojections.defra.gov.uk/>

a range of possible climate outcomes for different parts of Scotland, based on different emissions' scenarios. These represent overall trends in climate, i.e. a 30 year average of weather conditions which will continue to be variable over shorter timescales. The key climate change trends for Scotland, as projected by UKCP09, are for:

- warmer, drier summers;
- milder, wetter autumns and winters;
- an increase in extreme weather events including summer heat waves, drought and extreme precipitation events; and
- the rate of sea-level rise and sea surface temperature to increase around Scotland's coast.

There are uncertainties over the actual effects of climate change on nature. This is because of the complexity of interactions that affect the exact timing, sequence, intensity and location of climate impacts, and how and when natural systems will respond to these changes. Our understanding of the UK Climate Change Risk Assessment and other relevant research so far suggests

the main implications are<sup>4</sup>:

- **Warmer temperatures causing species to move north or higher up the hill to follow their preferred 'climate space'**<sup>5</sup>. Some species may decline, such as trees with large seeds, or flightless insects that can't disperse easily, or those that thrive on mountain tops and northern coasts which may not be able to move within Scotland. For many species the loss of suitable habitat may restrict their spread. For example, the Arctic charr is a fish that lives only in cold lochs. They are now being affected by rising water temperatures. There are likely to be gains as well as losses to Scotland's flora and fauna, as some birds and insects are able to move readily. The comma butterfly, for example, has recently extended its range into Scotland from England.

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4. For details of some of the changes already observed, see 'Climate change and the natural heritage: Background and Context' on SNH's website; for more details of possible future implications of climate change see the UK CCRA Report for Scotland, <http://www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/adaptation>

5. The area of land which is climatically suitable for a particular species or habitat.







#### Climate change and what it means for Scotland's nature

- **Warmer temperatures changing interactions between species.** In the seas around Scotland there have already been shifts in ranges of plankton and fish abundance. These are likely to have contributed to declines in seabird populations such as black-legged kittiwakes, which feed predominantly on lesser sandeel. In upland habitats, as snow cover declines, some plant species are favoured over others. Changes in snow-bed vegetation have already been recorded. Nutrient and carbon cycling in soils will be affected by changes to soil organisms.
- **Warmer temperatures allowing pests and diseases, including invasive non-native species, to establish or spread further.** These are difficult to predict, but new plant diseases are already threatening native trees. Sea temperature may in future be linked to the spread of potentially invasive non-native species in the marine environment. Ecosystems that are under stress from climate change and other factors, such as pollution, may be more vulnerable to pests and diseases.
- **Sea-level rise leading to loss of coastal habitats.** Being at or close to sea level, saline lagoons and machair are very vulnerable to change. Mudflats, saltmarsh and sand dunes are also vulnerable to change where there is no space for them to move inland because of land use, sea walls or the topography of the land. Reducing the area of these habitats may reduce their contribution to coastal defence.
- **Rising levels of atmospheric carbon dioxide, which dissolves in the sea, resulting in ocean acidification.** This makes it more difficult for marine organisms to extract carbonate ions from the water and produce calcareous shells and skeletons. These organisms include reef-forming corals, molluscs e.g. mussels, crustaceans e.g. lobsters, and others such as starfish, sea urchins, some algae and many plankton species. Ocean acidification is likely to have wide ranging and complex impacts on marine ecosystems and global weather patterns.



- **Changes in seasonal rainfall and extreme weather events affecting rivers, wetlands, hill slopes, and coasts.** Rivers may flash flood more frequently in winter, which can wash out spawning beds for salmon. Wetlands may dry out in warmer summers, allowing woody species to colonise or causing peat to erode and so release more previously captured greenhouse gases. Wildfires may increase in summer, damaging woodlands and moors.
- **Indirect effects from human responses to climate change.** Habitats may be lost through land-use change to grow bioenergy crops or new forests, or to take advantage of improved suitability of some land for farming. Habitats and geodiversity interests may be lost through hard engineering on rivers and coasts to reduce flood impacts. Indirect consequences of Scotland's response to climate change, for example associated with some renewable energy developments, are amongst the most significant for Scotland's landscapes.

