

Wiltshire Council – Climate Change Adaptation Action Plan

Revised 2016

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Executive Summary

Having a Climate Change Adaptation Plan allows us to consider the impacts and opportunities across all the council services, making connections between the complimentary work of different teams, sharing information and joining up resources. Bringing these areas together in one place offers us the opportunity to overview our likely response to a changing environment, identify potential gaps and question assumptions in provision.

During the past five years, we have already begun to see evidence of the likely changes in climate Wiltshire will face, such as hotter drier summers, warmer wetter winters, increased frequency of extreme weather and flooding. Looking ahead the indirect costs to councils of climate impacts are only likely to grow, making it vital that we continue to put in place adaptation measures to cope with the predicted change, and undertake greater mitigation actions to curb further increases in global warming.

Since the Climate Change Adaptation Plan was first published, Wiltshire Council has produced a Core Strategy for the county which identifies addressing climate change as a key strategic objective; including policies which will deliver; sustainable growth, build resilient communities, provide a network of green infrastructure, ensure more sustainable transport and reduce the risk of flooding. From this high level political direction, we have produced various strategies and updated plans, formed working groups, created tools and provided training to ensure we protect the residents and businesses within Wiltshire from the impacts of a changing climate and ensure joined up thinking with key delivery organisations. For a more detailed summary please see *Chapter 7*.

This is the first revision to the 2011 Climate Change Adaptation Plan, following the ECO Board's recommendation that the Plan be reviewed every five years. As part of this revision the previously identified risks and actions have been reconsidered by service leads, in the light of the considerable work undertaken by the council over the past five years.

The revised Climate Change Adaptation Plan will now cover five action areas, based on the previous five themes:

- Well-being and Public Health
- Financial and Economic
- Environmental
- Civil contingencies and Emergency Planning
- Infrastructure Resilience

For each action area a series of objectives have been defined in line with the strategic aims and identified risks. The opportunities and challenges have been summarised and the key activities to be delivered are set out in section five. A succinct Adaptation Action Plan for the next five years has been produced as a separate annex to this document. The actions have been reviewed with service leads across the council, with responsibilities and timescales agreed. The original weather predictions and scenarios generated for ascertaining and prioritising the

risks have been retained because we intend to revise the plan again, following publication of the UK climate projections modelling tool in 2018. We will then update the future climate change scenarios and review our decision making and assessment of climate related risks.

To ensure we are delivering the actions identified within this plan, and to incorporate any major changes to the council's structure, each service area will report progress to the ECO Board on an annual basis.

A review of weather predictions, climate change scenarios and assessment of risks will be undertaken post 2018.

Wiltshire Council will continue to develop relationships with key strategic partners and neighbouring authorities, to look for ways to work collaboratively when mutual risks and opportunities present themselves.

“The combination of the weight of scientific evidence and the dynamics of the financial system suggest that, in the fullness of time, climate change will threaten financial resilience and longer-term prosperity. While there is still time to act, the window of opportunity is finite and shrinking”. **Mark Carney, Governor of the Bank of England, 2015.**

1. Introduction

1.1 What is Adaptation?

Adapting to climate change is the process of building the resilience of businesses, industry, agriculture, natural environment, infrastructure, public services, households and vulnerable parts of our society and communities. It will help us to prepare for the expected impacts of climate change, such as flooding, heatwaves, droughts and extreme weather events and gives us the best chance to take advantage of any opportunities which may be presented as a result of these changes.

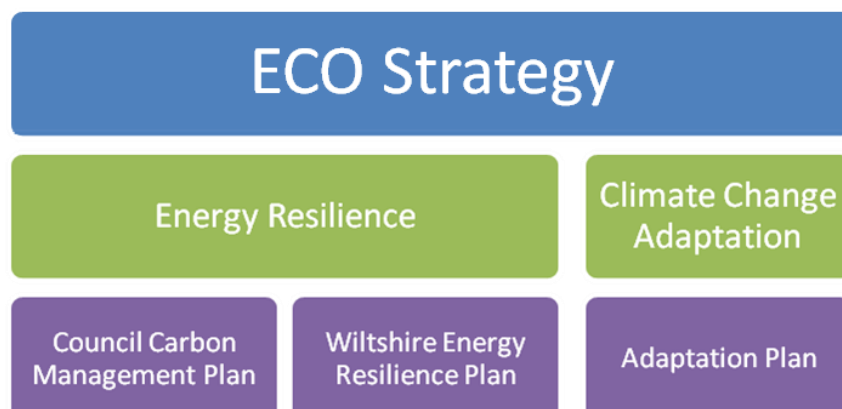
1.2 Why do we need a plan?

Wiltshire Council has a key responsibility for addressing climate change through adaptation and mitigation both within its services and as part of its community leadership role.

The [Energy, Change and Opportunity \(ECO\) Strategy 2011 – 2020](#), is a framework document designed to identify how Wiltshire as a council and a community can act on climate change. The overarching framework document is supplemented by three detailed action plans, which set out more specifically how we are going to deliver our climate change ambition.

The council has committed to producing the following action plans, which are illustrated below:

- Carbon Management Plan for the council’s emissions (published March 2011)
- **Climate Change Adaptation Plan for Wiltshire (revised 2016)**
- Wiltshire Energy Resilience Plan (published 2015)



The importance of addressing climate change is also recognised more widely by the Wiltshire Assembly.

1.3 Community Plan 2011-26

The Community Plan is the overarching strategic plan of the Wiltshire Assembly; setting out a long-term vision describing the sort of place local people want Wiltshire to become, and priorities for the county to be delivered in partnership. The plan identifies tackling climate change as one of its top three priorities.

1.4 Wiltshire Integrated Emergency Management Plan 2015

In order to capture learning from recent incidents and streamline the authority's response, three existing plans; the Major Incident Plan, Business Continuity Plan and Recovery Plan have been combined into a new single Integrated Emergency Management Plan. A key part of preparing for the impacts of a changing climate is ensuring that we have effective plans, training, exercising and resources in place to respond to severe weather events and other emergencies.

Specific actions already incorporated into these plans are not repeated here as these are, and will continue to be, reviewed and developed on a regular basis. The Emergency Planning Resilience and Response Team have also been integral in improving the county's community resilience, by working with the Area Boards to encourage Parish and Town Councils to develop 'Community Self- Help' plans.

This Climate Change Adaptation Plan differs from the Integrated Emergency Management Plan, in that it takes a long term view of climate change; looking to minimise the impacts, maximise the opportunities and hopefully reduce the requirements for an emergency response in the first place. This long-term outlook informs the approach of the Integrated Plan by highlighting shared risks and their wider impacts.

Having a Climate Change Adaptation Plan allows us to consider these impacts and opportunities across all the council services, making connections between the complimentary work of different teams, sharing information and joining up resources. By bringing these areas together in one place we have the opportunity to overview our likely response to a changing environment, identify potential gaps and question assumptions in provision.

2. Identifying the priorities for Wiltshire Council

In 2011 Wiltshire Council undertook a comprehensive risk based assessment of vulnerabilities to weather and climate, both short-term (2010-2015) and mid-term (up to 2050), and identified priority risks for its services, based on the Wiltshire Council corporate risk scoring matrix.

	Significant (4)	Moderate (3)	Minor (2)	Insignificant (1)	
	L	M	H	H	
	L	M	M	H	
	L	L	M	M	
	L	L	L	L	
	Rare(1)	Unlikely (2)	Possible (3)	Almost certain (4)	
	Impact				

Red = High Risk (Score 12 – 16)
Significant risks which are unacceptable; reduce the likelihood and / or impact through control measures.

Amber = Medium Risk (Score 6 – 9) Manageable risks, controls to be put in place; managers should consider the cost of implementing controls against the benefit in the reduction of risk exposure.

Green = Low Risk (Score 1 – 4)
Negligible risks - to be considered and monitored as costs may outweigh benefits.

It is important to note here that use of the terminology ‘likely’ and ‘unlikely’ is predominantly used in the context of risk management processes and does not directly align with the climate projections.

In order to ensure consistency and reduce subjectivity, the Likelihoods were fixed in advance rather than scored by officers. These decisions were based on weather and climate data using the near term historical weather information for Wiltshire and the mid-term risk assessment data from the UKCP09 medium emissions scenario

Vulnerabilities were scored by key officers representing each service area taking into account nine considerations. From this assessment it was possible to identify priority areas for action. Risks scoring a “High” level (12-16) are in the Action Plan.

