Climate Ready Scotland: Scottish Climate Change Adaptation Programme

**Draft Scottish Climate Change Adaptation Programme
Required by Section 53 of Climate Change (Scotland) Act 2009**

The Scottish Government
Riaghaltas na h-Alba

Climate Ready Scotland: Scottish Climate Change Adaptation Programme

**Draft Scottish Climate Change Adaptation Programme
Required by Section 53 of Climate Change (Scotland) Act 2009**

MINISTERIAL FOREWORD

We know our climate is already changing. We see it all around – record rainfall and flooding, droughts and wildfires, and worrying reports of ice shelves breaking up in Greenland. Although the aggregate impacts of climate change in Scotland might be less severe than in many other parts of the world, the impacts for individuals, businesses and communities can be distressing and damaging and it is important that Scotland is well prepared and resilient to change.

That is why taking action on climate change is one of my top priorities. This means adapting to the impacts of climate change that we are already experiencing and will experience in the future, while also contributing to global efforts to cut greenhouse gas emissions to prevent much greater change.

Preparing effectively for unavoidable climate change and reducing emissions are both essential actions if we are to ensure sustainable economic growth in Scotland – the overarching purpose of the Scottish Government – and to best protect our much valued ecosystems and species.

Climate change is not just an environmental issue – the impacts are also felt by businesses, communities and individuals. Our climate affects people's health, our road and rail services, water supplies, energy demands, tourism – the list is almost endless.   Adapting to these changes is not something that governments can do alone. It depends on organisations, businesses and communities understanding the impacts of the changing climate and taking action to prepare for its effects.

We cannot eliminate all the risks we face from a changing climate. There is considerable uncertainty with future climate change. Many of the factors likely to affect the degree of future change are uncertain themselves – for example population growth and technology developments. But uncertainty is not an excuse for inaction. The challenge is to ensure that the actions we take to adapt are flexible and can be adjusted as our understanding improves.

Everyone in Scotland must accept responsibility for their share of action and working collaboratively. Clear leadership, advice and guidance from government is vital and I am committed to ensuring that existing and future Scottish Government policy, as far as possible, helps Scotland adapt to the effects of climate change to create a more resilient country for us to live and work in and to help protect Scotland's much loved natural environment. This Programme is part of that commitment.

Paul Wheelhouse
Minister for Environment and Climate Change

EXECUTIVE SUMMARY

This is a draft of the first Scottish Climate Change Adaptation Programme as required by section 53 of the Climate Change (Scotland) Act 2009.

It addresses the impacts identified for Scotland in the UK Climate Change Risk Assessment (CCRA) published under section 56 of the UK Climate Change Act 2008. It sets out Scottish Ministers objectives in relation to adaptation to climate change, their proposals and policies for meeting those objectives, and the period within which those proposals and policies will be introduced.

The Programme also sets out the arrangements for wider engagement in meeting those objectives.

Introduction and Context

Section 56 of the Climate Change Act 2008[1] requires the UK Government to publish 5-yearly assessments of risk to the UK. The first UK Climate Change Risk Assessment (CCRA) was published in January 2012 and provides an assessment of the current and predicted threats and opportunities to the UK from climate change. It includes a Climate Change Risk Assessment for Scotland[2].

Following these assessments, section 53 of the Climate Change (Scotland) Act 2009 (hereafter referred to as "the Act")[3] requires Scottish Ministers to lay a programme before the Scottish Parliament, setting out:
- their objectives in relation to adaptation to climate change;
- their proposals and policies for meeting those objectives;
- the period within which those proposals and policies will be introduced; and
- otherwise addressing the risks identified in the report under section 56 of the Climate Change Act 2008.

The Act also requires the programme to set out the arrangements for involving employers, trade unions and other stakeholders in meeting Scottish Ministers objectives; and the mechanisms for ensuring public engagement in meeting those objectives.

The UK Climate Change Risk Assessment (UK CCRA)

The Climate Change Risk Assessment for Scotland describes, and where possible quantifies, the impacts from climate change facing Scotland up until 2100. The assessment is based primarily on the UK Climate Projections which were published in 2009 (UKCP09)[4]. UKCP09 provides projections of future climate from the present to 2100, and represents the most authoritative evidence of potential changes in climate for Scotland.

Over 130 impacts for Scotland have been identified, and while the majority of these represent potential threats for Scotland, some present potential opportunities. The impacts vary in character and whilst some have been quantified, others have had to rely on expert elicitation or a narrative based on literature. To allow some comparison of different risks, they have been categorised into classes of 'high', 'medium' and 'low' magnitude consequences and 'high', 'medium' and 'low' confidence. The overall confidence is generally 'low' to 'medium', with only impacts that are already experienced and those related to increased temperatures classified with 'high' confidence. Some impacts are identified as 'too uncertain', either because the science is not sufficiently well advanced to understand the scale of the consequences or the inherent uncertainty is too great.

This information, and other information where available, has been used to inform those impacts that the Scottish Government considers to require early adaptation action as highlighted in the Annex to this Programme.

---

[1] See www.legislation.gov.uk/ukpga/2008/27/contents
[2] See http://randd.defra.gov.uk/Document.aspx?Document=10069_CCRAforScotland16July2012.pdf
[3] See www.legislation.gov.uk/asp/2009/12/contents
[4] See http://ukclimateprojections.defra.gov.uk/21678

Scottish Climate Change Adaptation Programme

This Scottish Climate Change Adaptation Programme (hereafter referred to as "the Programme") addresses the impacts identified for Scotland in the UKCCRA. The Programme does not directly address matters which are expressly reserved to the UK Government[5]. Reserved matters are dealt with under the UK Government's National Adaptation Programme.

Due to the inherent uncertainty in some aspects of climate change, adaptation policies need to be flexible and adjusted as and when new information becomes available. The Programme is part of an iterative process and subsequent programmes are required to address impacts and opportunities identified in progressive CCRAs due every 5 years.
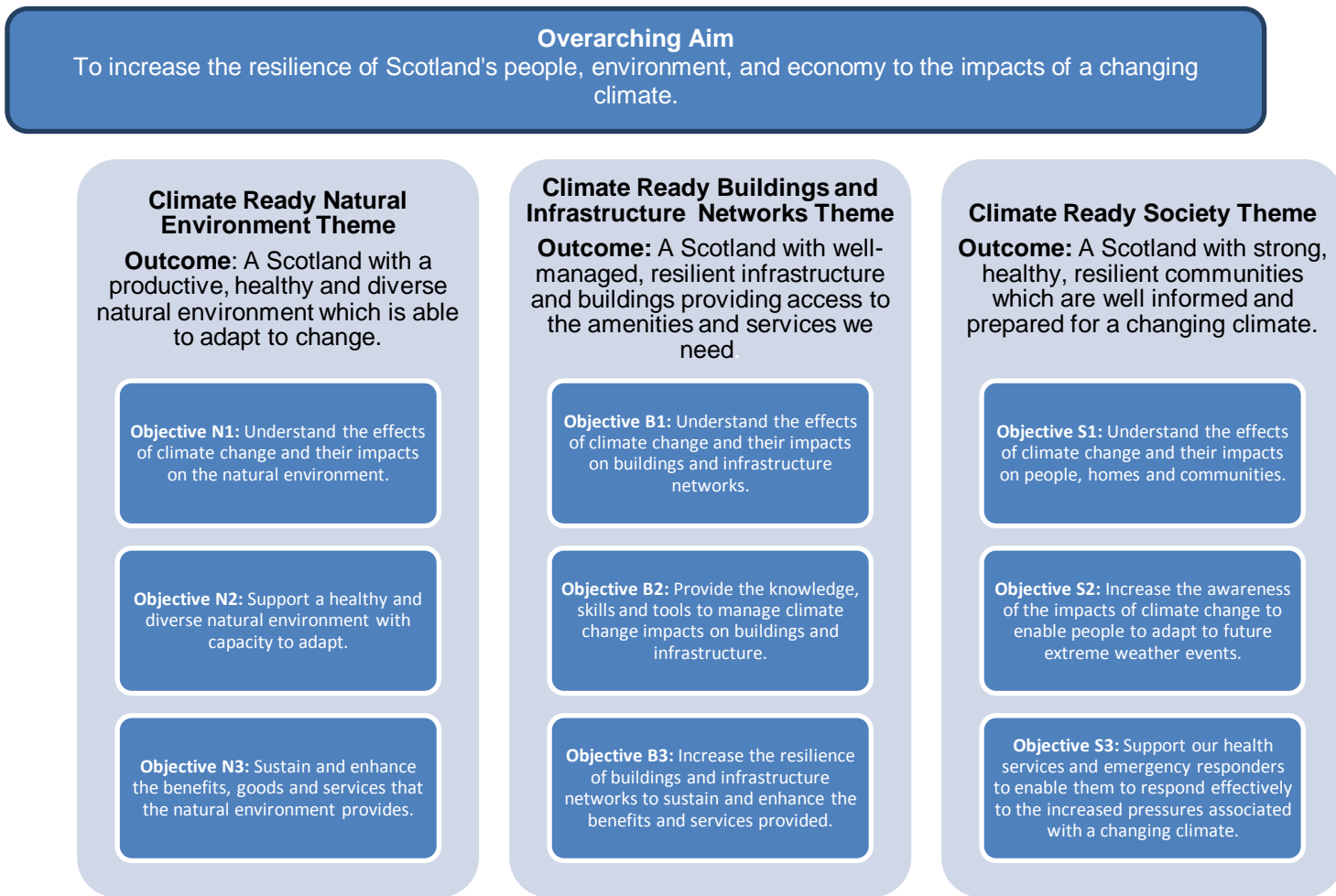
The Programme is structured around an overarching aim and three themes. There will inevitably be interactions between each theme and they should not be viewed in isolation. For example, the health and productivity of ecosystems underpins agriculture which is essential for livelihood and food security. Reducing vulnerability and building resilience in the natural environment will therefore help to reduce vulnerability and build resilience for society. And adapting our buildings can bring additional public health benefits for society by reducing heat and cold-related mortality, indoor air pollution and mould growth.

Each theme has an outcome that the Programme is seeking to deliver in the long term (up to 2050), and within each theme are three objectives (referenced by Theme as N1-N3, B1-B3 and S1-S3). This sets the long term framework for future Programmes (Figure 1).

Each Programme will set out the policies and proposals that provide the focus for the lifetime of that Programme in order to progress towards the long term objective. These will evolve and develop with each Programme, providing flexibility to adjust to new understanding and information.

---

[5] Reserved matters are those which the UK Government has control over and are set out in Schedule 5 of the Scotland Act 1998. Examples include immigration, tax, national security, energy policy and telecommunications.

Figure 1: Overarching Aim, Themes and Objectives

Overarching Aim
To increase the resilience of Scotland's people, environment, and economy to the impacts of a changing climate.

Climate Ready Natural Environment Theme	Climate Ready Buildings and Infrastructure Networks Theme	Climate Ready Society Theme
Outcome: A Scotland with a productive, healthy and diverse natural environment which is able to adapt to change.	**Outcome:** A Scotland with well-managed, resilient infrastructure and buildings providing access to the amenities and services we need	**Outcome:** A Scotland with strong, healthy, resilient communities which are well informed and prepared for a changing climate.
Objective N1: Understand the effects of climate change and their impacts on the natural environment.	**Objective B1:** Understand the effects of climate change and their impacts on buildings and infrastructure networks.	**Objective S1:** Understand the effects of climate change and their impacts on people, homes and communities.
Objective N2: Support a healthy and diverse natural environment with capacity to adapt.	**Objective B2:** Provide the knowledge, skills and tools to manage climate change impacts on buildings and infrastructure.	**Objective S2:** Increase the awareness of the impacts of climate change to enable people to adapt to future extreme weather events.
Objective N3: Sustain and enhance the benefits, goods and services that the natural environment provides.	**Objective B3:** Increase the resilience of buildings and infrastructure networks to sustain and enhance the benefits and services provided.	**Objective S3:** Support our health services and emergency responders to enable them to respond effectively to the increased pressures associated with a changing climate.

Governance

Delivery of the Programme will be overseen by the Climate Change Delivery Board (formerly the Emissions Reduction Programme Board).

The Board was established by the Scottish Government to oversee delivery of the statutory annual emissions reduction targets required by the Climate Change (Scotland) Act 2009. The Board meets quarterly and is chaired by the Director-General Enterprise, Environment and Digital. Membership covers Directors from the key areas within the Scottish Government involved with delivering emissions reductions.

The Board's scope will be expanded to include a new governance and reporting role for the Programme. Membership will be reviewed to ensure that Directors with responsibility for delivery of policies and proposals in the Programme are appropriately represented.

Monitoring and Reporting

The Act requires Scottish Ministers to provide an annual report on progress towards achieving the objectives and implementing the policies and proposals set out in the Adaptation Programme.

The Act also establishes the requirement to independently assess the Scottish Government's progress towards achieving the objectives and implementing the actions set out in the Adaptation Programme. An independent assessment must be commissioned within two years of this Programme being laid before the Scottish Parliament. The UK Committee on Climate Change is currently designated to perform this independent scrutiny role. In the event of a Scottish climate change advisory body being established, this function would revert to the Scottish body.

Public Bodies Climate Change Duties

Laying of the Programme before the Scottish Parliament brings into force the adaptation requirement of the public bodies climate change duties introduced by section 44 of the Act which requires that a public body within the definition of the Act, must, in exercising its functions, act in the way best calculated to help deliver the Programme.

Guidance[6] to assist public bodies comply with the duties has been published by the Scottish Government.

---

[6] See http://www.scotland.gov.uk/Publications/2011/02/04093254/0

Structure

The Programme is divided into 2 sections, with supporting annex:

Section 1: Objectives, Policies and Proposals

Section 2: Engaging Others

Annex

SECTION 1

OBJECTIVES, POLICIES AND PROPOSALS

This section sets out Scottish Ministers objectives in relation to adaptation to climate change, and their proposals and policies for meeting those objectives, as required by Section 53(2)(a)(i) and (ii) of the Act. These address the risks identified in the report under section 56 of the Climate Change Act 2008 (the UK Climate Change Risk Assessment), as required by Section 53(2)(b) of the Act.

As required by Section 53(2)(a)(v) of the Act, the period within which the proposals and policies will be introduced is as follows:

Proposals: Some proposals are likely to become firm policies once development work is complete and/or financial resources allow; other proposals may be options to consider over the course of the Programme or for introduction in future Programmes.

Policies: Policies will have either been introduced or will be introduced over the lifetime of the Programme.

Objectives

Each of the following theme Chapters contain objectives describing what is aimed to be achieved in the long-term (up to 2050). There are 9 objectives for the Programme spread across three themes (Figure 2).

Policies and Proposals

Attached to each objective are the policies and proposals that provide the focus for the lifetime of this Programme[7] in order to progress towards the long term objective.

For the purpose of the Programme, a 'policy' is considered to be a course of action which has been wholly or largely decided upon. In many cases, policies will have committed funding and/or legislation and timescales. A 'proposal' is considered to be a suggested course of action, the details of which might change as the course of action is explored and evidence is gathered.

---

[7] A new Programme will be produced to address impacts identified for Scotland in progressive CCRAs due every 5 years.