### What these changes mean for us

The changes we are seeing in nature have important consequences for all of us, such as:

- **Changes in habitats and species may reduce our ability to control** floods, filter pollutants from air and water, and regulate pests and diseases. Addressing these threats could therefore cost more in the long run.
- **Pests and diseases, and invasive non-native species** could result in greater damage to food, timber and fish production. More frequent extreme events could reduce wild salmon stocks, and ocean acidification could damage sea fisheries. Food producers will need to consider how to adapt to this.
- **Some of our distinctive habitats and species are threatened.** These, such as the Scots pine and capercaillie, make a significant contribution to Scotland's landscape character and cultural identity. Scotland will be different as our climate changes.





### What these changes mean for people

- **Scotland's landscapes will continue to change in response to these impacts.** Many of our landscapes enhance people's quality of life and visitors' experiences of Scotland. Recent changes include wind farm developments, and there may be future changes to cropping as agriculture responds to climate change<sup>6</sup>.
- **Recreation.** A changing climate will influence the ways people use and enjoy the outdoors, in both urban and rural areas. Warmer and drier summers may lead to an increase in outdoor recreation which would have potential benefits for public health. Tourism in Scotland may also benefit from this change. Equally, more unpredictable weather and wetter, milder winters, may reduce people's use of the outdoors, whilst increasing weathering of paths. Climate change should be reflected in investment in paths and places for recreation, and in visitor management.

6. SNH Climate Change, landscape & quality of life research <http://www.snh.gov.uk/publications-data-and-research/publications/search-the-catalogue/publication-detail/?id=1868>

## The role of Government

**The Government and other public bodies in Scotland, such as SNH, have statutory duties under Scottish climate change legislation, which are to:**

- contribute to delivery of Scotland's emissions reduction targets;
- support delivery of Scotland's adaptation programme; and
- do this in ways that are sustainable.

The UK Climate Change Act<sup>7</sup> 2008 and the Climate Change (Scotland) Act<sup>8</sup> 2009 have committed the UK and Scottish governments to reduce greenhouse gas emissions by at least 80% by 2050. The Scottish climate change legislation also set an interim reduction target of at least 42% by 2020. In the *Second Report on Policies and Proposals*<sup>9</sup> the Scottish Government

7. UK Climate Change Act [http://www.opsi.gov.uk/acts/acts2008/ukpga\\_20080027\\_en\\_1](http://www.opsi.gov.uk/acts/acts2008/ukpga_20080027_en_1)

8. Climate Change (Scotland) Act <http://www.opsi.gov.uk/legislation/scotland/s-acts2009a>

9. <http://www.gov.scot/Topics/Environment/climatechange/scotlands-action/lowcarbon/meetingthetargets>

has set out how these targets could be met within each sector from 2013–2027.

*The UK Climate Change Risk Assessment*<sup>10</sup>, published in January 2012, is the first assessment of current and predicted impacts of climate change for the UK, and includes a Scottish report. It draws together evidence and analysis on the threats and opportunities presented by the changing climate. Scottish Ministers were required to develop an adaptation programme to address these impacts, threats and opportunities.

*Climate Ready Scotland: Scotland's First Climate Change Adaptation Programme*<sup>11</sup> was published in May 2014. The aim of the programme is to increase the resilience of Scotland's people, environment and economy to the impacts of a changing climate. Structured around three themes:

- the natural environment;
- buildings and infrastructure; and
- society

10. <http://www.scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/adaptation>

11. <http://www.gov.scot/Publications/2014/05/4669>

The Programme encourages interactions between each theme. For example, the health and productivity of ecosystems underpins agriculture, which is essential for livelihood and food security. Reducing vulnerability and building resilience in the natural environment will therefore help to reduce vulnerability and build resilience for society. Each theme has an outcome which the programme is seeking to deliver in the long term (up to 2050).

Action on emissions targets and adaptation are reflected in Government's key strategies, and SNH has priorities to support these. They include key strategies:

- *The Land Use Strategy for Scotland*;
- *Scottish Biodiversity Strategy*;
- *Scottish Forestry Strategy*;
- *Scottish Soil Framework*;
- *National Planning Framework 3 and Scottish Planning Policy*;
- *Scotland's Renewable Energy Strategy*;
- *Scotland's National Marine Plan*;
- *River Basin Management Plans 2015–2027*; and
- *Flood Risk Management Strategies*







## Taking action

Nature can help us cope with climate change. Here are examples of what we will do:

- **Carbon:** Ensure that through effective management of the sea and land we 'lock up' carbon in the sediments and soils and enhance and maintain carbon rich habitats such as peatland, woodland, saltmarsh and seagrass beds.
- **Healthy ecosystems:** Develop approaches which secure healthy ecosystems so that they can help us adapt more easily to the effects of climate change, and in doing so sustain productive soils, clean water, and wildlife.
- **Helping nature adapt:** Identify the priority actions which will help Scotland's key habitats and species adapt to climate change.