3. Adaptation Action Plan

The revised Action Plan now consists of 13 Objectives meeting five key Aims. This is depicted in the diagram below. The Objectives have been divided up into Action Areas, based on the previous five themes, to ensure a range of adaptation measures are considered for each risk:

- Well-being and Public Health
- Financial and Economic
- Environmental
- Civil contingencies and Emergency Planning
- Infrastructure Resilience

The opportunities and challenges for each Action Area are summarised on the subsequent pages.

4. Aims and Objectives

AIMS

Wiltshire residents have adapted to the challenges of climate change and are supported by health and social care systems

Wiltshire businesses are prepared for the risks from a changing climate

Wiltshire balances the needs of fragile ecosystems with demand for resources from development

Wiltshire Council has effective plans, policies and resources in place to respond to severe weather events

New infrastructure is planned and designed to account for the projected changes in climate

OBJECTIVES

Well-being and Public Health

1. Residents are informed of health risks from excess heat and cold, flooding and poor air quality

2. Residents have health provisions which enable them to adapt to extreme weather

3. All Care Homes across Wiltshire consider climate change risks within care plans

Financial and Economic

4. Businesses are informed on the risks associated with climate change

5. Businesses have the tools to adapt to extreme weather

Environmental

6. Land based businesses have taken measures to reduce risks and impact of flooding and water shortage

7. Actions targeted at priority ecological habitats to maintain biodiversity and encourage adaptation

8. Planning policy and management strategies in place to protect landscapes and key environmental assets

Civil Contingencies and Emergency Planning

9. Residents are aware of their own responsibilities for managing and taking protection measures to extreme climate conditions

10. Processes are in place to mitigate against an emergency response requirement

11. Communities and businesses are protected through robust local plans and policy development

Infrastructure

12. Produce an evidence base on ability of local infrastructure to withstand extreme climate

13. New infrastructure future proofed against projected changes in climate

RISKS

CONTROLS

ACTIONS

5. Risks and Controls

5.1 Well-being and Public Health

Strategic aim – Wiltshire residents have adapted to the challenges of climate change and are supported by robust health and social care systems

Heatwaves increase the number of visits to GPs and hospitals, calls to NHS and social care referrals. According to Public Health England's 2015 Heatwave Plan, this leads to increased cost to health and social care providers, including councils,

from £266 to £625 per patient per day. Public Health England has stated that "heat-related mortality is projected to increase steeply in the UK by around 70% in the 2020s".

Controls in place to manage risks:

- [Air Quality Action Plan 2015](#)
- [Air Quality Strategy 2011 – 2015 \(under review\)](#)
- [Wiltshire Core Strategy](#), Adopted 2015
- [Heatwave Plan for England – advice for care home managers](#)
- Localised Heat Wave Plan
- Wiltshire Council Integrated Emergency Management Plan
- Cold weather alerts, made as part of the Winter Service Communication Plan
- Care providers are updated regularly with information related to climate risks
- The Care Quality Team check that Care Homes have Contingency plans/ Emergency plans in place, which respond to climate change related risks
- Business Continuity template shared with all Care homes

Currently, one-fifth of homes in England could experience overheating even in a cool summer. Flats, which are generally more at risk of overheating than houses, now make up 40% of new dwellings compared to 15% in 1996. There is low public awareness of the increasing risk from heat, and the level of action to adapt homes appears to be low. New homes are adding to the potential problem; as Building Regulations do not mandate a provision for the health risks from overheating now or in the future and urban greenspace, which helps to

Major risks effecting health

- Excess heat and cold causing increased ill-health, hospital admissions & deaths among vulnerable groups
- Flood related illness and displacement
- Health impacts relating to air quality and airborne substances causing allergic reactions (e.g. pollen)
- Closure of care homes due to extreme weather

"[Warm and Safe Wiltshire](#)" is a service provided by Wiltshire Council, Dorset and Wiltshire Fire Service and their partners, which aims to improve the energy efficiency of homes and help make them warmer, safer and healthier.

mitigate the urban heat island effect, has declined by 7% since 2001¹. Further action is needed to adapt the existing building stock and design new buildings to counter the impacts of high temperatures on health and well-being.

Around 90% of hospital wards are of a type that is prone to overheating, and the ability to control temperatures is often limited². Site level resilience measures need to be applied to local health and social care assets, to address for example, overheating and flood risks in care homes. Flooding could affect surrounding infrastructure, creating risks to power supplies, water supplies, transport links and supply chains. Flooding could also impact staff getting to and from work, which creates further risks to the emergency services.

Cold winters will remain the largest weather-related risk to health in England, due to a growing and ageing population. Despite an increase in average temperatures, temperature variability will remain and may increase, and the population may be less prepared for cold snaps due to their increasing rarity. Adapting homes to handle both high and low temperatures – increased insulation alongside passive cooling measures and ventilation – is necessary and readily achievable if considered together.

The [Wiltshire Air Quality](#) website details the latest data from air quality monitoring sites across Wiltshire, along with reports and health advice. The site also includes sign up for 'Know & Respond' which alerts people to poor air quality via a text messaging service

The south west has the highest levels of UV radiation across the UK, with the population having a higher incidence of skin cancer relative to the national average. Due to uncertainties over behavioural change it is not possible to provide projections of future risk, so while trends continue to be monitored nationally, joined up local action to promote protective behaviour should be undertaken across the south west. High temperatures are also linked to poor air quality, with high levels of ozone which are formed more rapidly in strong sunlight. Climate change may result in the earlier seasonal appearance of respiratory symptoms and longer duration of exposure to airborne allergens (e.g. pollen or spores).

¹ Managing climate risks to well-being and the economy: Adaptation Sub Committee (ASC) progress report 2014, Committee on Climate Change (CCC)

² Managing climate risks to well-being and the economy: ASC progress report 2014, CCC

Objective 1

Wiltshire residents are well informed of the health risks from excess heat and cold, flooding and poor air quality

Wiltshire council will provide information to residents through alerts and targeted educational programmes. We will work with partners across the South West to promote protective behaviour and update our various information portals. A more detailed action plan can be found in *chapter 6.1*.

Objective 2

Wiltshire residents have the necessary provisions which enable them to adapt to extreme weather

Wiltshire Council will help residents adapt to the predicted extremes in temperature by providing increased shaded areas and greater availability of drinking water in public open spaces. We will work with partners to identify vulnerable people with existing health conditions and provide help and advice, and install low-carbon cooling measures in council-owned housing. A more detailed action plan can be found in *chapter 6.1*.

Objective 3

All Care homes across Wiltshire consider climate change risks within care plans for both their customers and physical assets

Wiltshire Council will ensure all Care homes are aware of guidance for the care of individuals during heatwaves, that contingency/emergency plans are on CareFirst, and that Care Homes consider the surrounding infrastructure within care home contingency planning. A more detailed action plan can be found in *chapter 6.1*.

5.2 Financial and Economic

Strategic aim – Wiltshire businesses are prepared for the risks from a changing climate

Climate change is expected to increase the risk of interruption and financial loss to businesses but may also present opportunities for those able to take advantage of changing market conditions. A Company that routinely incorporates climate change impacts and adaptation into its decision making will be better prepared and more resilient than its competitors, able to respond to investor expectations and concerns about potential impacts to the bottom line, and may be able to benefit commercially.

Controls in place to manage risks:

- [Planning for an Emergency](#); online guidance for businesses on adaptation measures
- [Environment agency flood risk alerts](#) for businesses
- [Local Flood Risk Management Strategy](#)
- Surface Water Management Plans.
- [Operational Flood Working Groups](#)
- [River Basin Management Plans](#)
- [Catchment Abstraction Management Strategies](#)
- [Core Strategy Policy 68](#) requires new development to incorporate water efficiency measures

Businesses in Wiltshire operate as part of the global economy and as such are heavily reliant on goods and services sourced from and sold to overseas markets. Disruptions to supply chains can affect business operations in a number of ways, including losses to revenue, loss of productivity and damage to reputation. Climate change is expected to increase the risk of weather-related disruptions, particularly for supply chains that involve more vulnerable countries. Risks to business supply chains appear to be highest further upstream, yet businesses often only consider risks to their immediate suppliers³.