Figure 2: Themes and Objectives

Theme	Objective Reference	Objective
NATURAL ENVIRONMENT	**N1**	Understand the effects of climate change and their impacts on the natural environment.
	N2	Support a healthy and diverse natural environment with capacity to adapt.
	N3	Sustain and enhance the benefits, goods and services that the natural environment provides.
BUILDINGS AND INFRASTRUCTURE NETWORKS	**B1**	Understand the effects of climate change and their impacts on buildings and infrastructure networks.
	B2	Provide the knowledge, skills and tools to manage climate change impacts on buildings and infrastructure.
	B3	Increase the resilience of buildings and infrastructure networks to sustain and enhance the benefits and services provided.
SOCIETY	**S1**	Understand the effects of climate change and their impacts on people, homes and communities.
	S2	Increase the awareness of the impacts of climate change to enable people to adapt to future extreme weather events.
	S3	Support our health services and emergency responders to enable them to respond effectively to the increased pressures associated with a changing climate.

Climate Ready Natural Environment

> **A Scotland with a productive, healthy and diverse natural environment which is able to adapt to change.**

Introduction

This chapter considers the most important impacts of the changing climate on the natural environment and sets out the Scottish Government's related objectives associated with the identified climate risks.

The following issues are considered in this chapter:

- Biodiversity and ecosystem services – Scotland's habitats and species and the goods and services provided by its plants, soils, rivers and lochs and other natural capital.

- The health of the seas around Scotland and the species that live in them.

- The role of land management in protecting and enhancing habitats and biodiversity.

- The productivity of our land and seas and what this means for Scotland's land-based and fishing industries.

How is the changing climate likely to affect our natural environment?

Climate change will have important consequences for nature in Scotland.

Agriculture and forestry – With a future of generally warmer weather, drier summers and wetter winters, Scottish agriculture may experience positive change in some areas and negative change in others, including an increased risk of extreme weather event damage such as droughts or floods.

Scottish agriculture may experience positive change in some cases such as increased productivity in agriculture and forestry, with central, eastern and southern parts of Scotland likely to benefit the most where other conditions are not limiting. Primary producers in Scotland may also benefit from both improved growing conditions and higher global food prices. However, these positive impacts could be largely or entirely offset as there may also be negative consequences that would likely result in a decline in agricultural and forest productivity. An increased prevalence of pests and diseases, affecting either livestock or crops, and of drought conditions would reduce yields and any reduction in soil function. Flooding may result in crop damage, increase soil erosion and inflict longer term damage to high quality agricultural land.

Land based businesses are also well placed to help wider society adapt to climate change, most notably through managing flood risk and enhancing biodiversity.

Biodiversity and Ecosystems – Changes to soil biodiversity and function brought about by the changing climate could have severe implications for the wider ecosystem – reducing its ability to provide nutrients and water to sustain plant growth, and therefore leading to a decline in biodiversity and ecosystem function. In addition, an increase in flooding and erosion is likely to affect water quality, as potential pollutants, such as sediment and nutrients, are transported into water courses.

The pattern of land use may also change, for example the expansion of land used for agriculture – and potential displacement of other land uses to new areas – could have a potentially negative impact on biodiversity. Efforts to increase agricultural yields could have damaging effects on soils, contributing to ecosystem degradation. Increased demand for water by the agricultural sector may lead to over abstraction – reducing water flow and quality which is detrimental to habitats. Drying of soils and peat bogs could limit their ability to regulate and purify water, leading to a decline in water quality.

Our ecosystems could also be disrupted by invasive non-native species, pests and diseases, with species being displaced or even becoming locally extinct. Warmer temperatures may also cause species to move north or higher up hills to follow their preferred 'climate space'[8].

Marine Environment – Coastal flooding resulting from sea level rise and storm surges may damage coastal habitats through saltwater intrusion. Over the next century sea level around Scotland is going to rise. This is mostly due to the global heating and resulting expansion of ocean water, with a smaller contribution from the melting of ice-caps and glaciers. In Scotland, some of this rise will be mitigated by vertical changes in the level of the land.

We may see the arrival of new commercial fish species into Scottish waters and/or the loss of existing species, as the climate warms. The reduced ability for marine species to make shells and skeletons as the oceans become more acidic could impact heavily on Scotland's important shellfish industry. The disruption to or loss of marine ecosystem services, for example if there is increased occurrence of harmful algal blooms, could have a significant impact on Scotland's economy, of which a large contribution comes from the fishing and aquaculture industries.

---

[8] The area of land which is climatically suitable for a particular species or habitat.

Tourism and the Natural Environment – Warmer weather could result in increased tourism, although flooding may cause the loss of, or damage to, natural and man-made economically important coastal assets and visitor attractions - such as beaches, ancient monuments and golf courses. The loss of particular habitats and species could damage Scotland's tourism industry, which is heavily reliant on our natural environment. Increased occurrences of harmful algal blooms[9] could also have significant economic consequences when access is restricted during periods of high visitor numbers.

---

[9] Flooding results in the washing of nutrients into freshwater and shallow marine environments, causing algal blooms

Objectives, Policies and Proposals

This Chapter contains the objectives and the policies and proposals to drive the progress towards meeting the objectives. The objectives describe what is hoped will be achieved in the long-term (up to 2050), and the policies and proposals set out the priorities for this Programme.

The following objectives, policies and proposals address the relevant risks identified for Agriculture, Biodiversity and Ecosystem Services, Flooding and Coastal Erosion, Forestry and, Marine and Fisheries by the CCRA. The objectives are inter-related and are being addressed in a coherent way, recognising that they are mutually reinforcing with strong synergies across them.

What is already being done?

The impacts of climate change on Scotland's natural environment are being addressed through actions under the Scottish Biodiversity Strategy, the Land Use Strategy, River Basin Management Plans, the developing national marine plan and a wide range of environmental legislation. The Scottish Biodiversity Strategy has been updated to meet new international targets for 2020. Climate change impacts will be explicitly taken into account.

A key priority is protecting and enhancing Scotland's peatlands. Over 40% of Scotland's land cover has peaty soils. These store vast amounts of carbon and we need to ensure that that carbon remains locked up in the soil. Climate change will affect the way that peatlands take up and store carbon. We are therefore already acting to take climate change into account in peatland management practices. Healthy peatlands will also be more resilient to climate change: for instance they will absorb heavy rainfall or will be less prone to drying out.

Scotland's coastal and marine ecosystems also store carbon. Safeguarding saltmarshes, seagrass beds and kelp forests will help protect and enhance these long-term carbon sinks. Marine planning has a key role to play here.

The following table sets out what is currently being done by Scottish Government and key public bodies at a national level to help build resilience and deliver the objectives for the natural environment. It includes a wide range of existing and planned policies, legislation and on-going action.

Objective N1 - Understand the effects resulting from climate change and their impacts on the natural environment

No.	Policy and description	How will this help deliver the Objective?	Who will deliver?
N1-1	**Manage and monitor changes to Scotland's transport infrastructure environment** to detect impacts and changes on biodiversity and vegetation growing cycles: • **Transport Scotland Biodiversity action plan**; • **Transport Scotland Cost Effective Landscaping**, and; • **Network Rail Standard - Management of Lineside Vegetation.**	Use transport network auditing regimes under these policies to monitor new biodiversity impacts and detectable alterations in vegetation growing season cycles.	Transport Scotland
N1-2	Raising awareness of **implications of climate change for nature.** Publication and promotion of information describing the **implications of climate change for nature by Scottish Natural Heritage (SNH) and Scottish Environment Protection Agency (SEPA) through Scotland's Environment Website, public information and SNH Trend Notes.**	Supporting the use of long-term datasets, dissemination of information through Scotland's Environment Web, public information and SNH Trend Notes.	Scottish Natural Heritage, Scottish Environment Protection Agency, ClimateXChange
N1-3	Undertake research and develop **better modelling and spatial mapping of risks to evaluate future impacts of climate change on forests.**	Will provide forestry-specific interpretation of climate impacts so that forest managers are clear on what changes are happening and can be expected.	Forestry Commission Scotland
N1-4	Improve understanding on how we can **develop more resilient forests, identify adaptation strategies for all types of woodlands, and demonstrate these in forest settings.**	Will allow forest managers to make the required changes. Much of this will be taken forward through the new Research Forest in Queen Elizabeth Forest Park which will be trialling and demonstrating adaptation actions.	Forestry Commission Scotland
N1-5	Enhance collaborative research into **tree pests and diseases to develop understanding of the etiology, pathology, epidemiology and management of pests/diseases in a changing climate.**	Will ensure that we are as prepared as possible for managing forests in the presence of pests and diseases.	Forestry Commission Scotland

N1-6	Marine Scotland will use **marine research strategies and monitoring programmes** to gather data on the impact climate change is having on the seas. This will help inform future adaptation policies and proposals.	Research and monitoring findings from various initiatives will help inform decision making on adaptation across all sectors. For example – • The UK Marine Science Strategy (2010-2025) and Scottish Marine Science Strategy (2010-2015) set out high level marine science priorities and objectives. These are designed to ensure that marine science delivers both our vision for the seas (clean, healthy, safe, productive and biological diverse oceans and seas) and sustainable economic growth. Research findings from projects identified in the strategies will be used to identify gaps in knowledge and inform decision making on climate change adaptation. Some specific examples include: - monitoring carbon chemistry in our seas (including ocean acidification and potential impact on aquaculture); - a project studying pelagic foodwebs to predict the impact of climate change on marine top predators; - the development of a hydrodynamic model of Scottish shelf waters (the "Scottish Shelf Model"), which will help characterise the marine physical environment, against which changes in future conditions can be identified and potentially forecasted; - develop a better understanding of the effect of algal blooms on aquaculture through research to increase knowledge and understanding of possible solutions; - developing a better understanding of the role of blue carbon ecosystems in carbon sequestration and the role of Marine Planning and Marine	Scottish Government (Marine Scotland) with support from others e.g. Scottish Natural Heritage, Joint Nature Conservation Committee, Marine users

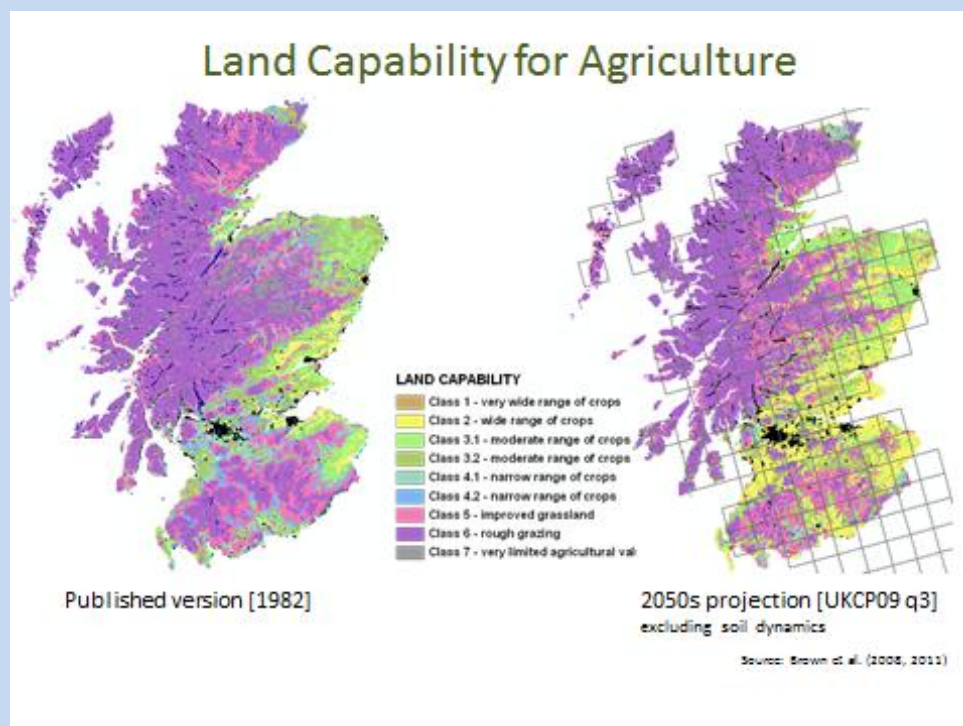|		Protected Areas in protecting these ecosystems. • Collaborative research and monitoring approaches across the UK and Europe via, e.g. UK Marine Monitoring & Assessment Strategy (UKMMAS), International Council for the Exploration of the Seas (ICES) and Oslo Paris Convention for the Protection of the North East Atlantic (OSPAR), as well as the implementation of EU Directives such as the Marine Strategy Framework will assist in the monitoring of impacts on, e.g. biodiversity and marine litter. • We will build on existing work to improve our understanding of the links between climate change and fish stock location and health. We already have an evidence base, for example a MCCIP report from 2012 on 'Fish, Fisheries and Aquaculture'. We also undertake a programme of annual surveys to cover major commercial fish stocks. This survey data along with a range of other data (e.g. landings, observer data on discards) is reviewed by ICES scientists and used for fisheries assessment models. ICES take into account a wide range of environmental, biological and management factors when doing stock assessment, including climate change.	
N1-7	Assess impacts - Continue support for the **Marine Climate Change Impacts Partnership (MCCIP)** which provides assessments of the impacts of climate change on the marine environment to help form policy and decision making.	MCCIP develops high quality evidence - e.g. Annual Report Card, Climate Smart Working Report - on the impacts of climate change on the marine environment that inform policy and decision making. The Report Card explores the issues, challenges, opportunities and achievements in putting climate change adaptation into practice.	Scottish Government (Marine Scotland)

N1-8	Understand the risks associated with **coastal flooding through development and implementation of local flood risk plans**.	Through development of local flood risk plans SEPA, local authorities and other responsible authorities will identify potential causes and consequences of flood risk and prioritise appropriate mitigation measures.	Scottish Environment Protection Agency, Local Authorities, Scottish Water
N1-9	**Encouraging citizen science and voluntary environmental monitoring**.	Enables vast amounts of environmental data to be collected over a wide range of environments over a long period of time. The data collected, such as the annual 'Big Garden Birdwatch' helps NGOs and agencies monitor the effects of climate on bird populations. It also helps encourage an interest and responsibility for the natural environment.	Scottish Government, Scottish Natural Heritage, Scottish Environment Protection Agency, The Conservation Volunteers, Education Scotland
N1-10	**Developing datasets to support flood risk management e.g. Light Detection and Ranging (LiDAR) and Scottish Detailed River Network (SDRN)** A requirement of the Flood Risk Management (Scotland) Act is to develop a programme to integrate necessary data.	Datasets of flood risk information available to all flood risk management practitioners to inform effective flood risk management decision making.	Scottish Government, OS, Scottish Water, Scottish Environment Protection Agency, Local Authorities and other public and private sector bodies
N1-11	Continue to fund the **Strategic Research Portfolio in Rural and Environmental Science** to improve the evidence base on the likely impacts of climate change on Scottish agriculture and ensure effective knowledge transfer of research outputs.	Research results will reduce uncertainty and provide the basis of future policy development and advisory activity for the agricultural sector.	Scottish Government, ClimateXChange, Main Research Providers: Scotland's Rural College, James Hutton Institute, Rowett Institute of Nutrition and Health, Moredun Research Institute, Biomathematics and Statistics Scotland, Royal Botanic Garden Edinburgh
N1-12	Deliver the current programme of research work on the effects of climate change on **Scottish food security**.	Research will assess the impacts of climate change on agriculture and food production in Scotland and ways in which impacts can be mitigated against and or adapted to.	Scottish Government, Scotland's Rural College, Rowett Institute of Nutrition and Health, ClimateXChange

Case Study

Drought risk and impacts of climate change on land capability

In updating the Land Capability for Agriculture (LCA), the James Hutton Institute have been looking at how to incorporate climate change into these guidelines. The institute have looked into drought risk and how it is linked to the expected additional irrigation demand for particular crop types.