The following expands on these actions.

## Carbon and land management

The carbon stored in Scotland's carbon-rich soils (notably peat and peaty soil) is equivalent to over 180 years of greenhouse gas emissions from Scotland at current emission rates<sup>12</sup>. Restoring peat-forming habitat which has been drained or damaged helps ensure that they remain as long-term sinks rather than sources of greenhouse gases. Soil organic matter is important for soil fertility, and enhancement of the organic carbon in agricultural soils will also help increase the overall stock of carbon (details are provided in the *Scottish Soil Framework*<sup>13</sup>).

We need to improve how we assess greenhouse gas emissions from peatlands and their related management activities.

Appropriate management practices, such as moderate grazing, can help to reduce carbon loss and increase the amount of carbon stored in vegetation and soils.

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12. <http://www.gov.scot/Topics/Environment/climatechange/scotlands-action/lowcarbon/meetingthetargets>

13. Scottish Soil Framework (<http://www.scotland.gov.uk/Publications/2009/05/20145602/0>).



The Scottish Forestry Strategy has a climate change theme: this uses forestry and adapts forestry practices to help reduce the impact of climate change and help Scotland adapt to its changing climate. The strategy aims to increase Scotland's forest from 17% to 25% of land cover. Trees and woodlands can contribute to carbon storage, by storing carbon in vegetation and soils. Using timber in long-lived end uses such as construction, where timber can replace more carbon intensive materials like concrete and steel, also helps add to carbon stores and reduce CO<sub>2</sub> emissions.

When used as an alternative energy source to fossil fuels, bioenergy such as woodfuel, can help reduce greenhouse gas emissions<sup>14</sup>. There is increasing demand for bioenergy feedstocks, but their production needs to complement, rather than conflict with, other land use objectives including timber and food production, wildlife and climate change adaptation.

14. SNH has published a statement on *Biomass and the Natural Heritage* available at: <http://www.snh.gov.uk/docs/B410082.pdf>

## Carbon and marine ecosystems

Important global carbon stores can be found in coastal and marine ecosystems such as saltmarshes, seagrass beds, kelp forests and coral reefs. Protecting existing saltmarshes and enabling them to advance landwards in the face of sea-level rise will help protect and enhance this long-term carbon sink. Seagrass beds and kelp forests are important short-term carbon sinks, with some of the carbon they capture also forming long-term carbon stores in marine sediments. Organisms with calcium carbonate shells or skeletons, such as corals, add to long-term carbon sinks when they die and their hard parts sink to the sea bed.

These carbon sinks are increasingly affected by rising sea water temperatures and by disturbance from trawling and dredging. Marine planning can help to safeguard these carbon sinks. In some places the species composition of communities has changed with long-lived shell forming organisms being replaced by short-lived and soft-bodied species. Ocean acidification will further reduce the amount of carbon that remains trapped in marine sediments.





## Taking action

### Securing healthy ecosystems

Healthy ecosystems help increase the resilience<sup>15</sup> of Scotland's communities to the impacts of climate change. Securing these through an 'ecosystems approach' means taking account of how nature functions, the benefits that nature provides for people, and involving people and communities in decision-making. It means working with nature to help communities cope with flooding, coastal erosion and over-heating. It also means adapting the way we affect habitats, species and the natural processes on which the wider benefits to people depend. After all, food production, water supply and a distinctive wildlife are prized parts of Scotland's culture and landscapes.

Vegetation, soils, rivers and wetland habitats can all play major roles in slowing run-off from catchments, and absorbing overspill within flood plains. This role in reducing flood risk should be used as

part of flood management and planned at the scale of the river catchment. Nature can work together with engineered solutions, such as barriers and walls, and can bring cost savings. A mix of engineered and natural flood management approaches is usually needed to manage flood risk.