Some larger companies are assessing climate risks, including those to their supply chains, and are responding accordingly. However, there is little

Major risks effecting businesses

- Reduced productivity for businesses due to extreme weather
- Flooding of businesses and local infrastructure
- Risks to supply chain operations from extreme weather and a changing climate
- Reduction in available water for abstraction

The International Corporate Governance Network (ICGN) takes the view that climate change is a corporate governance issue as well as a matter of social, economic, trade and public policy. In a governance context, this calls for diligent oversight by company boards as well as for investor awareness of what companies need to do to position themselves sustainably in a dynamic climate policy environment.
ICGN November 2015

³ Managing climate risks to well-being and the economy: Adaptation Sub Committee (ASC) progress report 2014, Committee on Climate Change (CCC)

evidence of action by small and medium-sized enterprises. Of the 400,000 businesses based in the South West 99% are SMEs, and within the Swindon and Wiltshire areas over 77% of enterprises employ five or less people. Research has shown that SMEs are most vulnerable to the impacts of climate change, but are the least knowledgeable and least well prepared.⁴

Too much water

On average, it takes flood affected businesses 6 months to return to full capacity, with some businesses closing down permanently. Assuming the number and location of businesses in England stay constant, by the 2020s, up to 40,000 (40% more) business units could

The winter 2013/2014 floods affected 500 properties in Wiltshire and incurred costs to the council of £1.4m, of which we were only able to recover £750k from government via the Bellwin scheme. The Federation of Small Businesses put the average cost to each UK small business in flood-hit areas at £1,531.

be located within areas at a high likelihood of flooding from rivers and the sea. The number of employees working in these areas could almost double by the 2050s, from 275,000 now to around 500,000.⁵

Too little water

66% of Wiltshire's groundwater sources have been assessed as 'poor' in terms of quantity status, with the remaining 34% assessed as 'good'. Water supply issues are important to the council, both in terms of addressing the costs of the Council's own water supplies, and securing long term provision of adequate water supplies for homes and industry in Wiltshire.

South Street Business Park

In September 2014 an unprecedented, storm related, flood hit Corsham. The business units in the South Street business park were affected by the flood with 2 ½ feet of water entering during the evening. Most of the businesses were out of operation for just a few days but it took some up to three weeks to return to normal production. The small businesses were able to rely on assistance and the good will of their local customers to tie them over, but have stressed the importance/value of the following to other businesses;

- Ensure you have Business Interruption Insurance
- Keep computer hard-drives off the floor
- Establish agreements with local firms to temporarily undertake some of your work, until your premises are operational again
- Be prepared to clean out the flood water yourself
- Ensure that any physical assistance from the insurance company that might be needed in cleaning up, is covered by the business interruption part and not the general contents insurance, because this can affect future rates.

⁴ Climate change Risks for South West England 2012, Climate UK

⁵ Managing climate risks to well-being and the economy: Adaptation Sub Committee (ASC) progress report 2014, Committee on Climate Change (CCC)

Catchment Abstraction Management Strategies indicate that many of Wiltshire's rivers are over abstracted, with over 70% under threat if abstraction licenses already granted were used to their full extent. The rivers within the Bristol Avon catchment are the exception to this, but even within this catchment there is no more water available for further licensing. A combination of climate change and increasing demand for water from a growing population is projected to increase the risk of water scarcity. Business can respond to the risk of reduced water availability by managing water more effectively.

Objective 4

Wiltshire businesses receive targeted engagement and informed investment advice on the risks associated with climate change

Wiltshire Council will identify vulnerable employment sites and utilize existing business relationships to raise awareness and encourage actions to build long term resilience. We will investigate abstraction levels and Wiltshire's water infrastructure to understand potential impacts on business relocation and growth, to provide informed advice for inward investment. A more detailed action plan can be found in *chapter 6.2*.

Objective 5

Wiltshire businesses have the tools which enable them to adapt to extreme weather

Wiltshire Council will produce and promote various guides and toolkits, to support local businesses plan for and adapt to the effects of a changing climate and increase their competitiveness. A more detailed action plan can be found in *chapter 6.2*.

5.3 Environmental

Strategic aim – Wiltshire exhibits a balance between the needs of fragile ecosystems and an increasing demand for resources and land for urban development

Controls in place to manage risks:

- Senior Ranger co-ordinates maintenance needed to country parks as a result of flooding/heavy rain
- Rights of Way Inspectors assess damage and undertake repairs
- [Local Flood Risk Management Strategy](#)
- [Countryside Access Improvement Plan](#) 2015 (updated every 5 years)
- [Asset Management Plan for the Country Farm Estate](#) (2004 - 2013)
- [Wiltshire Biodiversity Plan](#)
- Wildlife and Countryside Act [Schedule 9](#)
- [The Stonehenge and Avebury WHS Climate change risk assessment 2014](#)
- [The Wiltshire Invasive Non-native Species Project](#)
- [The Hampshire Avon Non Native Invasive Species \(HANNIS\) Forum](#)
- Monitoring by the [Animal & Plant Health Agency](#) of animal health and disease and invasive species data

According to the Defra 2010 June Survey, agriculture accounts for 80% of land use in Wiltshire, making it the largest land based economy. Almost half of Wiltshire's agricultural land is used as grassland for grazing cattle and sheep, followed by cereals and other arable crops, with less than 1% used for fruit and vegetables⁶. Higher temperatures

and longer growing seasons may provide opportunities for farmers in England to increase productivity and so benefit from potential increases in global food prices. However, farmers will not be able to take advantage of these opportunities if the productive capacity of the land becomes limited because of water scarcity, loss of soil fertility or persistent presence of pests and diseases.

Land and the ecosystem services it provides are already under pressure. Many of these existing pressures will continue to grow in the future. A larger, wealthier population will increase demand for food, timber, energy crops and land for urban development. Climate change will alter the ability of the land to supply ecosystem services and meet these growing demands. There is already evidence from recent events, such as the drought followed by flooding in 2012, which led to a 14% reduction in wheat yield in the UK relative to 2011⁷.

Major risks facing the Environment

- reduced water availability (including reduced reliability of supply through time)
- increased flood and waterlogging risk to agricultural land
- soil erosion and reduced organic matter leading to increased reliance on fertilisers
- increased risks from invasive species, pests and diseases
- Historic building and archaeological remains at risk from water damage, flooding

⁶ Wiltshire Intelligence Network

⁷ NFU Key Statistics: monthly update, April 2013

Ecosystems in good condition are more likely to cope with the additional pressures from climate change, however in England around three quarters of rivers are not meeting the requirements for good ecological status set out in the Water Framework Directive⁸. The plants and animals that make up ecosystems, and the underlying flows of materials and energy, all depend on factors such as local temperatures, rainfall patterns and soil moisture conditions. This makes them highly sensitive to changes in climate. In recent decades there has been a decline nationally in the abundance and distribution of 60% of species, with nearly a third experiencing a particularly steep decline of more than 50%⁹.

Objective 6

Land based businesses are aware of their ability to install mitigation measures against the risks of flooding and water availability and incorporate good husbandry practices

Wiltshire Council will liaise with farmers on the Country farm Estate to incentivise greater water efficiency and reduce activities that encourage soil erosion, such as over grazing. We will mediate with local farmers to investigate all opportunities for installing sustainable drainage systems. A more detailed action plan can be found in *chapter 6.3*.

Objective 7

Prioritise ecological habitats based upon their vulnerability to climate change in order to target action which will maintain biodiversity and encourage adaptation

Wiltshire Council will undertake mapping of publicly accessible space and ecological habitats, and use modelling tools to provide an assessment of Wiltshire's habitats. We will establish management regimes for parks, green spaces and semi-natural habitats to maintain biodiversity and manage the spread of invasive and undesirable species, and encourage adaptation of habitats and natural colonisation by species suited to changing climatic conditions. A more detailed action plan can be found in *chapter 6.3*.

Objective 8

Local planning policy and management strategies are in place to protect Wiltshire landscapes and key environmental assets

Wiltshire Council will protect and enhance green open space, habitats and ecological corridors via landscape scale projects, Sustainable drainage systems and a Landscape Strategy. We will work with partners to assess heritage assets at risk within flood zones and integrate the results into the Local Flood Risk Management Strategy. A more detailed action plan can be found in *chapter 6.3*.

⁸ Managing the land in a changing climate: Adaptation Sub Committee (ASC) progress report 2013, Committee on Climate Change (CCC)

⁹ Managing the land in a changing climate: Adaptation Sub Committee (ASC) progress report 2013, Committee on Climate Change (CCC)

5.4 Civil Contingencies and Emergency Planning

Strategic aim – Wiltshire Council has effective plans, policies and resources in place to respond to severe weather events and other emergencies, working in partnership with residents

As the Lead Local Flood Authority, Wiltshire Council is required to develop a Local Flood Risk Management Strategy, manage the risk of flooding from surface water, groundwater and smaller watercourses, and investigate significant flood incidents. Alongside this, changes to NPPF policies in 2015 made the Council a statutory consultee on planning applications for surface water management.