During this process, certain catchments were identified as having unsustainable use of water resources which will be further exacerbated by climate change. As land use has a key role in managing climate change, a preliminary assessment of changes in water supply and demand has been produced. This assessment could be further developed to provide additional guidance on sustainable abstraction levels.

Land Capability for Agriculture

LAND CAPABILITY

Class 1 - very wide range of crops
Class 2 - wide range of crops
Class 3.1 - moderate range of crops
Class 3.2 - moderate range of crops
Class 4.1 - narrow range of crops
Class 4.2 - narrow range of crops
Class 5 - improved grassland
Class 6 - rough grazing
Class 7 - very limited agricultural value

Published version [1982]

2050s projection [UKCP09 q3]
excluding soil dynamics

Source: Brown et al. (2008, 2011)

James Hutton Institute

Objective N2 - Support a healthy and diverse natural environment with the capacity to adapt

No.	Policy and description	How will this help deliver the Objective?	Who will deliver?
N2-1	**Review objectives and priorities for action in Scotland's Wild Deer: a National Approach (WDNA)** Prepare best practice guidance for deer management groups to support the code of practice on deer management under the Deer (Scotland) Act 1996 as amended.	Ensure responsible management of the land and or deer stocks in response to a changing climate.	Scottish Natural Heritage, other public bodies and land managers
N2-2	**Promote the role of green networks** in helping Scotland to mitigate and adapt to climate change by strengthening habitat networks, reducing habitat fragmentation and providing opportunities for species to migrate.	Green Networks will help nature adapt to climate change by strengthening habitat networks, reducing habitat fragmentation and providing opportunities for species to migrate.	Scottish Government, Scottish Natural Heritage, Forestry Commission Scotland, Local Authorities, other public bodies, and land managers
N2-3	**Demonstrate adaptive management in National Nature Reserves** to help explain the implications of climate change for nature and demonstrate management that takes account of these implications.	This work will contribute to adaptation by raising awareness and understanding amongst managers of protected sites and wider land.	Scottish Natural Heritage
N2-4	**Manage designated sites** – for land based biodiversity.	Identify the consequences of climate change for protected places and the Natura network and put in place adaptive measures.	Scottish Natural Heritage
N2-5	**Pilot the use of the Scottish Natural Heritage (SNH) Wildlife Management Framework to integrate climate change risks into wildlife management decisions (including deer).** This is a tool to support decisions around wildlife management issues such as controlling non-native species, managing conflicts between species, or ensuring sustainable use of species as a resource for food or sport. This should help make such decisions more robust in the face of climate change, and so contribute to adaptation.	The Framework includes questions around the impact of management actions on the ability of the species to adapt to climate change and on woodland expansion. It will be tested within SNH and then rolled out for use by others, including land managers.	Scottish Natural Heritage

N2-6	**Develop the ecosystem approach** into a usable set of tools for use by decision makers including through the **Scottish Biodiversity Strategy 2020 Challenge, and the Land Use Strategy.**	The ecosystems approach promotes a holistic approach to land management which will help to build resilience to climate change and ensure that wider benefits from nature, e.g. for climate change adaptation, are taken into account in decisions.	Scottish Government, Scottish Natural Heritage, Scottish Environment Protection Agency, James Hutton Institute and partners.
N2-7	**Implement Wildlife and Natural Environment Act (WANE) to develop a co-ordinated approach to managing non-native species and use new regulatory powers,** for example by promoting the Code of Practice as it applies to non-native and invasive species.	Will help minimise the impact of invasive non-native species on forest resilience. A co-ordinated approach to managing non-native species, using new regulatory powers under the WANE Act and more accessible advice and promotion to support the Code of Practice will help build resilience to climate impacts.	Forestry Commission Scotland, Scottish Natural Heritage, Scottish Environment Protection Agency, NGOs
N2-8	**Implement the Land Use Strategy (LUS) and associated action plan** - incorporates principles for sustainable land use and includes a commitment to investigate the relationship between land use change and ecosystems processes to identify adaptation priorities.	The Land Use Strategy (LUS) regional pilots in Scottish Borders and Aberdeenshire will be utilising the LUS Principles and taking an ecosystems approach to consider land use and land use change in their area. Incorporates Principles for the sustainable use of Scotland's land and actions which will aid the achievement of a long term future Vision for Scotland's land resources.	Scottish Government, Scottish Natural Heritage, Forestry Commission Scotland, Scottish Environment Protection Agency
N2-9	**Implement a Scottish Biodiversity Strategy** which considers climate risks for terrestrial and marine environments. New research under the strategy will help identify the priority risks for biodiversity.	Climate risk is being fully integrated into the development of the Strategy, covering the terrestrial and marine environment. Research under the strategy will also contribute knowledge regarding the priority risks for biodiversity that need to be managed.	Scottish Government, Scottish Natural Heritage, Forestry Commission Scotland
N2-10	**Promote the UK Forestry Standard and Climate Change guidelines** to raise awareness on the Standard to build resilience of forests to the impacts of climate change.	The guidelines help build the resilience of forests to the impacts of climate change.	Forestry Commission Scotland, forest managers
N2-11	**Embed climate change adaptation considerations, and potential responses such as Forest Habitat Networks**, into wider land use planning decisions through the use of Forestry and Woodland Strategies and regional Land Use Strategies.	Forest Habitat Network information will be used in land use plans, so that woodland creation and management can be targeted to further strengthening these Networks and increasing their resilience to climate impacts.	Scottish Government, Forestry Commission Scotland, Scottish Natural Heritage, Local authorities, others.

N2-12	**Improve the condition of native woodlands**; promote natural regeneration as a means of increasing resilience to change, and take other steps to increase adaptive capacity in woodlands.	More native woodlands in favourable condition will increase their capacity to adapt to climate impacts.	Forestry Commission Scotland, Forest Enterprise Scotland, Scottish Natural Heritage, Private sector forest managers
N2-13	**National Marine Plan (NMP).** This will be consulted on in 2013 and will set out objectives and policies for sustainable development of Scotland's seas; promoting economic growth while ensuring growth occurs in balance with the protection of natural and historic heritage. The National Marine Plan, NMP, will set out policies to ensure marine environment activity doesn't have an unacceptable effect on coastal processes and flooding.	In accordance with the Marine (Scotland) Act, Scottish Ministers and public bodies must act in a way best calculated to mitigate, and adapt to, climate change so far as is consistent with the purpose of the function concerned – as such the NMP includes objectives and policies for climate change mitigation and adaptation. Objectives and policies relating to the mitigation of, and adaptation to, climate change are embedded throughout the sectoral chapters of the National Marine Plan. Future regional marine plans, sectoral plans, licensing and consenting decisions which affect the sea will have to be taken in accordance with the National Marine Plan. The NMP will also be reviewed after 5 years to take account of new information on climate change impacts and ecosystem services.	Scottish Government (Marine Scotland), Marine Scotland Science, Regional Marine Planning Partnerships
N2-14	**Regional marine plans –** These will be developed from 2014 and will shape regional/local objectives and policies for coastal and marine management and include policies relating to climate change adaptation (and mitigation).	In accordance with the Marine (Scotland) Act, Scottish Ministers and public bodies must act in a way best calculated to mitigate, and adapt to, climate change so far as is consistent with the purpose of the function concerned – as such RMPs will be required to include objectives and policies for climate change mitigation and adaptation. Like the NMP, RMPs will also be reviewed after 5 years.	Scottish Government (Marine Scotland), Regional Marine Planning Partnerships
N2-15	**Manage designated sites** – for the marine environment.	Identify the consequences of climate change for the Natura network and put in place adaptive measures.	Scottish Natural Heritage, Scottish Government (Marine Scotland)

N2-16	Develop mechanisms to minimise the introduction and establishment of **invasive non-native species into Scottish waters.**	For example - Help control the spread of the invasive Didemnum vexillum (DV) (Carpet sea squirt). Continued monitoring of DV in Largs and other sites in Scotland for further spread.	Scottish Government (Marine Scotland) and partners
N2-17	**Implement River Basin Management Plans (RBMP).** The RBMPs set out how we can enhance the environmental quality of rivers, lochs and seas, delivering greater benefits for the environment, and safeguarding them for future generations.	These will help ensure resilience to climate impacts in terms of maintaining and improving water quality.	Scottish Environment Protection Agency, responsible authorities and land managers
N2-18	**Support the development of Local Flood Risk Management Plans.** This will manage waters at a river catchment level and include local flood risk management plans. Research demonstration projects to assess the benefits of working with nature to lower flood risk.	Local plans will include opportunities to slow or store flood water by enhancing, altering or restoring natural features and characteristics across catchments (natural flood management). By working with nature these measures will also often have benefits for biodiversity and water quality. This will give us robust evidence to encourage local authorities to implement natural flood management and build in a level of protection that over the years could mitigate the future impacts of climate change. It also raises awareness among landowners of their role in adapting to climate change.	Scottish Environment Protection Agency, responsible authorities and land managers
N2-19	Improve the condition of river **Special Areas of Conservation as part of River Basin Management Plans.**	Implementing river basin management plans will be critical in ensuring that inland water bodies achieve good or better status. Special Areas of Conservation are a mechanism for helping nature adapt.	Scottish Environment Protection Agency, Scottish Government, Scottish Natural Heritage, Forestry Commission Scotland (Natural Scotland)

N2-20	**Assess and manage coasts,** promoting adaptive coastal management that works with natural processes.	This will be done through: • Implementing the Scottish Biodiversity Strategy by addressing the risks to species and habitats due to coastal evolution. • Development of the National Marine Plan which will set out policies to ensure marine environment activity doesn't have an unacceptable effect on coastal processes and flooding. • Development of the Flood Risk Management Strategies and Plans and understand the risks associated with coastal flooding across Scotland. • Prepare Coastal Erosion Susceptibility Model for Scotland to inform Flood Risk Management Plans. • Identify locations where habitats are most vulnerable to coastal erosion and sea level rise.	Scottish Government, Scottish Natural Heritage, Scottish Environment Protection Agency, Local Authorities
N2-21	Promote the **Farming For A Better Climate Programme.** This is an advisory programme for land managers to help them mitigate climate change and adapt to the impacts of climate change which includes web-based advice & guidance, demonstration farms, farm events, seminars, conferences and raising awareness through publications in farming press.	Raising awareness of the challenges and opportunities that climate change will bring to land managers. Transfer knowledge and practical skills to increase adaptive capacity of Scottish farming.	Scottish Government, Scottish Rural College
N2-22	Support the project **"Future Proofing Scotland's Farming".** This is a skills development programme that aims to prepare agricultural businesses for the impacts, opportunities and risks that both climate and economic change present.	Raising awareness of the challenges and opportunities that climate change will bring to land managers. Transfer knowledge and practical skills to increase adaptive capacity of Scottish farming.	Soil Association, Quality Meat Scotland, National Farmers Union Scotland, Scottish Agricultural Organisations Society

Case Study

Implementation of Restoration and Natural Flood Management (NFM) measures and liaison with land managers

The Eddleston Water is a sub catchment of the River Tweed measuring 69 square km with the main stream measuring 12km. It covers a large area of hill and improved grassland, north of Peebles in the Scottish Borders. Tweed Forum is working with 12 farmers and land owners in the valley to facilitate a co-ordinated approach to Natural Flood Management (NFM).

NFM can be identified as those techniques that aim to work with natural hydrological and morphological processes, features and characteristics to manage the sources and pathways of run-off to reduce the damaging effects of flood waters.

In the Eddleston Water, work to 'slow the flow' and 'increase storage of flood waters' is on-going at 20 separate sites. The techniques being utilised include: Planting of native woodland on floodplains and in hill cleuchs. The trees and coarse grass generated will help slow the surface flow rate which will help take the peak off the flood water. New water retention ponds have been created to capture flood water. Re-meandering of canalised ditches and watercourses will encourage a more natural watercourse ecosystem to develop. The installation of log-jams in the headwaters to slow down run-off, will benefit water quality, wildlife and the fishery, to name but a few.

Promoting all the benefits that these measures have is called 'The Ecosystem Services Approach'. It is through land managers working together that real progress can be made. The benefits to the farm, the environment and the local community can be significant.

This is a partnership project involving: Private land-owners, Tweed Forum , Scottish Government, Scottish Borders Council, SEPA, Dundee University, Forestry Commission Scotland and British Geological Survey.

Eddleston Water Project
Tweed Forum

Objective N3 - Sustain and enhance the benefits, goods and services that the natural environment provides

No.	Policy and description	How will this help deliver the Objective?	Who will deliver?
N3-1	**Implement the EU reform of the Common Agricultural Policy** post 2013 to ensure that climate change adaptation objectives are considered.	EU Common Agricultural Policy provides a level of income security to farmers as well as incentives for measures aimed at supporting rural businesses and communities to develop and diversify as well as environmental protection and conservation measures. Currently, negotiations are still on-going at EU level. At Scottish level, we intend to hold a public consultation in 2013 on the content of the future Rural Development Programme, where stakeholders can express their views on priorities for inclusion.	EU, Scottish Government
N3-2	**Support Scotland's Animal Health Regime** to help prevent the introduction and spread of harmful organisms.	Climate change may lead to the introduction and spread of livestock diseases and threats to public health. Animal Health Regime Veterinary Surveillance programme has an important role for early detection of new and emerging diseases in livestock. Contingency plans set out actions to be taken in the event of a serious outbreak of an animal pest or disease.	Scottish Government and Veterinary Surveillance Partners: Scottish Rural College, Moredun Research Institute, Animal Health and Veterinary Laboratories Agency
N3-3	**Support Scotland's Plant Health Service** to help prevent the introduction and spread of harmful organisms.	Climate change may lead to the introduction and spread of plant diseases and threats to public health. Inspection, monitoring and surveillance activities under Scotland's Plant Health Service is vital to ensure Scotland's high plant health status is maintained. Contingency plans set out actions to be taken in the event of a serious outbreak of a plant pest or disease.	Scottish Government, Scottish Environment Protection Agency, Scottish Natural Heritage, Science and Advice for Scottish Agriculture