The management of coastal habitats can help address the effects of rising sea level and increased storm surges. This needs to be planned at the level of the coastal cell – a stretch of coastline between major headlands within which coastal sedimentation and erosion processes are highly interdependent. Where there is an adequate sediment supply locally, soft engineering techniques can make use of coastal habitats, such as beaches and saltmarsh, to absorb wave energy. This means making space for natural processes, and may mean removing existing coastal defences to allow the coast to realign inland. Managed coastal realignment can help to replace previously lost coastal habitats such as saltmarsh or mudflats, though the net effect will be to lose land area through coastal retreat.

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15. Resilience is defined as the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organisation, and the capacity to adapt to stress and change – IPCC 2007

Decisions on where realignment is appropriate need to take account of costs and benefits to a range of land uses. Near-shore habitats such as seaweed (kelp) beds also absorb wave energy and help protect coastlines.

In towns and cities, nature can help develop resilience to climate change. For example, we use trees and shrubs around buildings and in public open space to provide shade and shelter thus reducing energy demands for cooling and insulating purposes. Greenspace can help to manage floodwater within flood plains and stormwater through sustainable urban drainage schemes. Multi-functional green networks play an important role in achieving this adaptation, alongside other outcomes such as encouraging people to be out and about locally. Responding to climate change is one of the key aims of the Central Scotland Green Network. This national project is recognised in the National Planning Framework.

If we want to use ecosystems to help us adapt to climate change, we need to:

- **Deal with uncertainty:** Uncertainties over how climate change will affect nature, and how land use will change, mean that a flexible and adaptive approach is needed to allow us to respond to new information and so adjust plans and policies. This adaptive approach needs to be supported by surveillance and monitoring of how the climate is affecting nature, and by research to understand these links and improvements in management responses.
- **Promote resilience:** Nature needs space for species to live in and for natural processes to take place. Diversity is also important for resilience. By looking after habitats and the underlying soils and geomorphological processes, we can provide this space and promote diversity.

Protected places, such as Sites of Special Scientific Interest, are particularly important and need to be well managed, along with networks of habitats in the wider environment. Larger areas of habitats and species populations provide better opportunities for sustaining diversity.

- **Accommodate change:** Adaptation planning also means accommodating change. Ecosystems tend to be dynamic. Climate change projections show that wholesale changes are likely for the composition of some plant and animal communities and patterns of habitats. Some species will be winners and some will be losers.





## Taking action

### Helping nature adapt

On the next page are some adaptation principles to help us take an ecosystems approach to managing change. These address issues of uncertainty, resilience and accommodating change. We need to test these in practice and learn from experience. We encourage decision-makers to use these to inform actions to be taken on land and in water. SNH will review their usefulness and refine them further.

We are working with other agencies and researchers to assess the risks to habitats, species and ecosystem processes. Scotland has a legal obligation to maintain habitats and species of European importance, and to manage conservation interests in protected places and beyond. Helping nature adapt is also one of our key responsibilities in the Scottish Climate Change Adaptation Programme.

In choosing how best to use resources we pose some key questions for managers to think about:

- Will the action significantly reduce the level of risk that climate change poses for nature?
- Will the action allow valued habitats or species to expand or increase?
- How important are the wider public benefits arising from the action? (In considering these we also need to recognise the value people place on nature and landscapes and also the services that nature provides, such as carbon storage or flood alleviation.)
- What are the costs associated with the action?
- What are the chances of success?



## Adaptation Principles – helping nature adapt to climate change

- 1 Reduce other pressures** on ecosystems, habitats and species – e.g. pollution, unsustainable use, grazing, habitat fragmentation and invasive non-native species.
- 2 Make space for natural processes** including geomorphological, water and soil processes, and species interactions.
- 3 Enhance opportunities for species to disperse** by reducing fragmentation and increasing the amount of habitat available.
- 4 Improve habitat management** where activities such as grazing, burning or drainage cause declines in diversity or size of species populations, or where modifying management or increasing habitat diversity could improve resilience to climate change.
- 5 Enhance habitat diversity**, e.g. by varying grazing or plant cutting management on grassland or moorland, or creating new habitats on farms.
- 6 Take an adaptive approach to land and conservation management** e.g. by changing objectives and management measures in response to new information.
- 7 Plan for habitat change** where assessments indicate losses of habitats or species are inevitable, for example as a result of sea-level rise.
- 8 Consider translocation of species** in circumstances where assessments indicate the likely loss of a species despite new management measures, and where there are suitable areas for nature to adapt.