Controls in place to manage risks:

- Wiltshire Council Integrated Emergency Management Plan
- Localised Heat Wave Plan
- Local Resilience Forum Water Supply Disruption Plan
- Local Resilience Forum Flood Response Plan
- [Local Flood Risk Management Strategy](#) 2015
- [Groundwater Management Strategy](#) 2016
- Surface Water Management Plans
- Gully emptying programme
- [Wiltshire Sustainable Drainage System Guide](#)
- [Strategic Flood Risk Assessments](#) (SFRAs)
- [Waste Management Strategy](#) (due refresh)
- Risk Assessments for waste collection personnel
- Snow and Ice protocols in place, including updates via the website

Under the requirement of the Civil Contingencies Act 2004, Local resilience forums (LRFs) have been established across the country. These are multi-agency partnerships made up of representatives from local public services, including the emergency services, local authorities, the NHS, the Environment Agency and others. The Wiltshire and Swindon LRF aims to plan and prepare for localised incidents and catastrophic emergencies, working to identify potential risks and produce emergency plans to either prevent or mitigate the impact of any incident on the local community.

Emergency response and recovery are needed when preventative measures alone do not provide complete protection against an extreme weather event. Wiltshire Council will need to be able to cope with the increasing frequency

Major risks requiring an emergency response

- **Flooding of homes and buildings**
- **Drainage systems unable to cope causing flooding to homes, buildings and transport infrastructure**
- **Rainfall flooding could contaminate public waterways with sewerage**
- **Short term water shortages**
- **Multi-season drought & long-term water stresses**
- **Ability to manage waste in extreme weather conditions**

Wiltshire Council developed a Community Resilience Programme, through the Community Area Boards, to increase the ability of local town and parish councils to better cope during emergency incidents. Training and guidance have been provided.

and intensity of severe weather expected with climate change. In order to mitigate against long term increased costs to the council and take a proactive approach to longer term climate change, we need to build resilience in our communities, businesses and infrastructure, and therefore reduce the requirements for an emergency response in the first place which will save the council financially.

Objective 9

Wiltshire residents are aware of their responsibilities managing waste in extreme heat, using water more efficiency and putting in place protection measures against flooding

Wiltshire Council will communicate messages to the public about water efficiency to ensure we can manage at times of shortage, and how they can protect themselves from flooding when we have too much water. We will make residents aware of the risks from not managing waste in extreme heat. A more detailed action plan can be found in *chapter 6.4*.

Objective 10

Preventative processes are in place to mitigate against an emergency response requirement

In order to reduce long term increased costs to the council and take a proactive approach to climate change, Wiltshire Council will ensure adequate management, maintenance and financial resources are available for drainage and gully emptying programmes. We will work with partners to put in place contingency planning for water provision and demonstrate best practice by increasing our use of water efficient appliances. A more detailed action plan can be found in *chapter 6.4*.

Objective 11

Local communities and businesses are protected through robust local plans and policy development

Wiltshire Council will work with partners to identify high risk flood areas and identify causes for each one. We will produce and adopt specific strategies and plans to address the impacts of climate change, ensuring climate change risks are integrated across existing plans. We will use these strategies and policies to inform drought-resistant landscaping schemes, and plan for and create spaces for additional temporary flood water storage to alleviate the flooding of homes and buildings. A more detailed action plan can be found in *chapter 6.4*.

5.5 Infrastructure Resilience

Strategic aim –New infrastructure is planned and designed to account for the projected changes in climate over the rest of the century and beyond. Existing vulnerable infrastructure is identified and resources prioritised.

Loss of vital services can be detrimental to the economy, as well as to peoples' health and well-being. Acting now to improve the resilience of infrastructure makes good economic sense. According to Nicholas Stern's analysis; spending 1% of global GDP per year now will avoid spending 20% of global GDP in a few decades' time¹⁰. Most infrastructure assets are long-lived and costly to retrofit once they are built.

Physical infrastructure is routinely tested by extreme weather. Natural hazards such as storms, flooding, heavy snow and droughts already account for between 10-35% of all delays or service interruptions to electricity, road and rail customers every year.¹¹

Existing controls:

- National Planning Policy Framework and Local Plans
- [Core Strategy and detailed topic papers](#)
- [Local Flood Risk Management Strategy](#)
- [Highways Asset Management Strategy 2015](#)
- Long-term Investment Plan for Roads (2014-2020)

Major risks to infrastructure

- Buildings and infrastructure not resilient to a changing climate
- Decline in urban greenspace
- Damage to roads and pavements due to freeze-thaw effect, and long spells of continually wet weather
- Hot dry conditions cause older rural roads and pavements to subside, melt and crack
- Storm damage to street lights, signs, traffic lights & trees

Climate change will lead to an increase in the number of infrastructure assets exposed to high temperatures, flooding, and subsidence in the coming decades, therefore infrastructure planning and design needs to account for the projected changes in climate over the rest of the century and beyond for the longest-lived assets. Land use planning is one of the most important functions for increasing resilience to climate risks or locking future generations into increased vulnerability.

Delivering a green infrastructure is important because it can help to keep cities cool in the summer, provide drainage routes for surface water and provide pathways through the urban environment for biodiversity to migrate as the climate changes. Sustainable Drainage Systems (SuDS) such as permeable surfaces, wetlands and ponds can play an important role in managing local flood

¹⁰ The Economics of Climate Change: N Stern, HM Treasury, London 2006

¹¹ Managing climate risks to well-being and the economy: Adaptation Sub Committee (ASC) progress report 2014, Committee on Climate Change (CCC)

risk in urban areas since they replicate natural surface water drainage systems. It is estimated from surface water modelling carried out for Defra that over 16,000 properties in Wiltshire are at risk of surface water flooding in an extreme event.¹²

Objective 12

Produce an evidence base on the ability of local infrastructure to withstand extreme climate conditions

Wiltshire Council will use existing working groups and programmes to undertake assessments, review maintenance measures, monitor performance and identify vulnerability. This combined analysis will provide us with a coherent picture of existing infrastructure assets and identify where to prioritise funds to ensure their longevity. A more detailed action plan can be found in *chapter 6.5*.

Objective 13

Future proof new infrastructure systems to account for the projected changes in climate

Wiltshire Council will adopt sustainable building practices in major new developments, incorporate climate related risks around high temperatures, drought and flooding, into the Infrastructure Delivery Plan and into roads/highways project planning. In order to try and mitigate some of the impact of flooding we will develop a Green Infrastructure Strategy, create spaces for additional flood water, secure management and maintenance of SuDS and ensure there are adequate financial resources for a Drainage Gully Emptying programme. A more detailed action plan can be found in *chapter 6.5*.

¹² Wiltshire Local Flood Risk Management Strategy, 2014

6. Actions

6.1 Well-being and Public Health

Strategic aim – Wiltshire residents have adapted to the challenges of climate change and are supported by robust health and social care systems

High level risks with current rating scores	Actions
<p>Increased ill-health, hospital admissions & deaths among vulnerable groups from excess heat and cold (12)</p> <p>Increase in flood related illness and displacement (As well as injury and infection, the effect of flooding on mental health is well documented) (12)</p> <p>Health impacts relating to air quality and airborne substances causing allergic reactions (e.g. pollen). (Wiltshire Council is obligated to work toward UK LAQM objectives) (16)</p> <p>Closure of care homes due to extreme weather (12)</p>	1. Wiltshire residents are well informed of the health risks from excess heat and cold, flooding and poor air quality
	1.1 Establish a Joint Communication Plan with Wiltshire Clinical Commissioning Group, Adult Social Care, Public Health and Public Protection for Heat and Cold Head of Public Health, Public Protection and Communication
	1.2 Utilise the “Climate Just Vulnerability Mapping Tool” to identify areas at most disadvantage from climate impacts. Target advice and information
	1.3 Educate & communicate health risks associated with heatwaves and how to implement cooling measures Head of public Protection – annual programme of information, review 2018
	1.4 Work with partners across the south west to promote protective behaviour from high levels of UV radiation 1.5 Update the information portal on health and social care issues with Climate Change risks Commissioning, Community Services and Healthwatch Wiltshire. Completion by December 2016
	2. Wiltshire residents have the necessary health provisions to enable them adapt to extreme weather
	2.1 Identify people with respiratory and cardiac health conditions who could benefit from signing up to the air quality Know & Respond Service Public Health, review 2018
	2.2 Work with partners to identify vulnerable people with existing health conditions and provide help and advice Adult Care Operational Heads of Service - review 2018
	2.3 Ensure delivery of increased shaded areas in existing parks, especially play parks & in public open spaces Spatial Planning Manager (L&D) – Completion by December 2016
	2.4 Ensure greater availability of drinking water in outdoor spaces 2.5 Following a heat risk study of Council-owned housing, install low-carbon cooling measures targeted at vulnerable groups