N3-4	**Promote the use of Ecological Site Classification, Forest GALES** and other decision support systems to help forest managers to determine appropriate species and silvicultural systems in a changing climate.	Forest managers will have access to existing decision support systems to help decide on species suitability in a changing climate.	Forestry Commission Scotland
N3-5	**Implement the Scottish Windthrow Contingency Plan** to help minimise the financial impact of wind damage to commercial forests.	Will help minimise the financial impact of wind damage to commercial forests.	Forestry Commission Scotland
N3-6	**Support the Scottish Wildfire Forum** to help ensure that land managers and the emergency services work together to prevent and manage wildfires**.**	Enhance preparedness for forest fires through partnership working.	Scottish Wildfire Forum members
N3-7	**Publish resources for managers of productive forests to help them develop more resilient forests** in a changing climate and in the face of tree health threats. Promote these resources, and provide support to forest managers.	Should help forestry management practices adapt and will help reduce the impact of tree pests and diseases on forests, woodland and related open ground habitats.	Forestry Commission Scotland with input from partners Forest Enterprise Scotland, Scottish Government, Scottish Natural Heritage, Scottish Environment Protection Agency, private forestry sector and the third sector.
N3-8	**Promote tree health response contingency planning** to enable rapid on-the-ground action to deal with new tree health threats and to enable targeted deployment of emergency measures.	Will ensure that forest managers make the most effective response to tree health threats.	Forestry Commission Scotland, Scottish Government, Scottish Natural Heritage, private forest managers
N3-9	Develop **Operational Guidance for managing incidents of wildfire** for fire and rescue service managers and personnel.	Guidance for fire and rescue service managers and personnel.	Scottish Government
N3-10	Enhance operational capacity to enable **earlier detection and subsequent management of tree pests and diseases.**	Will ensure that forest managers make the most effective response to tree health threats.	Forestry Commission Scotland, Scottish Government, Scottish Natural Heritage, private forest managers
N3-11	**Common Fisheries Policy (CFP).** Influence the EU reform of the CFP to ensure that it recognises the impacts of climate change and is flexible to environmental change.	Achieve a CFP that is flexible to environmental change.	EU, Scottish Government

N3-12	**Improve targeting of species** by using selective fishing gear and reducing discards through conservation credits and TR2 schemes.	Selective gear and fewer discards will improve sustainability of fisheries management.	Scottish Government (Marine Scotland)
N3-13	Manage the impacts of climate change **to help fishing and aquaculture industries achieve Maximum Sustainable Yield (MSY) by 2015,** where possible, and by 2020 for all stocks at the latest.	MSY should be set at a level that takes into account the impacts of climate change.	EU, Scottish Government
N3-14	**Introduce new Technical Standards for containment by Scottish fish farms**. Enabling provisions for Technical Standards were included in the Aquaculture and Fisheries Bill which was introduced to the Scottish Parliament in October 2012.	All finfish farms operating in Scotland will have equipment, appropriate for conditions in which they operate, to contain fish.	Scottish Government (Marine Scotland)
N3-15	Fishing and aquaculture industries to develop and introduce **new technologies for environmentally sustainable commercial fishing and aquaculture.**	Aquaculture and Fisheries (Scotland) Bill included proposals for Technical Requirements for fish farm equipment (nets, pens and mooring systems) to minimise escapes. This will help with the continued production of existing species and new species farmed in Scottish waters. Issues include disease control related to changing temperatures, changes in the species which can be cultivated due to changes in temperature and improved technical requirements for fish farm equipment proposed by the Aquaculture and Fisheries Bill, which will help reduce storm damage and therefore risk of escapes. Aquaculture and Fisheries (Scotland) Bill passed by Scottish Parliament on 15 May 2013.	Scottish Environment Protection Agency, Marine Science Scotland

Case Study

Creating Resilient Forests II

Changing climate could result in catastrophic pest, disease and wind events for some species. With uncertain climate impact predictions and diverse views on adaptation methods, using a range of management and stocking strategies should help to increase resilience. Examples include the use of Continuous Cover Forestry, different thinning and spacing regimes and diversified plantings. Any emerging threats (e.g. pests) may then only affect a smaller proportion of the total forest investment.

Queen Elizabeth Forest Park
Forestry Commission Scotland

Research

The Scottish Government is funding research into the resilience of Scotland's biodiversity to climate change and land-use change. The research will deliver findings in five areas:

- Assessment of the roles of biodiversity in ecosystem function, to inform our understanding of the place of biodiversity within The Ecosystem Approach.

- Identification of the interactions between the changing climate and Scotland's species, habitats and ecosystems, including the main risks to Scotland's biodiversity which need to be managed, and the main contributions of Scotland's biodiversity to mitigation and adaptation to climate change.

- Identification of the potential consequences of land use changes for Scotland's biodiversity.

- Measurement and prediction of the responses of selected species, habitats and ecosystems to changes in the climate and in land use.

- Identification and development of management strategies and practices to address anticipated impacts and increase the resilience of Scotland's biodiversity to climate change and land use change.

Other research programmes on climate impacts and adaptation in the natural environment include:

- **Invasive non-native species (INNS) data gathering** in the marine environment, managed by Marine Scotland and SNH. Gathering data regarding the presence of INNS in the marine environment will allow the threat posed to be properly assessed.

- **Marine monitoring programmes**, managed by Marine Scotland and MSS. The programmes will allow marine plan and/or atlas information to be updated, and updated overall assessments of the seas to be undertaken.

- **Research vessel monitoring**, is being managed by Marine Scotland with support from partners such as SNH and SEPA. Research vessels will gather data to assist with assessment of ocean acidification in Scottish seas. Data used for other monitoring requirements e.g. the Marine Strategy Framework Directive, will be also used to establish how climate change may be influencing Scottish seas.

- **The Forest adaptation research programme**, run by Forest Research, will evaluate future climate impacts, identify adaptation strategies and understand how we can develop 'resilient forests'.

- **The Scottish Research Forest**, managed by Forest Research. Forest management approaches to enhance resilience can be trialled and demonstrated in the context of a working forest. Plans for the research forest include trials and demonstration of species, provenance and management system suitability; and how to enhance resilience to, plan for and deal with extreme events.

What else needs to be done?

In some cases, existing and planned action may be enough to achieve the objective. The following tables set out other possible additional courses of action. Some or all of these may become firm policies once development work is complete and/or financial resources allow.

No.	Proposal and description	How will this help deliver the Objective?	Who will deliver?
Objective N1 - Understand the effects resulting from climate change and their impacts on the natural environment			
N1-13	**Establishment of a co-ordinated Energy Sector Climate Change impacts research programme** which would consider the impacts of changing energy generation on biodiversity and ecosystem services.	The research programme could include consideration of the impacts of changing energy generation on biodiversity and ecosystem services.	Scottish Government

No.	Proposal and description	How will this help deliver the Objective?	Who will deliver?
Objective N2 - Support a healthy and diverse natural environment with the capacity to adapt			
N2-23	**Encourage the consideration of climate change impacts (and how they will be addressed) in Forest Plans,** and support this with grants and regulations so as to ensure that forest plans support ecosystems and habitat resilience and allow resilience-building measures to be trialled by forest managers.	This will be important in ensuring that forest plans support ecosystem and habitat resilience.	Forestry Commission Scotland

No.	Proposal and description	How will this help deliver the Objective?	Who will deliver?
Objective N3 - Sustain and enhance the benefits, goods and services that the natural environment provides			
N3-16	**Greater recognition of the role of integrated land management in tackling climate change** (as opposed to sector-based responses) and this being backed up by Government policy and support mechanisms.	Land Use Strategy Regional Land Use Framework pilots will be utilising the LUS principles and taking an ecosystem approach to consider land use and land use change in their area in an integrated manner.	Scottish Government, Scottish Natural Heritage, Forestry Commission Scotland, Scottish Environment Protection Agency

Climate Ready Buildings and Infrastructure Networks

> **A Scotland with well-managed, resilient infrastructure and buildings providing access to the amenities and services we need.**

Introduction

This chapter considers the most important impacts of the changing climate on buildings and infrastructure networks and sets out the Scottish Government's related objectives.

The following issues are considered in this chapter:

- 'Buildings' - existing and newly constructed buildings, including historic and traditionally constructed buildings, and man-made surroundings such as green and blue spaces.

- 'Infrastructure' – road (trunk and local) network, rail network; ports, harbours, ferries, canals and airports; energy transmission and generation; energy efficiency; water collection, and supply demand and treatment.

- Planning policy – both on land and at sea – which affects where man-made structures and surroundings are located.

The location, design, development and size of buildings and other structures can affect the surrounding natural environment. Equally, the provision of clean water is reliant on our lochs and rivers, so this theme has important links with the Natural Environment theme. The impacts of the changing climate on buildings and infrastructure is also likely to affect our economy and society, so this theme also has important links with the Society theme.

How is the changing climate likely to affect our buildings and infrastructure?

Businesses, individuals and key services rely on infrastructure on a daily basis – for water, for heating and for transport. Disruption to these assets will likely have a knock-on effect for our economy and society. Put simply, the changing climate will generate positive and negative impacts and challenges across the infrastructure and the built environment that we rely on.

Infrastructure: Disruptive impacts to road and railway infrastructure from severe weather, especially flooding, landslides and high winds are likely to occur with the changing climate. Climatic impacts to our transport networks will invariably result in stresses across other sectors; for example, flooding of transport networks will cause disruption to emergency services at a time when their services are likely to be in particular demand.

How climate change impacts could affect First ScotRail's ability to run normal rail services

In recent years First ScotRail has had to respond to increasingly disruptive weather events. This prompted the company to look at current and future weather and climate risks in more detail, with support from Adaptation Scotland. The project, led internally by ScotRail's Environmental Sustainability and Climate Change Manager, benefited from managerial input from facilities, performance, communications and health and safety units. Transport Scotland and Network Rail also participated in the project.

Adaptation Scotland facilitated workshops to help participants identify existing vulnerabilities and future climate change risks for Scotland's rail network. An important part of the process was identifying how outside influences could affect ScotRail's ability to run normal rail services. The Environmental Sustainability & Climate Change Manager said "it was useful to involve other departments and stakeholders who would not normally consider how climate change might affect them or other rail users".

Adaptation Scotland recommended developing a flexible adaptation plan to enable ScotRail to take timely action in light of uncertainties and changing business needs. Adaptation Scotland supported ScotRail to test its new business adaptation plan template, and it is hoped that ScotRail will have a fully operational adaptation plan by 2014.

First ScotRail
Adaptation Scotland

Flooding of energy infrastructure is likely to disrupt supply to households. Without adaptive action, climate change impacts could cause more frequent power cuts.

Climate projections indicate that annual rainfall may remain fairly stable, however it may be variable within the year, and is subject to more uncertainty at local levels. A decline in water availability and water quality in some areas may impact on water resources. Scottish Water uses climate projections in longer term water resource planning to ensure that it can make appropriate choices to ensure resilient service.

Climate change also presents risks to water quality – the expectation for increased variability means there may be more runoff of nutrients and soil particles. A key element in managing this will be increased monitoring to understand how catchments may be changing.

A decline in water availability and water quality is likely to impact on private water supplies (PWS) which already suffer from greater challenges in terms of meeting existing quality standards. Private water supplies (PWS) are the responsibility of the owners and users of the supplies and regulated by local authorities through the enforcement of legislation relating to PWS. There are around 20,000 PWS in Scotland, providing water for 3% of Scotland's population.

Scottish Government currently has a programme of work underway to assess the issue of quantity and quality of supply by private water supplies. These include:

- A grant specifically aimed at improving the quality of private water supplies. A non means tested grant of £800 per property is available.
- A research project to review the impact of varying water quality on the effectiveness of ultraviolet treatment (this is one of the most common types of treatment for PWS).
- A research project to understand the wider impacts and risks of private water supplies to public health and economic development. It will concentrate on the larger "Type A"[10] private water supplies that supply business premises and will include a review of the options for improving them including a connection to the public supply.

Buildings - Damage to properties from rain penetration and mould/algal growth not only results in financial costs, but can also affect the health of the occupants. In Scotland the greatest threats to infrastructure and the built environment will come from water, wind and heat. Property and buildings may be threatened because they are located in areas that are at increased risk of floods or landslips. There is currently limited information on the probabilistic projection of wind speed, although, wind-driven rain is likely to become more prevalent and any increase in surface water discharge from buildings will need to be managed. Space for landscaping however, offers opportunities for mitigating the impacts of wind driven rain.

Buildings and other structures of significant historical importance may be particularly vulnerable to the impacts of climate change and special consideration must be given to how these cultural assets can best be preserved in the face of a changing climate. Increasing sea levels and the impact of coastal erosion also makes protecting Scotland's vulnerable archaeology and coastal landscapes vital.

---

[10] Type A are those which supply 50 or more people, supply ten or more cubic meters of water per day or supply any kind of public or commercial activity.

Objectives, Policies and Proposals

This Chapter contains the objectives and the policies and proposals to drive the progress towards meeting the objectives. The objectives describe what is hoped will be achieved in the long-term (up to 2050) and the policies and proposals set out the priorities for this Programme.

The following objectives, policies and proposals address the relevant risks identified for the Built Environment, Energy, Transport and Water by the CCRA. The objectives are inter-related and are being addressed in a coherent way, recognising that they are mutually reinforcing with strong synergies across them.

What is already being done?

The following table sets out what is being done by Scottish Government and key public bodies at a national level to help build resilience and deliver the objectives for buildings and infrastructure networks. It includes a wide range of existing and planned policies, legislation and on-going action.

Objective B1 – Understand the effects of climate change and their impacts on buildings and infrastructure networks			
No.	Policy and description	How will this help deliver the Objective?	Who will deliver?
B1-1	Research to identify necessary resilience measures for new buildings including: • Wind loading for small buildings; • Effects of wind driven rain on external fabric; • Ability of buildings to be adequately ventilated in the summer, and • Surface water source control from hard standings.	Make buildings more resilient to climate change. Provide the design community with tools and better information on adaptation measures for climate change. This should lead to better designed buildings suited to the environment in which they will be located.	Scottish Government
B1-2	Research to **identify necessary resilience measures for existing buildings including**: • Thermal performance of the traditional building envelope and upgrading options available to older structures to improve energy efficiency; • Physical effects on buildings of changing weather patterns and profiles; • Quantify heritage assets affected by climate change using GIS and UKCP09;	Make buildings more resilient to climate change. Progress on mapping anticipated coastal erosion/flood risk will be measured by the development of a methodology for assessing climate change risk to historic sites, the creation of a climate change risk register for properties in the care of Historic Scotland and the incorporation of these into management planning and resource allocation. The results of research into climate change threats to the historic environment will be published and current guidance amended where appropriate.	Scottish Government, Historic Scotland

	• Collate action on understanding and mapping anticipated coastal erosion/flood risk to cultural heritage.		
B1-3	**Implement Secure and Resilient - A CNI Strategy for Scotland.** The strategy provides the overarching vision and strategic direction for all Critical Infrastructure (CI) Resilience stakeholders in Scotland, with the ultimate aim of enhancing the resilience of CI in Scotland.	Will enhance the resilience of energy infrastructure to flooding and other climate related risks. In particular, will enhance the resilience of the critical national infrastructure (CNI) which is essential for keeping the country running.	Scottish Government, CNI Site operators, UK Government, Energy Regulator, Scottish Environment Protection Agency
B1-4	**Trunk Road Customer Care Survey, Passenger** focus survey (rail passenger survey every six months) and National Household Survey.	Stakeholder attitude surveys will produce yearly assessment of public attitude on disruption. The various surveys undertaken by Transport Scotland will ask questions on the stakeholder's perception and attitude to severe weather and climate change. It will aim to build up a picture of transport users attitudes to climate change disruption in particular.	Transport Scotland
B1-5	**National Transport Strategy (2006)** • Review of climate impacts on transport networks with future recommendations; • Monitoring report on (visitor) demand against (transport network) capacity.	Will help to: • Assess the suitability of existing transport routes and nodes that specifically support lifeline services when the effects of high-winds and storm disruption are taken into account between 2013 and 2018. This work will be undertaken in conjunction with the recommendations within the 'Annual Review of Life-Line Services'. • Monitor demand against capacity across all transport modes.	Transport Scotland
B1-6	**A report on risks from fog projections**	Will help to determine if there will be significant effects from fog for the transport network.	Transport Scotland, Society of Chief Officers of Transportation in Scotland
B1-7	**Research under the Landslide Implementation Plan (2008)** Will collect and analyse information/data to determine which areas of the transport network are susceptible to landslips.	Delivery of the recommendations and findings from the Landslide Study to reduce exposure of roads to landslides.	Transport Scotland