## Part 2: What SNH intends to do

### Our role

**We raise awareness of how nature helps us cope with climate change, what climate change means for nature and how we can help it cope. We do so in a way that implements the Scottish public body climate change duties and shows SNH as a climate change leader.**

### Our progress

Since our last action plan (2012-2015), we have achieved the following notable milestones:

- With stakeholders, we launched Scotland's National Peatland Plan in August 2015, to guide the management and restoration of Scotland's peatland resource.
- We kick-started the peatland restoration challenge through our Peatland ACTION project and by

2015 had coordinated restoration of over 5,500 ha of degraded peatland at more than 100 sites.

- Our Adaptation Principles are in use, including within the Scottish Biodiversity Strategy 2013. We developed six case studies using our National Nature Reserves to help explain some of them.
- In 2014 we published the first review of the extent of Scotland's 'blue carbon' (marine carbon stores, including kelp and seagrass) and their capacity to store carbon.
- We are playing a key role in Scottish Government's research project in 2015 for past, present and future coastal change.
- We won a Nature of Scotland Award in 2014 for our suite of guidance on renewable energy developments.
- We reduced the CO<sub>2</sub> emissions from our own operations by 49% between 2000 and 2015, meeting our 2020 target five years early.

## Our approach

We will focus our effort on the management of Scotland's natural assets, so that they continue to provide a range of benefits for people as our climate changes. Our aim is for nature and landscapes to make an even stronger contribution to the Scottish Government's purpose and the Programme for Government. To that end, we continue to work closely with others to establish shared understanding of issues and outcomes.

Our priorities are around three areas:

1. Understanding the impacts of climate change on biodiversity and ecosystems.
2. Working to limit climate change (mitigation) through supporting sustainable renewable energy development, carbon storage in peatland and other ecosystems, and through a corporate greening programme.
3. Helping nature adapt to climate change, so that people can make best use of natural processes in preparing for climate change.

Therefore we will focus on:

### Understanding climate change

- Supporting others to gather appropriate long term data to provide evidence of the effects of climate change in both marine and terrestrial ecosystems.
- Raising awareness of the effects of climate change on nature, and the knock-on impacts for people by publishing case studies, information on trends and supporting the production of regular "report cards" on climate impacts.
- Incorporating management actions for protected areas to address the potential consequences of climate change.
- Contributing to Climate Change Risk Assessments to inform the Scottish Adaptation Programme.





## Our approach

### Natural Carbon storage

- Promoting action to improve the management and restoration of peatlands through Scotland's National Peatland Plan and 'Peatland Action' so that peatlands are valued much more highly for their many climate change and other benefits.

### Renewable energy

- Maintaining our contribution to the Scottish Government Low Carbon Economic Strategy and progress towards the renewable energy targets.
- Giving advice on strategic plans and individual proposals for onshore and marine renewables and related infrastructure developments. We publish guidance and research on the effects of developments and technologies on nature and landscapes and ways to minimise negative effects.

### Demonstration

- Establishing case studies and demonstration sites to show how we can help nature adapt, how nature can help us cope with climate change and to help explain the effects of climate change on nature.
- Providing tools for communities to talk about climate change, such as *Talking about our place*.

### Leading major projects that help people and nature adapt

- Leading the Ecological Coherence LIFE + project for integrated habitat networks to improve ecological coherence across the Central Scotland Green Network, and the Pearls in Peril LIFE+ project to increase the resilience of rivers to support freshwater pearl mussels.
- Being Lead Partner for a 2015 – 2020 European Regional Development Fund (ERDF) programme of Green Infrastructure projects across Scotland to improve green space in our towns and cities, many of which will support climate change adaptation.



### Reducing SNH's carbon emissions

- Using best practice to deliver our Low Carbon Vision for 2020, reducing our emissions by a rolling average which meets the Scottish Government's target to cut emissions by 80% by 2050, adapting our business to climate change and acting sustainably in our operations.
- Leading by example, we will report on and promote our achievements in delivering the public bodies' climate change duties.