	<p>3. All Care homes across Wiltshire consider climate change risks within care plans for both their customers and physical assets</p> <p>3.1 Operational Teams to ensure customers have contingency/emergency plans on CareFirst Adult Care Operational Heads of Service - review 2018</p> <p>3.2 Care homes to be aware of PHE “Appropriate care of vulnerable individuals during heatwaves” guidelines Commissioning - Community Services (through the Wiltshire Care Partnership). Completion by December 2016</p> <p>3.3 Consider surrounding infrastructure within care home contingency planning; risks to power supplies, water supplies, transport links and supply chains</p> <p>3.4 Asset Managers should report on the uptake of resilience measures, including coping limits (i.e. point at which an event becomes too severe for the asset to maintain its ability to function) for public health & social care assets Adult Care Operational Heads of Service</p>
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6.2 Financial and Economic

Strategic aim – Wiltshire businesses are prepared for the risks from a changing climate

High level risks with current rating scores	Actions
<p>Flooding of businesses and local infrastructure (12)</p> <p>Risks to supply chain operations from extreme weather and a changing climate (12)</p> <p>Reduction in available water for abstraction (16)</p> <p>Reduced productivity for businesses due to extreme weather. Risk to Food businesses through water and food borne diseases, emergent diseases (eg Zika) coupled with increases of antimicrobial resistance (12)</p>	<p>4. Wiltshire businesses receive targeted engagement and informed investment advice on the risks associated with climate change</p>
	<p>4.1 Using Climate Just mapping, identify business parks and industrial sites at risk of flooding to target intervention Enterprise Manager – link with Employment land/space review 2016</p>
	<p>4.2 Investigate abstraction levels and Wiltshire’s water infrastructure, to understand potential impacts on business relocation and growth, to provide informed advice for inward investment Enterprise Manager – Start investigating Sept 2016</p>
	<p>4.3 Use existing business relationships to raise awareness, with a sector specific focus, and encourage actions to build long term resilience Enterprise Manager – establish task group – Sept 2016</p>
	<p>4.4 Promote use of The Enterprise Network (TEN) and Fire stations to maintain communication during recovery period Enterprise Manager – establish task group – Sept 2016</p>
	<p>4.5 Environmental Health Officers to educate owners of food premises of the increased risk of food poisoning, fly infestations and invasive species in the face of rising temperatures Public Protection</p>
	<p>5. Wiltshire businesses have the tools to enable them to adapt to extreme weather</p>
	<p>5.1 Produce a “weathering the storm” guide for Wiltshire SMEs, coupled with workshops and partnership building to necessitate action Enterprise Manager – Sept 2016 work toward Business Expo in 2017</p>
	<p>5.2 Promote use of the “Business Resilience Health Check tool”, and the BitC “Business Emergency Resilience Group 10 min Plan”, to help smaller companies conduct risk assessments Head of Public Protection - on-going, review progress 2016</p>
	<p>5.3 Provide business advice/education regarding business continuity for extreme weather events Head of Public Protection – on-going, review progress 2016</p>
	<p>5.4 Encourage businesses in high risk areas to address their resilience and fit property-level protection measures Enterprise Manager – following Business Expo and mapping work – 2017</p>
	<p>5.5 Promote use of the “Climate Ready Resilience Framework”, to help businesses assess and manage climate risks to their supply chain Enterprise Manager – establish task group – Sept 2016 and promote through Growth Hub – on-going review 2017</p>
	<p>5.6 Promote use of WRAP’s “Rippleffect advice and information guide”, on how to use water more efficiently and save money Enterprise Manager – water efficiency through BIDS and Growth hub – Sept 2016</p>

6.3 Environmental

Strategic aim – Wiltshire exhibits a balance between the needs of fragile ecosystems and an increasing demand for resources and land for urban development

High level risks with current rating scores	Actions
<p>Multi season drought/reduced water availability (12)</p> <p>Increased flood and waterlogging (12)</p> <p>Increased soil erosion and reduced organic matter leading to increased reliance on fertilisers (12)</p> <p>Spread of new livestock diseases increasing economic impact on the farming industry (12)</p> <p>Historic buildings and archaeological remains more exposed to risk of water damage and flooding (12)</p> <p>Extended dry periods cause drying out and de-watering of usually wet monuments sites and features (12)</p>	<p>6. Land based businesses are aware of their ability to install mitigation measures against the risks of flooding and water availability and incorporate good husbandry practices</p>
	<p>6.1 Incentivise greater water efficiency and storage at farm level Estates Manager, Strategic Asset & FM – Review in 2018</p>
	<p>6.2 Incorporate good husbandry clauses into farm tenancy agreements; to reduce activities that encourage soil erosion e.g. over-use, over-grazing Estates Manager, Strategic Asset & FM – on-going. Review impact in 2018</p>
	<p>6.3 Mediate between the Environment Agency and local farmers to investigate all opportunities for installing sustainable drainage systems (SuDS)</p>
	<p>6.4 Develop systems of water capture & storage (See Civil contingencies & emergency planning below)</p>
	<p>6.5 Update the Asset Management Plan for the Country Farm Estate Estates Manager, Strategic Asset & FM – Completion by October 2016</p>
	<p>6.6 Reduce the total amount of food produced by tackling food waste and lowering demand</p>
	<p>7. Prioritise ecological habitats based upon their vulnerability to climate change in order to target action which will maintain biodiversity and encourage adaptation</p>
	<p>7.1 Establish management regimes for parks, green spaces and semi-natural habitats to maintain biodiversity and manage the spread of invasive and undesirable species Countryside team – awaiting response</p>
	<p>7.2 Consult on a GIS pilot project in Devizes, mapping publicly accessible space and Ecological habitats. Work with the Biological records Centre in Devizes. Potential to roll out across all Market towns Spatial Planning Manager (L&D) – Completion by May 2016</p>
	<p>7.3 Use the “National biodiversity climate change vulnerability model” to provide a spatially explicit assessment of Wiltshire’s priority habitats, to target action which will build biodiversity resilience Spatial Planning Manager (L&D) – Completion by December 2017</p>
	<p>7.4 Encourage adaptation of habitats and natural colonisation by species suited to changing climatic conditions through the Wiltshire Biodiversity Action Plan</p>
	<p>7.5 Use of habitat creation in strategic locations to reduce the risk of soil erosion Spatial Planning Manager</p>

	<p>(L&D) – on-going. Review in 2018</p> <p>7.6 Produce a Policy on Green Infrastructure which will benefit existing and new biodiversity Spatial Planning Manager (L&D) – Completion by October 2016</p> <p>7.7 Develop and adopt a Green Infrastructure Strategy to ensure delivery of more and improved habitats for native and other non-invasive species Spatial Planning Manager (L&D) – Completion by December 2016</p>
	<p>8. Local planning policy and management strategies are in place to protect Wiltshire landscapes and key environmental assets</p>
	<p>8.1 Protect & enhance green open space, habitats and ecological corridors via landscape scale projects and SuDS Spatial Planning Manager (L&D) – on-going. Review in 2018</p> <p>8.2 Develop and adopt a Landscape Strategy to ensure strategic landscape design considers how subsidence and root penetration will be affected by climate change Spatial Planning Manager (L&D) – Completion by September 2017</p> <p>8.3 Assess heritage assets at risk within flood zones and integrate results into the Local Flood Risk Management Strategy. Listed or Scheduled sites should be prioritised. Assess and record heritage assets at risk from de-watering as well those at risk from flooding Conservation Specialist and County Archaeologist - Dec 17</p>

6.4 Civil Contingencies and Emergency Planning

Strategic aim – Wiltshire Council has effective plans, policies and resources in place to respond to severe weather events and other emergencies, working in partnership with residents