B1-8	**Support the report on "Wetter weather, public transport and traffic/congestion patterns in urban areas".**	The report will improve understanding about how wetter weather, along with an increasing emphasis on public transport, may change traffic and congestion patterns in urban areas.	Society of Chief Officers of Transportation in Scotland
B1-9	Establish a **central coordinating point for information and data collection relating to climate effects on the transport network** and for developing knowledge sharing activities for this sector.	Transport Scotland's Road Asset Management Plan (RAMP) will be the central coordinating point for information and data collection relating to climate effects on the trunk road network.	Transport Scotland
B1-10	**Scottish Road Network Climate Change Study (2005)** Continue to implement and deliver the programme of design, research and policy initiatives identified in the Scottish Road Network Climate Change Study.	Completion of actions listed in the Study will enhance the resilience of the road network.	Transport Scotland
B1-11	**Engagement with World Road Association and UK and European Road/Transport Authorities.** Yearly report update on Transport Scotland's website outlines benefits accrued from links with European transport agencies.	Exchange information and share best practice experience with transport providers in other countries on coping with wetter conditions, with particular emphasis on flooding.	Transport Scotland
B1-12	**Flood Risk Management Plans** The Flood Risk Management (Scotland) Act 2009 requires the development of Flood Risk Management Strategies (FRMS) and Local Flood Risk Management Plans (LFRMP).	Local Flood Risk Management Plans will include full consideration of properties and key energy, transport, water and ICT infrastructure which may be at risk. This work builds on the National Flood Risk Assessment published in December 2011.	Scottish Environment Protection Agency, Scottish Water, Local Authorities, other responsible authorities
B1-13	**River Basin Management Plans (RBMP)** The RBMPs set out how we can enhance the environmental quality of rivers, lochs and seas, delivering greater benefits for the environment, and safeguarding them for future generations.	Will ensure greater resilience in terms of water quality and quantity.	Scottish Environment Protection Agency, responsible authorities and land managers
B1-14	**Study of impact of flows on sewerage network.** Study will use both rainfall and wider climate change data.	Will set out how Scottish Water will take account of sewerage flows when improving and maintaining its waste water assets in future.	Scottish Water, Scottish Environment Protection Agency

Objective B2 – Provide the knowledge, skills and tools to manage climate change impacts on buildings and infrastructure			
No.	Policy and description	How will this help deliver the Objective?	Who will deliver?
B2-1	Policy to introduce, under the building regulations, a new requirement to extend non-domestic sustainability labelling to school buildings. This will increase awareness of sustainability features and continue their adoption.	This ties in with the Scottish Futures Trust Schools programme and is a pathfinder for extending sustainability to all non-domestic buildings. It will encourage the sustainable design and construction of all new buildings. For example, the introduction of measures to minimise the potential for summertime overheating. Defining higher standards to measure sustainability will enable higher quality buildings to be created and for such benefits to be formally recognised.	Scottish Government
B2-2	**Sustainable Urban Drainage Systems (SUDS) Working Party** National promotion of SUDS. [SUDS are water management practices and facilities designed to drain surface water in a manner that will provide a more sustainable approach than the conventional practice of routing run-off through a pipe to a watercourse.]	Guidance to inform and educate homeowners on the control of surface water around buildings.	Scottish Government, Scottish Environment Protection Agency, Scottish Water, Society of Chief Officers of Transportation in Scotland
B2-3	**Water Use Efficiency** To introduce under the building regulations a new mandatory standard for water efficiency provision in dwellings to reduce carbon emissions and fuel.	Will help reduce demand for water and save energy.	Scottish Government
B2-4	**Implement Historic Scotland's Climate Change Action Plan (2012-2017)** This plan aims to improve the condition of the historic environment and reduce the number of historic buildings and monuments at risk from the impacts of climate change.	Risk assessment will be undertaken to evaluate which sites managed by Historic Scotland are most at threat from coastal erosion, flooding, damp and mould and rainwater penetration. This will improve decision-making for prioritising the on-going conservation and maintenance programmes, thus ensuring the long term survival of the most valuable assets. Technical reports and new guidance will reference the latest research by Historic Scotland on adaptation measures for traditional and historic buildings, including updating of Guide for Practitioners 6.	Historic Scotland

B2-5	**Joint agency climate action programme** The Scottish Environment Protection Agency (SEPA), Scottish Natural Heritage (SNH), Forestry Commission Scotland (FCS) and Historic Scotland are working towards a programme of action to help protect historic sites and property from the impacts of climate change.	Aims to reduce flood risk through the use of natural flood management and the provision of advice on the management of historic sites, including archaeological sites, and property exposed to flooding and coastal erosion.	Scottish Environment Protection Agency, Historic Scotland, Scottish Natural Heritage, Forestry Commission Scotland
B2-6	**Home Energy Efficiency Programme for Scotland.** Delivering heating and insulation measures across Scotland to help improve energy efficiency and reduce energy demands of existing housing stock in the most fuel poor areas.	The main aim of this policy is to reduce fuel poverty and help drive down greenhouse gas emissions from homes through upgrading Scotland's ageing housing stock. This is expected to help reduce overall energy demands on our energy infrastructure thereby helping to increase resilience.	Scottish Government, Local Authorities, Energy companies
B2-7	**Liaise with industry on thermal generation** (generation of electricity from sources that create heat, such as coal, gas and nuclear). To improve communications and promote joint working, the Scottish Government established the Thermal Generation and Carbon Capture and Storage Industry Leadership group as a joint liaison between Government and industry to steer and guide policy direction on matters relating to thermal generation.	Will review the efficiency of power station cooling processes in light of climate change projections and ensure that climate change adaptation is fully considered in the future development of thermal generation and CCS policy in Scotland. Whilst energy policy is reserved, the Scottish Government has a role to play in developing CCS and Thermal generation due to responsibilities and duties in relation to planning, consents and environmental regulation.	Scottish Government. Scottish Environment Protection Agency, Industry

B2-8	**Marine Research Strategies and Monitoring Programmes.**	Marine Scotland will use marine research strategies and monitoring programmes to gather data on the impact climate change is having on the seas. This will help inform future adaptation policies and proposals.	Scottish Government (Marine Scotland) with support from others e.g. Scottish Natural Heritage, Joint Nature Conservation Committee, marine users
B2-9	**National Marine Plan (NMP)** The NMP will shape national objectives and policies surrounding Scotland's coastal and marine management.	The NMP will include clear policies for climate change mitigation and adaptation and should identify the development or activities most likely to be affected by the climate change impacts.	Scottish Government (Marine Scotland) and Marine Planning Partnerships
B2-10	**Regional marine plans**	Regional marine plans should include policies with regards to climate change mitigation and adaptation.	Scottish Government (Marine Scotland) and Marine Planning Partnerships
B2-11	**Transport Scotland Asset Management Strategy** Utilise National Flood Risk Assessment (NFRA) to identify locations of potential flooding across transport network.	The Transport Scotland Asset Management Strategy will take account of the future climate. It will determine which areas of the transport network are susceptible to flooding, inundation, subsidence and ground water to improve knowledge on capacity and capability of these assets.	Transport Scotland, Society of Chief Officers of Transportation in Scotland
B2-12	**High Winds Strategy (2009)** Strategy for managing the impacts of high winds on the trunk road network.	Regular reviews of the network to identify locations where wind management procedures should be developed.	Transport Scotland
B2-13	**Third and Fourth Generation road maintenance contracts** Revise/update maintenance regime procedures to prioritise subsidence and incorporate weather events into repair work programme.	Updates will help: • Transport networks and emergency responders react effectively to unexpected climatic events; • Road networks to be more resilient to weather events and planning repair work to take account of changes in weather patterns; • Ensure works to prevent subsidence are dealt with as a priority, and comprehensively, where financial resources allow.	Society of Chief Officers of Transportation in Scotland, Transport Scotland

B2-14	**Implement the Scottish Integrated Maritime Transport Strategy.**	Will assess the vulnerability of coastal transport infrastructure to sea level rise and flood risk. Will also assess potential sea level rise risk at specific Scottish ports.	Transport Scotland, Society of Chief Officers of Transportation in Scotland
B2-15	**Road Scotland Act (1984): Asset Management Plans and Network Rail Asset Management Policy** Enhanced monitoring of bridges and other structures within inspection regimes for those structures known to be at risk. Further development of risk assessment for scour, debris impact & inundation as guidance and changes evident from inspections become available.	Will help manage risks to road and rail bridges.	Transport Scotland, Society of Chief Officers of Transportation in Scotland
B2-16	**Road Scotland Act (1984): Implement Resilience Plans**	Maintain the current level of winter preparedness across road networks.	Transport Scotland, Society of Chief Officers of Transportation in Scotland
B2-17	**Local Forest Management Strategies to Tackle Slope Instability.** Focussed work at key locations on the National Forest Estate.	Will help combat slope instability to prevent damage to the transport network.	Forest Enterprise Scotland, Transport Scotland
B2-18	**High level output specification for railways;** related to the public performance measures to consider "severe disruption".	This is about measuring the volume of trains running through a severe disruption and this is a key performance indicator for the next rail franchise.	Transport Scotland, Network Rail
B2-19	**Gather data to inform Scottish Water's investment programme from 2015 onwards which will address adaptation needs of water infrastructure.**	Understand how future and existing assets and operations should be adapted to minimise the threats from climate change. Information on the programme and how the water industry operates is available from: http://www.scotland.gov.uk/Topics/Business-Industry/waterindustryscot/who.	Scottish Water

B2-20	Integrated approach to catchment modelling	Improved monitoring of rainfall, river and surface water flows.	Scottish Water
B2-21	**Manage leakage to water distribution network** Annual leakage levels agreed between Scottish Water, Scottish Government and Regulators.	Will help reduce energy and cost of supply.	Scottish Water

Case Study

Use of Sustainable Urban Drainage system at Tollcross Aquatic Centre Glasgow

The original swimming pool at Tollcross, Glasgow was extended to form a new aquatic centre as part of the preparations for the commonwealth games 2014. The works created an opportunity to demonstrate environmental responsibility in the control of surface water. This was reflected in the use of a sustainable urban drainage system to deal with the water run-off from both the extended roof area and car park.

The car park is constructed from Tarmac Dry, a propriety permeable pavement system. Any surface water carrying hydrocarbons/pollutants is cleaned as it percolates down through the stone sub-base before infiltrating to ground. Water is also allowed to drain away via a HydroBrake to the existing surface water sewer at a 'Greenfield' flow rate of 1.26 l/sec. Water that does not drain via the HydroBrake or through infiltration is temporarily stored in the voids of the stone sub-base until it can eventually escape. Roof run-off is restricted to 'Greenfield' flow rate (1.8 l/sec) by means of a HydroBrake and then flows to an infiltration trench receiving 1 level of treatment. Surplus water is temporarily stored in a crated attenuation tank. Once capacity is available remaining surplus water drains from the tank via the HydroBrake and infiltration trench to the Tollcross Burn.

Scottish Government

Objective B3 – Increase the resilience of buildings and infrastructure networks to sustain and enhance the benefits and services provided

No.	Policy and description	How will this help deliver the Objective?	Who will deliver?
B3-1	**Building Regulations Guidance** The Building Regulations set standards for design and construction which apply to most new buildings and many alterations to existing buildings in Scotland. These standards and guidance are kept under review to allow them to reflect best practice and adapt to changes in climate. Current guidance is being reviewed to consider potential impacts of climate change on buildings with regards to wind driven rain and the effect of increasing air-tightness within buildings on air quality.	• New guidance will emphasise the need for flood risk assessments and flood design strategy; • New guidance to be introduced on efficiency of water use within buildings; • Guidance within the Building Regulations Technical handbooks to be revised to reduce the risk of new buildings being affected by wind driven rain, damp, mould and insect pests. This should improve the resilience of buildings to the likely impact of climate change.	Scottish Government, Historic Scotland
B3-2	**Planning Advice Notes (PAN)** provides advice and information on technical planning matters. As part of the modernisation of the planning system, the planning advice notes are being reviewed and consolidated. Revised PANs are to be underpinned by the principles of sustainable flood risk management.	The consolidated PAN on flooding, water and drainage will provide advice and guidance for applicants, developers and local authorities on the role of sustainable flood risk management. It will highlight the role of climate change adaptation with regards to flood risk and the water environment and promote the avoidance of development in medium to high flood risk areas. It will also provide guidance on sustainable drainage systems (SUDS).	Scottish Government
B3-3	**Scottish Planning Policy (SPP) (Climate Change)** SPP identifies that short and long term impacts of climate change should be taken into account in all decisions throughout the planning system. Scottish Planning Policy is the statement of the Scottish Government's policy on nationally important land use planning matters.	The SPP sets out how the planning system should help address Climate Change through mitigation and adaptation measures, providing relevant examples for planning authorities to consider. For example: • To promote the benefits of open spaces the SPP advises that planning authorities should undertake an audit of the open space resource in their area and how well it meets the needs of the community and to use this to prepare an open space strategy which sets out the vision for new and improved open space and addresses any deficiencies identified. Planning authorities are also encouraged to integrate green infrastructure/networks into new development and	Planning Authorities

		regeneration proposals, • SPP requires development proposals that have a significant probability of being flooded, or that would increase the probability of flooding elsewhere, not to be permitted. Developers are encouraged to account for flood risk before committing to particular projects. The SPP provides policy guidance to planning authorities and developers on flood risk issues.	
B3-4	**Raise awareness and provide access to knowledge via Sust: Sustainability in Architecture programme** based at Architecture and Design Scotland.	Assist with the education of commissioning clients and designers on the issues and techniques relevant to sustainable design. This will help to provide the design community with tools and improved knowledge with regards to adaptation measures for climate change.	Scottish Government
B3-5	**Commission and promote demonstration projects** in association with funders/developers about the benefits of incorporating sustainable design in their projects.	A number of initiatives are already underway or planned. For example: • Scotland's Housing Expo; • Scottish Sustainable Communities Initiative (SSCI); • Polnoon Housing project.	Scottish Government
B3-6	**Promote Keeping Scotland Running - A Guide to Critical Infrastructure Resilience** Includes guidance to assist Government, Industry and Strategic Coordinating Groups (SCG's) in the implementation and delivery of enhancing resilience through sharing of best practice and risk/resilience analysis and assessment methodologies to support the wider 'Secure and Resilient' CNI Strategy in Scotland.	Will help enhance the resilience of critical infrastructure to climate change. This would ensure that the emergency planners are better sighted on risks affecting critical infrastructure and are better prepared to deal with the impacts of climate change on these sites.	Scottish Government
B3-7	**Provide Energy efficiency advice and support** Establish single energy and resource efficiency service for business and public sector.	The roll out of the new service-"Resource Efficient Scotland" from 1 April 2013 will help improve energy efficiency therefore reducing demands on our energy supply infrastructure.	Scottish Government, Zero Waste Scotland

B3-8	**Civil Contingencies Act (2004): Transport resilience community engagement** Provide short briefing/guidance note for businesses and transport operators on the effects of climate change.	Encourage transport operators to take climate change into account when developing their business continuity plans.	Society of Chief Officers of Transportation in Scotland, Transport Scotland, Transport Operator companies
B3-9	**Improving driver skills in extreme weather (road and rail).**	Development of education programmes and learner training to cover how to drive in extreme conditions through: • **Eco-driver programme** in the Rail Franchise simulator to improve driving in extreme conditions; • **Freight sector engagement** with Road Haulage Association and Freight Transport Association.	Transport Scotland, Learning driver organisations
B3-10	**River Basin Management Plans (RBMP)** The RBMPs set out how we can enhance the environmental quality of rivers, lochs and seas, delivering greater benefits for the environment, and safeguarding them for future generations.	Will ensure greater resilience in terms of water quality and quantity.	Scottish Environment Protection Agency, responsible authorities and land managers

Research

The following research projects are underway or are planned to help meet the Objectives under this theme:

- **A report on risks from fog projections**, led by Transport Scotland in partnership with SCOTS, will review available information on fog projections. This will help to determine if there will be significant effects from fog for the transport network.