We support others to take forward their responsibilities for climate change:

### Understanding climate change

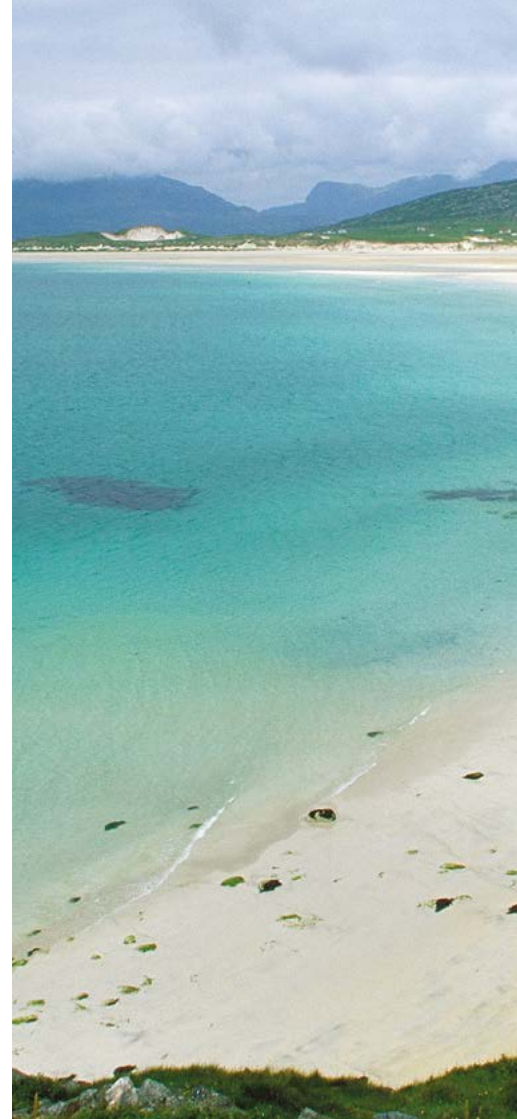
- Working with ClimateXChange to identify indicators which can be used to assess progress in biodiversity adaptation, as well as impacts.
- Supporting an action plan for addressing the challenges of ocean acidification in order to better understand the effects of changes in seawater chemistry on shellfish and other fauna in Scottish waters.

### Natural Carbon storage

- Working with Marine Scotland to improve our understanding of the location of marine carbon stores and the activities which might affect them.
- Working with Forestry Commission Scotland to increase woodland cover and resilience in Scotland, integrated with other land-based objectives.

### Promoting the role nature can play in addressing climate change

- Working with partners to reduce pressures on ecosystems, so as to increase the resilience of our most vulnerable and valued wildlife. Together we will do this by making space for natural processes, creating opportunities for species to disperse by improving habitat connectivity, and, as far as possible, allowing coasts and rivers to flood.
- Working with Community Planning Partnerships to strengthen habitat networks and green infrastructure in our towns and cities. Making better use of these resources can provide a low cost option to tackling current issues and meeting future challenges,





### Our approach

such as encouraging healthier lifestyles, building community capacity, supporting local economies, and adapting to the adverse effects of climate change.

- Working with land managers and other public bodies to support action to address climate change through administration of schemes under the Scottish Rural Development Programme.
- Advising public bodies how plans, proposals and strategies, including development plans and strategic environmental assessments, can help nature limit and adapt to the effects of climate change. Priorities include protecting carbon stores, enhancing natural features to support flood risk management, using habitat networks to increase ecosystem resilience, and increasing green space close to where people live and work.

### Reducing public sector carbon emissions

- Helping to cut greenhouse gas emissions by working with Government and other public bodies to improve standards and share best practice.







## Further reading

### Climate change and nature

Terrestrial Biodiversity Climate Change Impacts Summary Report Card, Living With Environmental Change. Morecroft, M.D. & Speakman, L. (2015). [www.nerc.ac.uk/research/partnerships/lwec/products/report-cards/biodiversity/](http://www.nerc.ac.uk/research/partnerships/lwec/products/report-cards/biodiversity/)

UK Climate Change Risk Assessment 2012, published by Defra. [www.gov.uk/government/publications/uk-climate-change-risk-assessment-government-report](http://www.gov.uk/government/publications/uk-climate-change-risk-assessment-government-report)

SNH Trends & Indicators [http://gateway.snh.gov.uk/pls/apex\\_cagdb2/snhlive.tai\\_disp\\_template\\_pkg.display\\_main\\_page](http://gateway.snh.gov.uk/pls/apex_cagdb2/snhlive.tai_disp_template_pkg.display_main_page)

SEPA river level and flow data – [www.sepa.org.uk/water/river\\_levels.aspx](http://www.sepa.org.uk/water/river_levels.aspx)