High level risks with current rating scores	Actions
<p>Flooding of homes and buildings (12)</p> <p>Drainage systems unable to cope causing flooding to homes, buildings and transport infrastructure (12)</p> <p>Pluvial flooding (occurring when an extremely heavy downpour of rain saturates drainage systems and the excess water cannot be absorbed) could contaminate public waterways with sewerage (12)</p> <p>Multi-season drought & long-term water stresses (12)</p> <p>Short term water shortages (12)</p> <p>Ability to manage waste in extreme weather conditions (16)</p>	<p>9. Wiltshire residents aware of their responsibilities managing waste in extreme heat, using water more efficiency and putting in place protection measures against flooding</p>
	<p>9.1 Increase flood resilience planning and community awareness Head of Public Protection – annual programme of information, review 2018</p>
	<p>9.2 Work closely with partners to deliver flood mitigation schemes and encourage property protection measures Head of Highways Asset Management & Commissioning – ongoing through the Operational Flood Working Group</p>
	<p>9.3 Communicate messages to public about managing waste in extreme heat</p>
	<p>9.4 Undertake a co-ordinated and sustained awareness raising campaign aimed at businesses, property developers and residents regarding water use (check with planning. Water company)</p>
	<p>10. Preventative processes are in place to mitigate against an emergency response requirement</p>
	<p>10.1 Ensure adequate financial resources for Highways' Gully Emptying Programme Head of Highways Asset Management & Commissioning – additional funding allocated for 2016</p>
	<p>10.2 Investigate all methods of securing long term management and maintenance of SuDS Head of Highways Asset Management & Commissioning – annual report made to Environment select committee</p>
	<p>10.3 Undertake assessments to identify drainage risks and review maintenance to establish whether more frequent clearing is required Head of Highways Asset Management & Commissioning – review on-going monitoring 2018</p>
	<p>10.4 Integrate weather vulnerability and risk management into roads/highways project planning Head of Highways Asset Management & Commissioning – review in 5 years' time</p>
	<p>10.5 Discuss with Wiltshire's Water Utility companies contingency planning for provision of bowsers for PWS that run dry where they serve vulnerable parties Head of Public Protection – Severe Weather Group</p>
	<p>10.6 Demonstrate good practice by increasing the use of water efficient appliances and rain water harvesting systems as part of Corporate Buildings Standards. Where they have been installed follow up monitoring and use of the harvested water to promote best practise</p>
	<p>10.7 Review best practice and ensure proper storage of waste to take account of rising temperatures, and</p>

<p>Lack of capacity for Coroner services resulting in delays in inquests and autopsies, additional stress for bereaved, storage shortages, negative reputational impacts (12)</p>	<p>the impact on local residents from fires, odours and flies Public Protection 10.8 Capacity issues have been addressed by the Public Health & Public Protection service 10.9 Ensure Business Continuity Plans for Registration and Coroner are in place Head of Public Protection – review Registration Plan and produce Coroner Plan 2016 10.10 Produce Excess Deaths Plan Head of Public Protection – in place, review 2017 10.11 Work with Natural England and Local Nature Partnerships to monitor populations of disease-bearing vermin and pests in the face of rising temperatures and review resource requirements to manage them</p>
<p>Biodiversity: Increase in invasive species changing the community and composition (12)</p>	<p>11. Local communities and businesses are protected through robust local plans and policy development 11.1 Produce Surface Water Management Plans for high risk locations in Wiltshire Senior Planning Officer Spatial and Head of Highways Asset Management & Commissioning – review progress of additional plans in 2018 11.2 Develop and adopt a Green Infrastructure Strategy Spatial Planning Manager (L&D) – Completion by December 2016 11.3 Work with the Environment Agency to identify & map flash flood 'hotspots' & identify causes of flooding in each case Head of Highways Asset Management & Commissioning – work underway through Operational Flood Working Group. Review progress 2018 11.4 Plan for and create spaces for additional temporary flood water storage Head of Highways Asset Management & Commissioning – review progress currently identified through operational flood working group 11.5 Develop and adopt a Landscape Strategy to inform drought-resistant landscaping schemes and 'low water gardens' in open spaces that require minimal irrigation Spatial Planning Manager (L&D) – Completion by September 2017 11.6 Contractors obligation for business continuity plans – build in requirement to review flood risk at key sites (landfill, closed landfill, waste transfer stations, household recycling centres, etc.) within the mobilisation plans for the new contracts 11.7 Refresh Waste Management Strategy, to include Climate risks 11.8 Consider energy from waste potential as part of Waste Management Strategy refresh</p>

6.5 Infrastructure Resilience

Strategic aim – New infrastructure is planned and designed to account for the projected changes in climate over the rest of the century and beyond. Vulnerable existing infrastructure is identified and resources prioritised

High level risks with current rating scores	Actions
<p>Buildings and infrastructure not resilient to a changing climate (12)</p> <p>Drainage systems unable to cope causing flooding to homes, buildings and transport infrastructure. Pluvial flooding could contaminate public waterways with sewerage (12)</p> <p>Damage to roads and pavements due to freeze-thaw effect, and long spells of continually wet weather (12)</p> <p>Storm damage to street lights, signs, traffic lights & trees (12)</p> <p>Hot dry conditions cause older rural roads and pavements to subside, melt and crack (12)</p>	<p>12. Produce an evidence base on ability of local infrastructure to withstand extreme climate conditions</p> <p>12.1 Operational Flood Working Group to identify local infrastructure vulnerability and interdependencies for future schemes Head of Highways Asset Management & Commissioning – review process in 2018</p> <p>12.2 Undertake assessments to identify drainage risks and review maintenance to establish whether more frequent clearing is required Head of Highways Asset Management & Commissioning – review on-going monitoring 2018</p> <p>12.3 Through the Highways Major Maintenance Programme, investigate better preparation for extreme weather Head of Highways Asset Management & Commissioning – review on-going progress 2018</p> <p>12.4 Monitor infrastructure performance during extreme weather events Head of Highways Asset Management & Commissioning – undertake focus survey annually</p> <p>12.5 Monitor proximity and stability of trees; consider tree-surgery to mitigate risk Head of Highways Asset Management & Commissioning – undertake focus survey annually</p>
	<p>13. Future proof new infrastructure systems to account for the projected changes in climate</p> <p>13.1 Adopt sustainable building practices in major new developments</p> <p>13.2 Incorporate climate related risks around high temperatures, drought and flooding, into the Infrastructure Delivery Plan</p> <p>13.3 Ensure contracts specifying new assets or infrastructure require them to be resilient & adaptable to the climates they will experience over their lifetime Procurement</p> <p>13.4 Ensure adequate financial resources for Highways' Gully Emptying Programme Head of Highways Asset Management & Commissioning y – additional funding allocated for 2016</p> <p>13.5 Investigate all methods of securing long term management and maintenance of SuDS, Head of Highways Asset Management & Commissioning – annual report made to Environment select committee</p> <p>13.6 Develop and adopt a Green Infrastructure Strategy Spatial Planning Manager (L&D) – Completion by December 2016</p>

	<p>13.7 Plan for and create spaces for additional temporary flood water storage Head of Highways Asset Management & Commissioning – review progress currently identified through operational flood working group</p> <p>13.8 Integrate weather vulnerability and risk management into roads/highways project planning Head of Highways Asset Management & Commissioning – review in 5 years' time</p> <p>13.9 Through the Highways Major Maintenance Programme, identify vulnerable areas and improve maintenance Head of Highways Asset Management & Commissioning – review process in 2018</p> <p>13.10 Adopt sustainable resilient road building practices, and review specifications for carriageway repair Head of Highways Asset Management & Commissioning – review annually</p> <p>13.11 Use heat appropriate materials on new roads / when maintaining existing roads Head of Highways Asset Management & Commissioning – review annually</p>
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7. Work undertaken since 2011

Summary of work undertaken since the Climate Change Adaptation Plan was produced in 2011

- produced Core Strategy for Wiltshire which identifies addressing climate change as a key strategic objective, including policies which will deliver; sustainable growth, build resilient communities, provide a network of green infrastructure, ensure more sustainable transport and reduce the risk of flooding,
- revised the Wiltshire Biodiversity Action Plan, making it available on-line,
- produced a design guide for developers incorporating Sustainable Drainage Systems, and are finalising a Ground Water Flooding Strategy,
- put in place a Strategy and Delivery plan regarding our duties under the Flood and Water Management Act,
- established a Strategic Flood Risk Management Group to review progress on flood alleviation and the operational flood working groups,
- held workshops for each area board, encouraging them to create combined emergency plans addressing flooding, health, highways and utilities,

- launched a “Planning for Emergencies – Are you ready” on-line guide, detailing how to prepare yourself, family and business,
- reviewed Business Continuity Plan, Major Incident Plan and Recovery Plan, and developed an Integrated Emergency Management Plan,
- established a Regional Resilience Group, made up of Business Continuity leads from each local authority,
- developed Actions for dealing with Heatwaves from level 1 (preparedness) to level 4 (emergency situation),
- put in place a joint communication plan with Wiltshire Commissioning Group, Adult social Care and Public Protection addressing winter/cold issues,
- produced an Air Quality Plan – covering the eight air quality management areas across the county,
- created an Air Quality website to communicate information and daily air quality reports to the public,
- participated in the government's Review of Transport Resilience and produced a Wiltshire Transport Resilience report,
- facilitated development of the South West Highways Alliance “Resilience Assessment Tool” - a web-based toolkit using risk assessment and analysis to provide adaptation and mitigation options for highway manage

Appendix

1 A Changing Climate

Overview

The Fifth Assessment Report from the Intergovernmental Panel on Climate Change (IPCC) in 2014 said that “Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, and sea level has risen”.¹³ Human influence on the climate system is clear, with emissions from human activity resulting in concentrations of greenhouse gases in the atmosphere which are unprecedented for 3-5 million years. Recent climate changes have had widespread impacts on human and natural systems.