- **Research under the Landslide Implementation Plan (2008)**, led by Transport Scotland, will collect and analyse information/data to determine which areas of the transport network are susceptible to landslips. Recommendations from the Landslide Study will continue to be implemented and delivered. Completion of actions listed in the study will reduce exposure of roads to landslides.

- **Report on 'Wetter weather, public transport and traffic/congestion patterns in urban areas' by** 2015. This will be led by SCOTS and the report will improve understanding about how wetter weather, along with an increasing emphasis on public transport, may change traffic and congestion patterns in urban areas.

- **Research on evaluating occupant interaction with ventilation systems in dwellings.** Ventilation standards are set by building regulations, supported by guidance within Section 3, Environment, of the technical handbooks. This project will examine whether a reduction in uncontrolled infiltrating air to dwellings may need to be replaced by a controlled means in order to maintain indoor air quality for the building and occupants.

- **Research on proposed changes to U-values. The u-values are set by building regulations, supported by guidance within Section 6, Energy, of the technical handbooks.** Details are required to aid the understanding of the principles of limiting infiltration, linear thermal bridging, precipitation and condensation and the application of these principles to improve Scottish construction practice.

What else needs to be done?

In some cases, the existing and planned action may be enough to achieve the objective. The following table sets out other possible additional courses of action. Some or all of these may become firm policies once development work is complete and/or financial resources allow.

Objective B1 - Understand the effects of climate change and their impacts on buildings and infrastructure networks				
No.	**Proposal and description**	**How will this help deliver the Objective?**	**Who will deliver?**
B1-15	Develop an **Energy Sector Climate Change impacts research programme.**	Develop an improved understanding of the climate impacts for energy, identified in the UK CCRA, where consequences or likelihood are unclear, unknown or require further evidence. This will include: • supporting research to identify the significance of increased energy demand and reduced energy generation efficiency which would help to quantify effects of climate change and reduce uncertainty. • identifying the potential issues associated with increased demand for water for cooling.	Scottish Government
B1-16	**Assessment of potential sea level rise risk at specific Scottish ports.** Will determine risk to current operating limitations at such ports.	Will help developments at new and existing ports take account of sea level rise risk and ensure all port operations are able to function at current standards.	Transport Scotland, Scottish Environment Protection Agency have key role as statutory advisor.
B1-17	**Tomorrow Railways and Climate Change Adaptation (TRACCA)**	Specific for the Rail Network in Scotland, this proposal will drive the consideration of climate change issues within rail network decision making.	Transport Scotland, railway partners
B1-18	To consider a long-term approach to the management of surface water to ensure that sewer systems are resilient to climate change.	An integrated approach to the drainage of surface water arising from impermeable surfaces such as roofs and roads that takes account of all aspects of the drainage systems and produces long-term and sustainable actions that will ensure they are resilient to the changing climate.	Partnership between Scottish Water, Local Authorities, Scottish Canals, developers, homeowners

Objective B2 – Provide the knowledge, skills and tools to manage climate change impacts on buildings and infrastructure			
No.	**Proposal and description**	**How will this help deliver the Objective?**	**Who will deliver?**
B2-22	**The drafting of regulations to implement Section 63 of the Climate Change (Scotland) Act 2009**. This aims to reduce greenhouse gas emissions and improve the energy efficiency of existing non-domestic buildings.	This should ultimately lead to improvements to the internal and external fabric and building services of existing buildings. Thereby increasing their energy efficiency. This should also increase the longevity of such buildings.	Scottish Government
B2-23	To extend the requirement **for sustainability labelling beyond schools to other non-domestic buildings**.	Reducing water use will reduce the energy consumed and the carbon emissions associated with distributing, processing and heating of water.	Scottish Government
B2-24	**Establish a Scottish Government Energy Sector Flood Risk work stream** (as part of the Energy Sector Resilience group) to develop a wider understanding of the flood risks on Scotland's energy infrastructure.	Develop improved knowledge of flood risks to wider energy infrastructure based on latest data available.	Scottish Government, Energy site and network operators
B2-25	**Network Rail Strategic Business Plan** Business Plan to demonstrate how severe disruption caused by weather will be addressed.	Maintain the current level of winter preparedness across rail networks.	Transport Scotland, railway partners

Objective B3 – Increase the resilience of buildings and infrastructure networks to sustain and enhance the benefits and services provided			
No.	Proposal and description	How will this help deliver the Objective?	Who will deliver?
B3-11	**High Level Output Specification and Scottish Ministers Guidance to the Office of Rail Regulation.**	The rail industry will contribute towards a greener Scotland and rail regulation must not act as a barrier in making the rail network and operations resilient to predicted future changes in the climate.	Transport Scotland, railway partners
B3-12	**Introduce new Guidance on good public transport interchange design to cope with more extreme weather.** (for bus shelter design, railway station etc.)	Passenger infrastructure will be designed and delivered to cope with more severe weather.	Society of Chief Officers of Transportation in Scotland, Transport Scotland and in conjunction with manufacturers
B3-13	**Work with UK Government and insurance industry to ensure the availability of flood insurance.**	Work with the UK Government and insurance industry to ensure continued availability of affordable flood insurance once the Statement of Principles comes to an end.	UK Government, insurance industry, Scottish Government and the other devolved administrations

Climate Ready Society

> **A Scotland with strong, healthy, resilient communities which are well informed and prepared for a changing climate.**

Introduction

This chapter considers the most important impacts of the changing climate on Scotland's society and sets out the Scottish Government's related objectives.

The following issues are considered in this chapter:

- The resilience of communities against climate change impacts and in particular on vulnerable people.
- The impacts from a changing climate on people's health and wellbeing.
- The preparedness of the emergency and rescue services to deal with climate change impacts.
- The impacts on businesses and industry from a changing climate.

There are strong links between Climate Ready Society and the other themes in the Programme. For example, there are links with the Buildings and Infrastructure Networks theme where the impacts of climate change on buildings can affect the health of occupants if not properly managed. Our success in adapting transport and energy infrastructure to the effects of a changing climate will in turn impact on the resilience of households, communities and emergency responders.

How is the changing climate likely to affect Scottish society?

Health and wellbeing – Climate change will impact on people's health and wellbeing. Extreme weather events and other climate-related impacts may reduce health and wellbeing, with consequently detrimental effects on Scottish society. For example, an increase in severe weather episodes such as flooding may result in an increase in mental ill health due to distress of displacement, loss of personal possessions and financial losses.

Wetter, warmer winters will have the potential to lead to increased algal and fungal growth in buildings, with consequential effects on those vulnerable to allergy diseases (e.g. asthma) and other respiratory diseases. Measures taken to control the spread of pests and diseases could lead to access restrictions in the countryside.

There may also be positive effects for people's health and well-being, for example reduced winter mortality and morbidity as a result of higher average winter temperatures. A projected rise in mean annual temperature, coupled with a projected reduction in rainfall levels presents an opportunity for healthier lifestyles such as walking, cycling and other outdoor activities which would have a positive outcome on

both physical and mental health. Higher temperatures may also lead to a reduced reliance on heating, helping to alleviate the detrimental effects of fuel poverty.

Emergency and Rescue Services – Climate change is likely to have an impact on the emergency and rescue services as severe weather events become more frequent.

When extreme weather events occur, the Fire and Rescue Service, the Police, Ambulance Service, Health Boards and other local responders are called on to respond. They are required under civil contingencies legislation[11] to work together to ensure the response is co-ordinated effectively.

A projected increase in the frequency of severe weather events, such as flooding, landslides and wildfires will increase the overall pressure on the emergency and rescue services which may impact on the ability of the services to respond. Pressures on the emergency services are also likely to increase due to warmer summers which could potentially lead to a greater uptake of outdoor activities, increasing the risk of accidents which the emergency services will need to respond to.

Communities – More frequent severe weather may disrupt the lives of individuals and communities. Preparing society to help with adaptation measures is key if the risk of climate change for communities and in particular, those most vulnerable is to be reduced.

Vulnerable groups such as the elderly, the disabled, single parents and those on low incomes are more at risk to the impacts of climate change, either because of physical vulnerability and/or less resources to draw on when an extreme weather event occurs. For example, the socially vulnerable are more at risk to the negative effects of flooding as they are more likely to live in properties that flood easily without the necessary resources to adapt their home as necessary, including having suitable insurance.

The impacts of the changing climate are also likely to be felt by rural communities in particular. Disruption of transport and communication links due to flooding will disproportionately impact on rural communities which are heavily reliant on them. Rural communities are also more reliant on private water supplies, which may be more vulnerable to the effects of climate change than public supplies, such as waterborne diseases.

---

[11] Civil Contingencies Act 2004

> **Case Study**
>
> **Communities addressing the challenges and opportunities that their area faces as a result of climate change**
>
> The Carse of Gowrie community has been working together over the last two years to address the challenges and opportunities that the area faces as a result of climate change.
>
> The work started in 2011 when Perth & Kinross Council and Adaptation Scotland ran a series of community engagement workshops. This helped people from across the area to find out about the changes in climate expected for the region and, discuss how these changes might impact the community.
>
> Following on from these workshops, community members formed a sustainability group to take forward local projects to build resilience and support the region in adapting to long term climate change. The community is now involved with a wide range of projects including state of the art online mapping work to record many community features. The maps will be used to help address current risks through the creation of a 'crowdmap' for recording and monitoring the consequences of weather events or recording animal and bird sightings. The analysis of data collected will provide an evidence base which will allow them to adapt and plan for long term climate change. An increased awareness of local climate change impacts has also led the community to get involved with projects to reduce carbon emissions, improve environmental sustainability and create networks for biodiversity to make the area more resilient.
>
> **Perth and Kinross Council**
> **Adaptation Scotland**

Businesses – The changing climate will present threats and opportunities to businesses and industries in Scotland. Some negative consequences will affect all kinds of businesses, such as: increased risk of flooding of buildings and other assets; disruption to transport and communication networks, with staff unable to get to work, and; disruptions to supply chains.

There are also likely to be specific consequences from climate change which could have a financial impact on certain types of businesses:

Insurance Industry: The insurance industry is directly exposed to climate change risks at home and overseas through the risks to underwritten products and decisions on where to invest its assets[12]. The cost of repairing damage to property and infrastructure from flooding and coastal erosion is likely to increase, and that is why the Scottish Government is working with Defra, the insurance industry and the other devolved administrations, to make sure that insurance remains widely available and affordable in flood risk areas, and that this doesn't cause insurance prices to rise for other people.

---

[12] PWC Report: International Threats and Opportunities of Climate Change to the UK.

The Environment and Climate Change Minister has met the ABI and others to raise Scottish flood insurance issues, but financial services remain a reserved matter. However, Scottish Government Ministers and officials will continue to engage with Defra and the insurance industry to emphasise the work being done in Scotland to manage flood risk and to put forward the Scottish perspective of the UK Government's deliberations.

Supply Chains: The Scottish economy may be affected by the impacts of climate change overseas. These effects may be considerable, and possibly larger than the immediate impacts of climate change in Scotland. The effects will be felt in particular in relation to supply chains and commodity pricing. Supply chains may be affected by restrictions in the availability of key products caused by climate impacts such as extreme events, flooding or drought. Transport disruption caused by climate change related events overseas can also affect supply chains.

At a global scale, the impacts of climate change could also lead to restrictions on food supply – leading to higher prices and lower availability in Scotland. This would exacerbate food-related health and social inequalities in Scotland. However, food security in Scotland is unlikely to be as severely impacted as that in many other parts of the world.

Trade and Investment: Scotland's trade and investment will also be affected by climate change overseas. At present, the largest proportion of our trade and investment is with other European countries and the United States, which are relatively well equipped to manage the impacts of climate change. However, as our trading and investment patterns change, Scotland may find itself exposed to greater risks from climate change impacts overseas.

However, the risks to Scotland may be low, relative to many other countries and, together with its transition to a low-carbon economy, this may make Scottish businesses more attractive to investors, provided the risks that we do face are managed appropriately.

Objectives, Policies and Proposals

This Chapter contains the objectives and the policies and proposals to drive the progress towards meeting the objectives. The objectives describe what is hoped will be achieved in the long-term (up to 2050) and the policies and proposals set out the priorities for this Programme.

The following objectives, policies and proposals address the relevant risks identified for health and wellbeing, emergency rescue services and, businesses and services by the CCRA. The objectives are inter-related and are being addressed in a coherent way, recognising that they are mutually reinforcing with strong synergies across them.

What is already being done?

The following table sets out what is being done by the Scottish Government, NHS Scotland and other public bodies at a national level to help build resilience and deliver the objectives for Scotland's society. It includes a wide range of existing and planned policies, legislation and on-going action.