Impacts of Climate Change on forestry in Scotland – a synopsis of spatial modelling research, Research Note, Forest Research, Forestry Commission Scotland 2008 [www.forestry.gov.uk/pdf/fcrn101.pdf/\\$FILE/fcrn101.pdf](http://www.forestry.gov.uk/pdf/fcrn101.pdf/$FILE/fcrn101.pdf)

Marine Climate Change Impacts Partnership Annual report cards [www.mccip.org.uk/annual-report-card/](http://www.mccip.org.uk/annual-report-card/)  
<http://www.mccip.org.uk/>

For information on ocean acidification, see <http://www.epoca-project.eu/index.php/what-is-ocean-acidification.html>

### Carbon

[www.iucn-uk-peatlandprogramme.org/](http://www.iucn-uk-peatlandprogramme.org/)

Scotland's National Peatland Plan [www.snh.gov.uk/docs/A1697542.pdf](http://www.snh.gov.uk/docs/A1697542.pdf)

The Scottish Government's Rationale for Woodland Expansion [www.forestry.gov.uk/woodlandexpansion](http://www.forestry.gov.uk/woodlandexpansion)

Farming for a Better Climate – advice and case studies [www.sruc.ac.uk/info/120175/farming\\_for\\_a\\_better\\_climate](http://www.sruc.ac.uk/info/120175/farming_for_a_better_climate)

Assessment of carbon budgets and potential blue carbon stores in Scotland's coastal and marine environment. [www.snh.gov.uk/publications-data-and-research/publications/search-the-catalogue/publication-detail/?id=2176](http://www.snh.gov.uk/publications-data-and-research/publications/search-the-catalogue/publication-detail/?id=2176)







## Further reading

### Healthy ecosystems

Applying an ecosystems approach to land use: Information Note. Scottish Government 2011. [www.gov.scot/Resource/Doc/345453/0114927.pdf](http://www.gov.scot/Resource/Doc/345453/0114927.pdf)

SNH help on applying an ecosystems approach [www.snh.gov.uk/about-scotlands-nature/scotlands-biodiversity/an-ecosystems-approach/](http://www.snh.gov.uk/about-scotlands-nature/scotlands-biodiversity/an-ecosystems-approach/)

SEPA's Natural Flood Management Handbook 2016 [www.sepa.org.uk/media/163560/sepa-natural-flood-management-handbook1.pdf](http://www.sepa.org.uk/media/163560/sepa-natural-flood-management-handbook1.pdf)

Retrofitting urban parks to deliver climate change actions. 2012. Resource supported by SNH, available from greenspace scotland website: [www.greenspacescotland.org.uk/](http://www.greenspacescotland.org.uk/)

Green networks and development plans. SNH Information Note 2012. [www.snh.gov.uk/docs/B1041551.pdf](http://www.snh.gov.uk/docs/B1041551.pdf)

### Help nature adapt

[www.snh.gov.uk/climate-change/taking-action/adapting-to-change/helping-nature-adapt/](http://www.snh.gov.uk/climate-change/taking-action/adapting-to-change/helping-nature-adapt/)

Case studies available here [www.snh.gov.uk/climate-change/taking-action/adapting-to-change/helping-nature-adapt/turning-principles-into-practice/](http://www.snh.gov.uk/climate-change/taking-action/adapting-to-change/helping-nature-adapt/turning-principles-into-practice/)

### General

Scottish Biodiversity Strategy  
[www.biodiversityscotland.gov.uk/](http://www.biodiversityscotland.gov.uk/)

For information on SNH and renewable energy, see [www.snh.gov.uk/planning-and-development/renewable-energy/](http://www.snh.gov.uk/planning-and-development/renewable-energy/)

SNH Annual Climate Duties Reports  
[www.snh.gov.uk/climate-change/taking-action/carbon-management/corporate-greening/](http://www.snh.gov.uk/climate-change/taking-action/carbon-management/corporate-greening/)

Consideration of Climatic Factors within Strategic Environmental Assessment  
<http://ec.europa.eu/environment/eia/pdf/SEA%20Guidance.pdf>





[www.snh.gov.uk](http://www.snh.gov.uk)

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**Dualchas Nàdair na h-Alba**

All of nature for all of Scotland  
Nàdar air fad airson Alba air fad