The Committee on Climate Change: Adaptation Sub-committee, states that “If global greenhouse gas emissions continue to increase at their current rate, average temperatures are expected to rise by more than two degrees above preindustrial levels by around the middle of this century, and by four degrees by the end of this century”.¹⁴ Two degrees is the point above which scientists consider to be dangerous runaway warming, which will result in irreversible changes to the earth and bring major challenges for public wellbeing and the economy.

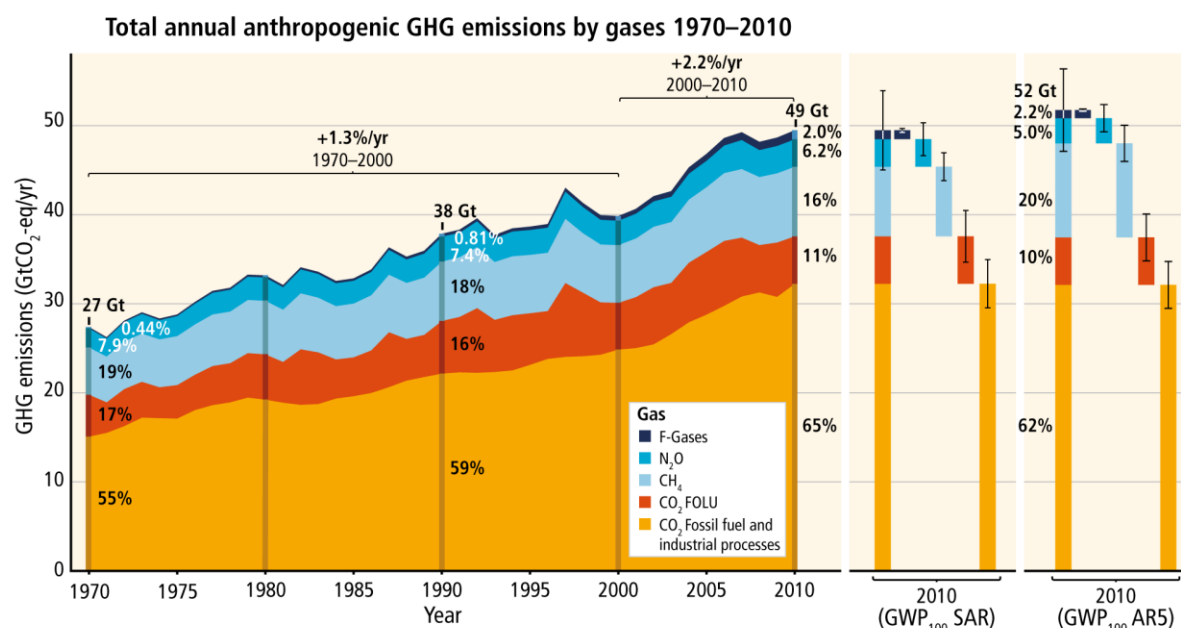
In the UK, the most significant early impacts of climate change are likely to be increases in the frequency and severity of extreme weather – heatwaves and flooding, and possibly storms and drought. Average sea level is rising by three millimeters per year. Hundreds of plant and animal species are feeling the onset of spring and summer, on average, 11 days earlier than in the 1970s. Winter rainfall is arriving in more intense bursts.¹⁵

Annual Green House Gas (GHG) emissions grew on average by 2.2% per year, from 2000 to 2010, compared to 1.3% per year, from 1970 to 2000 (see diagram below) despite a growing number of climate change mitigation policies. We have to adapt to climate change, because even if emissions stopped completely tomorrow, our climate would still continue to change for 30-50 years as a result of past emissions. Decisions made now in regulating global emissions, and the speed in which any reductions are implemented, will influence the degree of climate change experienced from 2050 until the beginning of the next century.

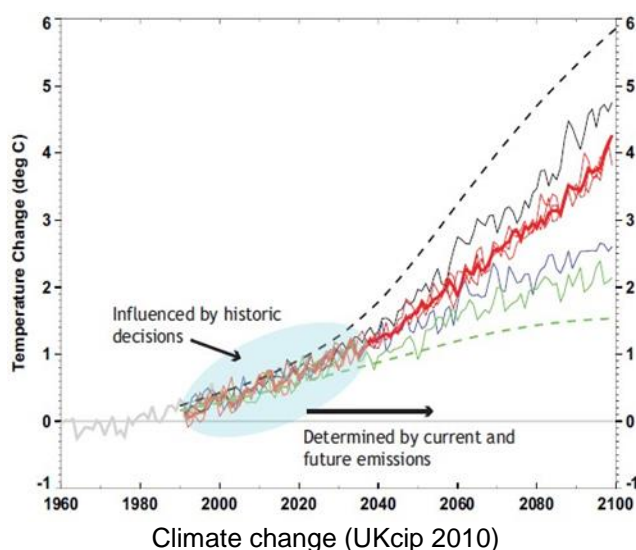
¹³ Climate Change 2014 Synthesis Report, ipcc

¹⁴ Managing climate risks to well-being and the economy: Adaptation Sub Committee (ASC) progress report 2014, Committee on Climate Change (CCC)

¹⁵ How a changing climate affects us, CCC website



“Total anthropogenic GHG emissions have continued to increase over 1970 to 2010 with larger absolute increases between 2000 and 2010, despite a growing number of climate change mitigation policies. Emissions of CO₂ from fossil fuel combustion and industrial processes contributed about 78% of the total GHG emissions increase from 1970 to 2010, with a similar percentage contribution for the increase during the period 2000 to 2010. The contribution of population growth between 2000 and 2010 remained roughly identical to the previous three decades, while the contribution of economic growth has risen sharply”¹⁶.



The UK Climate Impacts Programme (UKcip) Climate Change graph illustrates the influence of historical emissions on the warming that will be experienced up until the middle of the 21st century. The shaded blue area denotes the amount of climate change to which we are already committed. The coloured lines show the possible increases in global temperature that may be experienced post 2050 depending on how much emissions are reduced.

Although individual weather events cannot be directly attributed to climate change, we are aware of the types of impacts faced from extreme weather incidences (which are predicted to increase as climate change develops) because we have

¹⁶ Intergovernmental Panel on Climate Change: 5th Assessment Report 2014

already experienced many of these, including heatwaves, droughts and flooding events.

2 United Kingdom Climate Projections

In order to adapt our infrastructure and services, we need to know how much the climate is likely to change and what temperatures and rainfall patterns we can expect. Making timely and proportionate changes to how we do things ensures that our investments, such as buildings and transport infrastructure, last for as long as they possibly can. Effective decisions now can reduce long term running costs in the future.

The United Kingdom Climate Projections 2009 (UKCP09) is a climate modelling tool which helps us plan and prepare for a future with climate change. It builds upon earlier modelling work (UKCIP02), and has been developed by the Hadley Centre, based at the Met Office in Exeter, in conjunction with the United Kingdom Climate Impacts Partnership (UKCIP) which is funded by DEFRA. The model provides probabilistic projections which show the potential range of possible changes. It gives a clear indication of what is most likely within that range giving us a greater confidence of the local temperatures or precipitation patterns we are likely to experience in the future.

A recent study found that the UKCP09 still remains a vital source for informing UK adaptation. We are therefore content to continue using the 2009 projections, and will look to review our modelling scenarios when UKCP18 (a new project set to deliver a major upgrade to the UKC09 suite of information and services) becomes available in a few years' time.

The results from the UKCP09 Projections suggest a broad trend of **hotter, drier summers** and **warmer, wetter winters** across the whole of the UK by the end of the century with significant regional variations that will see average **summer temperatures rise** between 2.5°C in those areas least affected and 4.5°C in those areas most affected.

Winter temperatures are expected to increase between 2°C and 3°C. This does not mean that cold winters and snow and ice, such as the 2009/10 and 2010/11 winters, will become consigned to the past, as there will still be natural variability within our climate, they will just become less frequent and we may become less adapted to cope with them.