Objective S1 - Understand the effects of climate change and their impacts on people, homes and communities
No.	**Policy and description**	**How will this help deliver the Objective?**	**Who will deliver?**
S1-1	**The Food Standards Agency (FSA) to continue to develop a greater understanding of the main food borne disease related pathogens** in terms of their transmission routes and vectors to identify opportunities to control these.	FSA continues to conduct research relevant to high risk pathogens. For example, the recent publication of research into E. coli to identify practical ways for reducing E. Coli in cattle. This will allow the FSA to consider methods such as the use of probiotics in feed, vaccination of animals and further bio security measures on farms. The FSA food surveillance sampling database also holds all data from participating Local Authorities on the results of food samples analysed for pathogens, providing information of emerging risks.	Scottish Government, Food Standards Agency

S1-2	**Research to identify and develop an understanding of communities, in particular vulnerable groups to the impacts of climate change.** Building on work on Climate Change, Justice and Vulnerability by the Joseph Rowntree Foundation (2011), the Scottish Government has worked to map flood disadvantage in Scotland, This work considers how underlying social vulnerability can exacerbate the impact of flood events and enables a closer look at the vulnerability characteristics of flood disadvantaged neighbourhoods. A report providing a first look at flood disadvantage in Scotland will be published in Summer 2013.	Develop a robust research base to support informed medium and longer term operational decision making.	Scottish Government

Objective S2 – Increase the awareness of the impacts of climate change to enable people to adapt to future extreme weather events

No.	Policy and description	How will this help deliver the Objective?	Who will deliver?
B3-1	**Building Regulations Guidance** The Building Regulations set standards for design and construction which apply to most new buildings and many alterations to existing buildings in Scotland. These standards and guidance are kept under review which allow them to reflect best practice and adapt to changes in climate. Current guidance is being reviewed to consider potential impacts of climate change on buildings with regards to wind driven rain and the effect of increasing air-tightness within buildings on air quality.	• New guidance will emphasise the need for flood risk assessments and flood design strategy. • New guidance to be introduced on efficiency of water use within buildings. • Guidance within the Building Regulations Technical handbooks to be revised to reduce the risk of new buildings being affected by wind driven rain, damp, mould and insect pests.	Scottish Government
S2-1	**Eradicate fuel poverty by 2016 as far as practicable.** Energy efficiency is one of the three key influences on fuel poverty, along with household income and fuel costs.	Greater instances of extreme weather can be expected to change the demand for heat. Rising fuel prices may continue to cause fuel poverty. The main aim of this policy is to reduce fuel poverty. It is supported by other actions such as the energy efficiency elements of the Scottish Housing Quality Standard (SHQS) (which social housing must meet by 2015); the proposed Energy Efficiency Standard for Social Housing (EESSH) with first milestones to be met by 2020; and Scotland's national retrofit programme (Home Energy Efficiency Programmes for Scotland (HEEPS) providing and levering in further incentives to improve energy efficiency.	Scottish Government

S2-2	**Improve Housing Quality** by ensuring all houses meet the tolerable standard, and that all social housing meets the Scottish Housing Quality Standard (SHQS) by 2015.	The tolerable standard is a minimum condemnatory standard which all houses in Scotland must meet, and includes being substantially free from rising and penetrating damp as well as having satisfactory thermal insulation (defined as the presence of loft insulation where a property can have it). The tolerable standard also forms part of the SHQS, which all social housing providers are committed to meeting by 2015.	Scottish Government, local authorities, RSLs, home owners
S2-3	Develop draft regulations for consultation by 2015 which would **set minimum standards for energy efficiency in private sector housing**, likely to be under section 64 of the Climate Change (Scotland) Act 2009.	Over time, minimum standards for private sector housing will lead to improvements in energy efficiency. It could also encourage behaviour change in raising awareness of the need for adaptations amongst home owners.	Scottish Government, working group of key stakeholders, home owners
S2-4	**Scottish Government to continue to raise awareness and provide information to society on how best to adapt to a changing climate.**	Adaptation Scotland is supporting communities vulnerable to climate change impacts. A toolkit for communities and community-facing organisations has been developed, built around a Training Module: Building Resilient Communities – preparing for the impacts of climate change.	Scottish Government, Adaptation Scotland
S2-5	**The Food Standards Agency (FSA) to improve the understanding of food safety related behaviour by consumers** and targeted education to assist in greater consumer knowledge and understanding of risks in the domestic sector.	The FSA conducts regular social research into consumer behaviour. Every 2 years a UK survey, which has a specific element for Scotland, provides information on consumers understanding of risks, their knowledge and their attitudes in relation to food safety and healthy eating. The FSA also holds regular citizen forums to gather the views of consumers on numerous policy matters. Both of these allow the FSA to target information to improve consumer's knowledge via relevant channels including events, published literature, PR and media. It is anticipated that climate change will bring new risks and challenges to food safety and healthy eating, being able to identify these and assist consumers in mitigation of risks will continue to be important.	Scottish Government, Food Standards Agency

S2-6	**Develop psychosocial disaster recovery guidance** to support a better response to people who have experienced trauma. This is part of the Scottish Government's Care for People guidance.	Development of areas to support a better response to people who have experienced trauma. This is part of the Scottish Government's Preparing Scotland work on resilience.	Scottish Government
S2-7	**Develop and promote resources which support capacity building in communities, to help build resilience to emergencies, including responding to severe weather events**. Provide advice and information for responders, community groups and the voluntary sector to promote greater awareness amongst individuals and communities of what they can do to protect themselves, their homes and businesses from the consequences of emergencies, such as severe weather events.	This information and advice will help create more resilient communities.	Scottish Government in liaison with local communities and voluntary sector.
S2-8	**Continue to develop the Ready Scotland website** as a source of advice and information for the public about preparing for and managing the potential consequences of emergencies, including severe weather events.	Ready Scotland aims to raise awareness of the risks and consequences of a range of emergencies and to provide the public with practical advice and information to support their preparedness and resilience.	Scottish Government
S2-9	**Undertake annual assessments of the potential vulnerability of emergency service Critical National Infrastructure (CNI) sites** to threats, including the impacts of climate change.	Improved knowledge and preparedness of exposure and vulnerability to climate change risks.	Scottish Government, Fire and Rescue Service, Police, Special Air Service
S2-10	**Promote and support SEPA flood risk awareness raising activities** providing the public with advice and information about their flood risk and on potential preventative action that can be taken by individual householders in advance of a potential flood.	Increased public awareness of their flood risk and greater sign-up to SEPA's Floodline direct warnings service will increase communities' preparedness and resilience.	Scottish Environment Protection Agency, Scottish Government
S2-11	**Deliver Flood Warning Dissemination Programme** to enable Floodline messages to be delivered direct to all registered users. This will help provide better flood warning for members of the public in advance of an anticipated flooding event.	Better flood warning and on-going risk assessment giving as much notice is key to adaptation as it allows the emergency services and the public to prepare for and respond to potential flooding incidents.	Scottish Environment Protection Agency

S2-12	**Increase awareness of flood risk and flood resilience in schools** by working through the Curriculum for Excellence.	Working through the Curriculum for Excellence, the project will raise awareness of flood risk among school pupils. Working with school pupils helps householders of the future as well as their family members now to build their resilience and adapt to climate change. School flooding workshops run by Heriot Watt University, involving an interactive flooding model, will demonstrate the importance of making room to store and slow water in the urban environment and help change individual behaviours about slabbing over gardens etc.	Education Scotland, Scottish Government, Scottish Environment Protection Agency, Heriot Watt
S2-13	**Ready For Emergencies resilience resource for schools.** This explains the risks associated with flooding and severe weather and helps raise awareness of how to cope with such emergencies.	The resource covers flooding and severe weather and builds the understanding and preparedness of school pupils to the risk and coping with emergencies, including those from climate change impacts.	Education Scotland
S2-14	**Improve education on flood risk management to increase awareness and understanding of the importance of community resilience.**	Enhanced education on flood risk management for future generation of householders and flood risk managers, and help with future flood-related job recruitment. Will help encourage people to take action to protect themselves, their family and their property even in areas which have not experienced flooding before.	Scottish Government, Scottish Environment Protection Agency, Education Scotland
S2-15	**Support the Scottish Flood Forum.** This Group provides advice and support for communities and businesses to help build resilience and reduce their flood risk. The Group also offers assistance to individuals and communities after flooding events.	The independent Scottish Flood Forum works directly with communities and businesses to reduce their flood risk. It also provides recovery support after flooding events. The SFF helps build community resilience and individual responsibility.	Scottish Government

Case Study

Argyll and Bute Community Emergency Planning Initiative

In winter 2012, a severe gale left many parts of Argyll without power for up to 4 days. After recovery was complete the subsequent debrief identified a need for Argyll and Bute Council to work with communities to improve their resilience during weather related emergencies. The council wanted to ensure that individuals are better prepared for severe weather and to encourage them to think less about what the emergency services can do for them and more about what they can do for themselves.

The Council project team created a handbook for Argyll communities based on the guidance and toolkit from the Scottish Government's Ready Scotland website. Strathclyde Police, Strathclyde Fire and Rescue, NHS Highland, HM Coastguard, Scottish Government, British Red Cross, WRVS, Argyll Voluntary Action, Scottish Power and Scottish Southern Energy all contributed. The handbook 'A Guide to Helping Your Community Prepare an Emergency Plan' was then issued to all 54 community councils in Argyll. The handbook can be found at http://www.argyll-bute.gov.uk/community-resilience.

The production of the handbook has been backed by a programme of engagement by the Council, Argyll Voluntary Action and a range of partner agencies, providing support and advice to those communities which wanted to get involved. Action by communities has been very effective, with over 50% of communities in Argyll and Bute now preparing community emergency plans.

Argyll and Bute Council, with support from the Scottish Government, have also issued "emergency kits" to communities involved, which will help if they need to implement their emergency plan. The kits include things like a wind up radio, battery operated torches and foil blankets.

When severe weather hit Arran and Kintyre again in March 2013, the work done by communities proved very valuable in helping to co-ordinate the response to, and recovery from, the resulting emergency.

Further information about this and other case studies of good practice in building community resilience to emergencies can be found at www.readyscotland.org.

Argyll and Bute
Scottish Government

	Objective S3 – Support our health service and emergency responders to enable them to respond effectively to the increased pressures associated with a changing climate		
No.	**Policy and description**	**How will this help deliver the Objective?**	**Who will deliver?**
S3-1	**NHS Scotland Boards to develop individual Climate Change Adaptation Plans** in accordance with the NHS Scotland Sustainable Development Strategy.	Mandatory requirement for each NHS Board to have a Climate Change Adaptation Plan.	NHS Boards
S3-2	**Scotland Property and Asset Management Plans** to provide, maintain and develop a high quality, sustainable asset base to ensure the delivery of high quality health care.	Ensure that NHSScotland provides, maintains and develops a high quality, sustainable asset base that supports and facilitates the provision of high quality health care and better health outcomes and, that the operational performance of assets is appropriately recorded, monitored, reported and reviewed and, where appropriate improved.	NHS Boards
S3-3	VTEC/E.Coli 0157 Action Plan	The Action Plan will seek to address all current gaps in responses to VTEC/e.coli infection in Scotland, and to have a beneficial effect on other diseases that may be spread via the same pathways as VTEC/ E. coli O157 (e.g. protection of private water supplies).	Scottish Government, VTEC/E.coli Action Group
S3-4	**NHS Procurement and Estates to consider accommodation design for housing IT equipment.**	Ensure that IT suites in NHS properties take account of heat generated by equipment, and that any potential overheating issues are addressed at the time of installation of equipment.	Scottish Government, National Services Scotland, National Procurement, NHS
S3-5	**Revise Scottish Capital Investment Manual** to take account of changes in sustainable development policy and strategy.	Scottish Capital Investment Manual is reviews and revised as necessary.	Scottish Government, Health Facilities Scotland
S3-6	**Improve Strategic Coordinating Groups (SCGs) risk and impacts assessment guidance.** This will provide a more consistent approach to assessing the potential for emergencies, including severe weather events and widespread flooding.	A risk assessment process for measuring the capability and capacity to respond to emergencies in Scotland. A revised process will be issued no later than November 2013 in line with the SCG reform and will use the National Risk Assessment (NRA), National Resilience Planning Assumptions (NRPAs) and Local Risk Assessment Guidance (LRAG) to carry out assessments.	Scottish Government, responder agencies

S3-7	To enhance the capability of Scotland's Fire and Rescue services through assessing their operational preparedness and response capabilities to severe weather events.	Current assessment of operational preparedness and response capability to severe weather events.	Scottish Fire and Rescue Service
S3-8	**Continue to assess the potential impacts of environment factors on the delivery of police services through the Scottish Police Service Strategic Assessment.**	The police service will continue to assess the impact of environmental factors on possible increases in demand to deal with for example, more severe and more frequent weather events or possible increases in organised outdoor events. This forms part of the routine and regular strategic assessment process.	Scottish Police Service
S3-9	**Preparing Scotland suite of guidance** to support legislative compliance, good practice and enhanced resilience across Scotland's responder agencies and wider resilience community.	Provision of guidance for responder agencies on complying with their duties under civil contingencies legislation.	Scottish Government
S3-10	**Develop and extend training of accredited 'incident commanders'** to provide greater resilience across the emergency and rescue services to deal with major or critical incidents.	Improved multi-agency operational capacity to ensure resilience of command to deal with any major or critical incident.	Scottish Police Service
S3-11	**Promote and support the production of 'Lessons Learned'** from agency debriefs on weather related events and action the lessons learnt through changes to policy, processes and training.	Collective responsibility to identify lessons from single and multi-agency debriefs on climate-related events and action the lessons through changes to policy, processes and training.	Scottish Government, responder agencies
S3-12	**Delivery of a wide programme of specialist and technical training.**	Equipping Fire and Rescue Service to respond to all types of incidents, including those resulting from severe weather.	Scottish Fire and Rescue Service
S3-13	**Support a Scottish flood forecasting service.**	An improved forecasting service – up to five days' warning of potential flood risk – enables the emergency and rescue services to be better prepared to respond. It also helps address vulnerable communities' flood risk.	Scottish Environment Protection Agency, Met Office

What else needs to be done?

In some cases, the existing and planned action may be enough to achieve the objective. The following table sets out other possible additional courses of action. Some or all of these may become firm policies once development work is complete and/or financial resources allow.

Objective S1 - Understand the effects of climate change and their impacts on people, homes and communities			
No.	**Proposal and description**	**How will this help deliver the Objective?**	**Who will deliver?**
S1-3	**Build on the Health Protection Scotland Scoping Report on the effect of extreme weather events on public health to identify priority areas for action.**	Consider the findings of the report and implement key recommendations of the report. This is a wide-ranging report which provides a comprehensive overview of the potential impacts on health due to climate change.	Health Protection Scotland, Scottish Government
S1-4	**Assessment of new, emerging or re-emerging disease epidemiology and research** to increase the understanding of how these relate to public health and determine what possible future action is required.	This work will increase understanding of issues in relation to epidemiology of diseases of public health concern, and will determine what, if any, future action is required. There are a number of potential impacts of changing climates, most obviously an increase in temperature leading to new or re-emerging diseases which require a climate unlike that currently found in Scotland. For example, an increase in temperatures could lead to an increase in particular ticks which carry certain diseases. Similarly, a wetter, warmer climate could see an increase in water-based diseases. We will need to work with HPS to consider the likelihood of the incidence of particular diseases occurring in different climatic conditions, and to what extent this would pose a health risk. It is likely that the initial scoping work can be carried out in the next 5 years, but an assessment of the need for any further work could not be made until after this first phase has been completed.	Health Protection Scotland, Scottish Government

No.	Proposal and description	How will this help deliver the Objective?	Who will deliver?
S1-5	**Undertake research to strengthen the evidence base for risk assessment** and planning purposes as well as partner and stakeholder engagement. This should be widely disseminated across Emergency and Rescue Services, Scottish Government and Local Authorities.	Robust research base supporting informed medium and longer term operational decision making.	Scottish Government, Met Office, ClimateXChange
S1-6	**Research to inform decision making about future resource allocation and 'spend to save' options –** research should assess the possible future economic impact on the Emergency and Rescue Services of climate change adaptation against current expenditure patterns.	Robust research base supporting informed medium and longer term operational decision making.	Scottish Government, ClimateXChange

Objective S2 – Increase the awareness of the impacts of climate change to enable people to adapt to future extreme weather events			
No.	**Proposal and description**	**How will this help deliver the Objective?**	**Who will deliver?**
S2-16	**Improve public information and access to guidance on heat waves.**	Develop guidance on action to take in heat waves, with specific tailoring for those most vulnerable to the effects and their carers. Information campaigns should be prepared in advance of prolonged heat waves and ready to disseminate when appropriate.	Health Protection Scotland, Scottish Government
S2-17	**Emergency and Rescue Services to consider opportunities for raising public awareness around flooding risks and protective activity.**	More informed and resilient communities.	Emergency and Rescue Services

Objective S3 – Support our health service and emergency responders to enable them to respond effectively to the increased pressures associated with a changing climate			
No.	**Proposal and description**	**How will this help deliver the Objective?**	**Who will deliver?**
S3-14	Take forward appropriate **'Good Places Better Health for Scotland's Children' recommendations.** Good Places Better Health recommendations were published in December 2011.	The following recommendations could be examined further in terms of their contribution to climate change resilience: • Review energy efficient criteria of the Tolerable Standard and the Scottish Housing Quality Standard to enable energy efficiency improvements; • Streamline and simplify the grants system for energy efficiency improvements; • Improve Registered Social Landlord action on fuel poverty; • Improve the uptake of home insulation grants; • Use point of sale/exchange of lease/construction of extensions to require communication and/or upgrading of building's energy efficiency; • Ensure home reports include details of how to access any grant funding for energy efficiency improvements.	Scottish Government
S3-15	**Need to consider chronic diseases where a changing climate could add extra stresses.**	Warmer weather could worsen air quality (exacerbates effects of air pollution) and increased problems for asthma sufferers. Increased damp weather could worsen chronic lung conditions such as COPD.	Scottish Government

SECTION 2

ENGAGING OTHERS

This section sets out the arrangements for involving employers, trade unions and other stakeholders in meeting Scottish Ministers objectives; and the mechanisms for ensuring public engagement in meeting those objectives, as required by Section 53(2)(a)(iii) and (iv) of the Act.

The impacts identified in the CCRA are for Scotland as a whole, not just the Scottish Government. The long-term sustainability of Scotland in a changing climate will depend on businesses, government, organisations, communities and the individuals in them accepting responsibility for their share of action and working collaboratively. In some cases it will require a behaviour change - in others a continuation or adaption of their efforts. This section describes the mechanisms which will continue to develop to support the objectives in this Programme.

Some mechanisms will bring together stakeholders from across sectors. For example, Adaptation Scotland's Climate Ready Clyde project has brought together participants from over 40 different public, private and community sector organisations. Participants include individual organisations and businesses as well as key regional partnerships such as the Metropolitan Glasgow Strategic Drainage Partnership, the Glasgow and Clyde Valley Strategic Development Planning Authority and the Glasgow and Clyde Valley Green Network Partnership.

Case Study

Climate Ready Clyde case study

Organisations from across Glasgow and the Clyde Valley have come together to develop a shared response to the risks and opportunities that the region is facing from climate change. The project was kick-started by Adaptation Scotland in autumn 2011 with input from Glasgow City Council. Participants from key regional partnerships including the Metropolitan Glasgow Strategic Drainage Partnership, the Glasgow and Clyde Valley Green Network Partnership and the Glasgow and Clyde Valley Strategic Development Planning Authority are actively involved with the project along with over 40 other organisations and businesses from the private, public and third sectors.

Climate Ready Clyde has already increased understanding of how changes in climate are likely to affect different organisations, services and sectors across the region, and how the responses of individual sectors and organisations will have knock-on effects on the ability of others to respond.

The project shows that organisations and businesses are willing and able to work across traditional institutional and sector boundaries to address risks and opportunities from climate change. Whilst Adaptation Scotland's facilitation role was crucial in supporting the project at the start, the legacy of the project is of new working relationships and a shared vision of a Climate Ready Clyde.

Glasgow and Clyde Valley
Adaptation Scotland

A number of partner organisations will be directly involved in delivering policies aimed at achieving long term objectives, such as SNH, SEPA, Historic Scotland and Forestry Commission Scotland, as highlighted in this Programme. In addition to this direct role for specific organisations, the following mechanisms will ensure wider engagement in achieving the Programme's objectives.

Public Bodies

In addition to being major employers in Scotland, public bodies have a key role in building a resilient Scotland prepared for the challenges of the changing climate. Through the public bodies climate change duties, relevant public bodies are required to help deliver this Programme.

Public Bodies Climate Change Duties

Section 44(1) of the Climate Change (Scotland) Act 2009 requires public bodies, as defined in the Freedom of Information (Scotland) Act 2002 as amended, to act in the way best calculated to help deliver the Scottish Government's programme for adaptation to climate change. All public bodies need to be resilient to the future climate and to plan for business continuity in relation to delivery of their functions and the services they deliver to the wider community. Public bodies can also influence Scotland's resilience by, for example, protecting ecosystem services such as natural flood management.

Guidance[13] to assist public bodies comply with the duties has been published by the Scottish Government.

The Public Sector Climate Action Group was established in 2010 to provide leadership and direction to ensure the public sector plays its part in delivering the challenging targets in the Climate Change (Scotland) Act 2009 and to provide co-ordination between the public and private sectors. Membership was drawn from across Scottish public bodies, and a link established with the private sector through the Chair of the 2020 Climate Group joining as an observer.

These leadership arrangements are currently under review to consider alternative structures that can provide effective and mainstreamed arrangements to support public sector action on climate change, including achieving the objectives set by this Programme.

Local Authorities

Local authorities work at the heart of every local community and are ideally placed to lead the community response to climate change. With knowledge of local needs, industries and landscapes, local government allows adaptation actions to be tailored effectively to localised impacts of climate change. Local authorities can also work in partnership with their broader community of local estate managers, employers, community leaders and planning partners in preparing for a changing climate. Local

---

[13] See http://www.scotland.gov.uk/Publications/2011/02/04093254/0

authorities across Scotland are working hard to build capacity and take action in response to the risks and opportunities that they face as a result of changes in climate.

In 2007, all 32 Scottish local authorities showed their commitment to acting on climate change by signing Scotland's Climate Change Declaration. This represented a voluntary commitment to take action and report annually on work to reduce emissions and adapt to the unavoidable impacts of climate change. In their work on climate change adaptation, local authorities have shown their leadership on strategic and targeted action across all themes of the Programme and examples of this are illustrated within case studies in the Programme.

The Scottish Government is supporting local authorities, and their Community Planning Partners, through Adaptation Scotland to assess risks and opportunities from the impacts of climate change to service provision and assets. In 2013, COSLA was a partner in revising Adaptation Scotland's publication Adapting to Climate Change: An introduction for Public Sector Policy Makers, Resource Managers & Practitioners[14]. This publication shares best practice in existing local authority partnership approaches to climate change adaptation and outlines support and tools available to the public sector.

Adaptation Scotland

A key mechanism through which the Scottish Government will ensure wider engagement with employers, the public and other stakeholders in meeting the objectives in this Programme will be through its support for Adaptation Scotland.

Adaptation Scotland is a service funded by the Scottish Government to work across sectors to increase awareness and preparedness to the impacts of climate change. Delivered by Sniffer, the service provides support to help public and private sector employers, and the public through their communities, implement policies and actions that will enable them to build resilience to current weather and climate and, adapt to future climate change. Adaptation Scotland's highly networked approach encourages new connections, collaborations and innovations.

---

[14] http://www.adaptationscotland.org.uk/Upload/Documents/IntrotoadaptationforpublicsectorFINAL_1.pdf

Examples of Adaptation Scotland activities

Public sector
Through partnership working with the Sustainable Scotland Network, COSLA and major public bodies, Adaptation Scotland is working strategically to influence adaptation work across the public sector. This has included a priority focus on promoting the implementation of a risk based approach to adaptation and providing an annual review of local authority adaptation progress.

Adaptation Scotland published Scotland's Climate Change Adaptation Workbook and has used this resource as the basis for public sector engagement and training programmes. Scotland's 32 local authorities are encouraged to use the five stages of the workbook as a basis for reporting on their adaptation work in annual reports submitted as part of Scotland's Climate Change Declaration. The workbook will continue to be developed to support public bodies' compliance with the Public Bodies Climate Change Duties.

Adaptation Scotland has published an introduction to climate change adaptation for the public sector.

Private Sector
Adaptation Scotland is a member of Scotland's 2020 Climate Group Business Engagement sub-group and plays a key role in raising awareness of adaptation among group members. Between 2011 and 2012, Adaptation Scotland delivered a pilot project to help Royal Mail, FirstGroup UK Bus (Scotland) and First ScotRail to assess their climate risks. The outputs of the pilot project will be used to inform future partnership working and encourage wider uptake of adaptation planning support among the business community. Adaptation Scotland has also published adaptation guidance for businesses and developed a business adaptation planning template which is being trialled with 2020 Group sub group members. The template will be available for use by all businesses.

Communities
Adaptation Scotland is working with communities and partner organisations to better understand the challenges that Scotland's communities will face as a result of climate change and, develop resources to raise awareness and help support on the ground action.

Adaptation Scotland has piloted an innovative new resource: 'Are You Ready?' to help community groups better understand and respond to the challenges that they face as a result of current weather and future climate change. Adaptation Scotland has also developed workshops that can be used to help communities carry out more detailed adaptation planning work. A guide to running these workshops has been published online along with accompanying resources.

Adaptation Scotland has also supported piloting of community adaptation projects as part of the Scottish Government's Climate Challenge Fund.

Place based adaptation

No one organisation will be able to adapt to climate change in isolation and Adaptation Scotland is supporting stakeholders to work collaboratively to adapt to climate change.

Adaptation Scotland is working in partnership with the Key Agencies Group[15] and local and strategic planning authorities to develop guidance, resources and training sessions that will help to embed adaptation at the heart of planning and place-making.

Adaptation Scotland is also supporting stakeholders in Glasgow and the Clyde Valley to develop a regional climate change adaptation strategy and action plan. The Climate Ready Clyde project has provided an important opportunity for stakeholders to work together to raise awareness of the challenges and opportunities facing the region and begin work to develop a shared response.

Climate Justice

Working in partnership with Scottish Government and the Joseph Rowntree Foundation, Adaptation Scotland co-organised Scotland's first conference in September 2012 on how climate justice now needs to be seen as a domestic issue so that vulnerable groups and communities in Scotland are engaged and resilient to a changing climate. Adaptation Scotland's work programme will build on lessons from this landmark event through close collaboration with others in the public and third/community sector.

Key messages on climate change

Adaptation Scotland is identifying key messages and actions that will make Scotland less vulnerable to climate change. This work is crucial for a consistent message on climate change across Scotland. Adaptation Scotland is also collating a series of case studies to bring adaptation to life.

---

[15] Following the publication of Delivering Planning Reform, the Agencies set up a working group to implement the commitments and keep each other up to date on progress: http://www.scotland.gov.uk/Topics/Built-Environment/planning/modernising/cc/KeyAgencies.
Members of the group include Architecture and Design Scotland, Historic Scotland, Scottish Environment Protection Agency, Scottish Natural Heritage, Scottish Water, Transport Scotland and Scottish Enterprise.

ClimateXChange

ClimateXChange is Scotland's Centre of Expertise on Climate Change. It is funded by the Scottish Government and provides research to inform climate change policy making in Scotland. The virtual centre involves researchers across 16 Scottish research and higher education institutions. ClimateXChange has a programme of research projects that support adaptation decision making across sectors in Scotland. The ClimateXChange programme addresses four key adaptation questions:

- how do we measure progress in adaptation?;
- how do we understand what the future might look like for different sectors?;
- what are the costs, benefits and equity of different adaptation options? and;
- what can we learn from adaptation in practice?

ClimateXChange also responds to particular policy-relevant questions as these arise, and is working with a range of sector stakeholders on projects that address particular issues. Examples include: working with foresters and the forestry policy community to expand our understanding of how Scotland's native woodlands can adapt to a changing climate; and, working with emergency responders to consider the resourcing issues around ensuring climate change preparedness in the emergency and rescue services.

ClimateXChange's adaptation research:

Measuring adaptation progress
ClimateXChange is developing indicators that will allow us to measure climate change adaptation. The project is establishing baseline information that gives us a picture of where we are starting from. It also provides tools to assess the nature, extent and effectiveness of adaptation responses.

Scenarios – exploring different possible futures
ClimateXChange is using scenario analysis to support the development of adaptation strategies and actions. The project is analysing key climate change risks and opportunities and linking these with wider socio-economic changes. The resulting scenarios can provide a deeper understanding of future climate change impacts and responses across different sectors.

Adaptation costs and benefits
The project is considering the full range of costs, benefits and trade-offs associated with particular adaptation actions. These include impacts on people's well-being.

Demonstrating adaptation in practice
ClimateXChange is working with 'on the ground' specialists and practitioners such as farmers and foresters to provide knowledge on emerging adaptation issues. ClimateXChange is establishing a range of case studies, demonstration sites and networks, which cover sectors including: farming; woodlands and forestry; housing; and river catchments.

2020 Climate Group

Many businesses are assessing their vulnerability to climate change and are seeking to develop appropriate adaptation strategies. The Scottish Government is promoting better coordination and sharing of knowledge and practice.

Through its support of the 2020 Climate Group, the Scottish Government has identified the importance of working collaboratively with the business sector in outlining and leading the strategic direction needed to combat the effects of climate change.

Joint Communiqué on Climate Change from the Scottish Government and the Scottish Trades Union Congress

The Scottish Government and the STUC agreed a joint Communique on Climate Change on 27 May 2009[16]. The joint communiqué outlines shared aims and objectives, and a commitment to work in partnership to ensure the creation of high quality jobs through Scotland's transition to a low carbon economy and states that: "Addressing the economic, employment and social impacts of the transition to the low-carbon economy and adapting to climate change will be vital to building stakeholder support and delivering the necessary programmes of action." It agrees to jointly "Promote the importance of education, training, skills and workforce development in delivering effective action on climate change".

Low Carbon Scotland: Behaviours Framework

The Low Carbon Scotland: Behaviours Framework[17] sets out the Scottish Government's strategic approach to encourage low carbon lifestyles amongst Scotland's individuals and households. While the focus of this Framework is supporting behaviours to reduce greenhouse gas emissions, engagement on these issues can also provide opportunities to engage on adapting to the changing climate. For example:

- **Climate Challenge Fund (CCF)** – Since 2008, the Climate Challenge Fund has been supporting communities to tackle climate change by reducing their carbon emissions. While continuing to support the transition to low-carbon living, new approaches to encourage communities to generate local ideas to address the impact of climate change are being explored.
- **Low Carbon Dialogues** – a range of people out with our regular stakeholder network are being invited to take part in a series of Low Carbon Dialogues with the Minister for Environment and Climate Change, which started in March 2013. The themes for these bi-annual discussions will include both mitigation and adaptation issues with a focus on behaviour change.
- **Low Carbon Networks** - including Eco-congregations, Sustainable Scotland Network, Eco-schools and the Scottish Communities Climate Action Network, raise awareness of climate change and the impacts of this.

---

[16] http://www.stuc.org.uk/news/643/stuc-and-scottish-government-issue-joint-communique-on-climate-change
[17] See http://www.scotland.gov.uk/Publications/2013/03/8172

w w w . s c o t l a n d . g o v . u k