Total annual precipitation rates will remain about the same. However, there is likely to be an increase of between 10 - 40% in winter rainfall and conversely a similar expected decrease in summer rainfall. Alongside these trends, we are expected to experience more **extreme weather events** with an increase in the frequency and intensity of **heavy rainfall**, leading to **flash flooding in summer** and saturated soils leading to **flooding in winter**. More frequent **heatwaves** are also expected along with continuing **sea level rise**.

3 Future Climate Change in Wiltshire

According to the UKCP09 projections, by 2050 Wiltshire will experience hotter summers with an increase in average summer temperature of between 2.0 – 3.9 °C on the current average summer temperature of 21°C. The hottest summer days could see average temperature rise to as much as 26.4°C. Increasing temperatures in excess of approximately 25°C are associated with excess summer deaths, with higher temperatures associated with greater numbers. Excess summer deaths show regional variations, which relate largely to differences in temperature levels across the country. According to the Public Health England Heatwave Plan, the excess deaths and illness related to heatwaves occur in part due to our inability to adapt and cool ourselves sufficiently; therefore relatively more deaths occur in the first days of a hot period emphasising the importance of long-term planning actions by local authorities.

Average winter temperatures are also set to rise with an expected increase of between 1.5 – 2.9 °C on that which is currently experienced.

Total annual rainfall is unlikely to change, however, the patterns of rainfall could shift with total summer rainfall likely to decrease by around 20% and winter rainfall predicted to rise by around 15%.

A range of projections are presented in *section 8.6* below which show how the county's climate (temperature, precipitation and humidity) will have changed by 2050.

4 Why do we need to Adapt?

There are many reasons, including financial, social and environmental benefits, why we need to adapt to changes that may arise from climate change.

In 2006, the Stern Review on the Economics of Climate Change drew the conclusion that the benefits of strong, early action on climate change considerably outweigh the costs and suggested that climate change presented a unique challenge for economics.

Sir Nicholas Stern, the Review's author, was quoted as saying "Adaptation to climate change, that which is taking steps to build resilience and minimise costs, is essential. It is no longer possible to prevent the climate change that will take place over the next two to three decades, but it is possible to protect our societies and economies from its impacts to some extent".

In 2015 the Governor of the Bank of England, Mark Carney, highlighted the threat the climate change poses to financial stability, grouped around the physical risks to insured assets, liability risks that may arise in future for carbon extractors and emitters, and the financial risks associated with the transition to a low-carbon economy.

The Public Health England (formally Health Protection Agency) report in 2012 stated that projections indicating an increase in annual mean temperatures of around 2 to 5°C higher than present, would make heatwaves more frequent in the future in the UK. At present, “the health burden due to low temperature exceeds that of high temperature. However, heat-related mortality, which is currently around 2,000 premature deaths per year (assuming no adaptation takes place), is projected to increase steeply in the UK throughout the 21st century, from around a 70% increase in the 2020s to around 540% in the 2080s”¹⁷.

The Adaptation Sub Committee’s (ASC) first report to Parliament on the National Adaptation Programme was published in June 2015. The key findings of the ASC’s evaluation were:

- There are plans in place and action is being taken to address the risk of future **water scarcity**. Significant decisions in terms of new water storage, treatment and supply infrastructure will need to be taken. Reforming the water abstraction licencing regime also remains an urgent priority.
- **Flooding** remains one of the most serious current and future risks to the UK from climate change. Investment in flood and coastal defence assets will need to steadily increase in the future. Concerted efforts will also be needed by local authorities and partner organisations to improve the management of catchments, the coast, and urban areas in ways that alleviate the potential for flooding.
- Impacts on health from **higher temperatures** are likely to increase in the future due to climate change combined with a growing, ageing population. Action is needed to begin to adapt the UK’s built environment, so that homes and other buildings can be comfortable and safe in higher temperatures. Recent losses in urban greenspace should also be reversed.
- Key indicators of **environmental quality** continue to move in the wrong direction, putting at risk vital ecosystem goods and services such as clean air, clean water, and carbon storage. Harmful land management practices persist, particularly on sensitive peat habitats in the uplands. Some of the most productive agricultural land in England is at risk of becoming unprofitable within a generation due to soil erosion and the loss of organic carbon. Without further action, farmers may not benefit from the opportunities of longer growing seasons, and the natural environment will be severely harmed by climate change.

The Paris Climate change conference in December 2015

The Paris Agreement for 2020, and the accompanying decision text, aims to “strengthen the global response to the threat of climate change in the context of sustainable development and efforts to eradicate poverty”.

¹⁷ Health Effects of Climate Change in the UK 2012, Public Health Agency

It commits the 195 parties collectively to:

- Hold average global temperature increases to well below 2°C above pre-industrial levels and pursue efforts to limit the rise to 1.5°C above pre-industrial levels.
- Increase the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions.
- Make finance flows consistent with a pathway towards low greenhouse-gas emissions and climate-resilient development.

Together, these provisions set an overall direction of travel towards a low-carbon economy, identify a greenhouse gas mitigation market, an adaptation and resilience market, and call time on fossil-fuel investments.

5 Legislative drivers

A number of legislative drivers and policy commitments also encourage action on climate change adaptation in the UK.

[Climate Change Act 2008](#)

In 2008, the Climate Change Act was passed making the UK the first country in the world to introduce a legally binding emissions reduction target of an 80% cut in national greenhouse gas emissions from 1990 levels by 2050. Although the Climate Change Act's main focus is on mitigating emissions, it also provides a statutory framework for planning and implementing adaptation and includes the establishment of the Adaptation Sub-Committee (ASC). The Act also identifies a range of organisations (water and energy companies etc, but not including Local Authorities) that have a duty to prepare adaptation reports that outline the key impacts of climate change upon the functions of their organisation and develop proposals and policies for how to prepare for these risks.

The Climate Change Act requires a five yearly [Climate Change Risk Assessment](#) (CCRA), to understand the level of risk and opportunities for the UK arising from climate change and setting out the main priorities for adaptation. The first CCRA Evidence Report (2012) identified approximately 700 risks, focused on 100 which were built around 11 sectors and formed into themes. Overall, the findings of the CCRA indicate that the greatest need for early adaptation action (i.e. within the next 5 years) is in the following areas:

- Flooding;
- Impacts on natural capital and agriculture;
- Managing water scarcity;
- Overheating of buildings and infrastructure in the urban environment;
- Health risks associated with heatwaves and other risks that may affect the NHS;
- Opportunities for the UK economy, particularly to develop climate adaptation products and services

[The National Adaptation Programme](#)

The Adaptation Sub-Committee (ASC) reports to Parliament every two years on the Government's progress in preparing the UK for the impacts of climate change, by delivering the National Adaptation Programme (NAP). The Programme contains a register of policies and actions to help us to adapt successfully to future weather conditions. It aligns the risks identified in the [Climate Change Risk Assessment](#) to actions being undertaken or to be undertaken and the timescales according to each theme. There are seven themes within the NAP – one specifically covering local government

[Climate Local](#)

Climate Local was a Local Government Association initiative, supported by the Environment Agency Climate Ready service, to drive, inspire and support council action on climate change. Launched in June 2012, it aimed to support councils both to reduce carbon emissions and to increase resilience to a changing climate. The initiative is the only one of its type in England and was the successor to the old Nottingham Declaration on Climate Change. Wiltshire council became a signatory of the Climate Local Initiative in September 2014. In 2016 the Climate Ready service was canceled.

[Civil Contingencies Act \(2004\)](#)

The Civil Contingencies Act 2004 establishes a statutory framework for civil protection at the local level, placing a responsibility upon local authorities to:

- develop plans for dealing with emergencies including extreme weather events,
- warn and advise the public in the event of an emergency,
- provide advice and assistance to businesses and voluntary organisations about business continuity management.

Local responders are divided into two categories and proportionate sets of duties are applied on each. Category 1 responders are those organisations at the core of emergency response (e.g. emergency services, local authorities) and form the constituent partners of the Wiltshire and Swindon Local Resilience forum.

[Flood and Water Management Act \(2010\)](#)

The 2010 Flood and Water Management Act requires upper tier local authorities to create local flood risk management strategies, carry out flood risk management work and develop a register of structures or features which may have a significant impact on local flooding. Wiltshire Council has a Local Flood Risk Management Plan in place.

[National Planning Policy Framework and Planning Practice guidance](#)

Addressing climate change is one of the core land use planning principles which the National Planning Policy Framework expects to underpin both plan-making and decision-taking. National Planning Policy Framework paragraphs 93 and 94; include the requirements for local authorities to adopt proactive strategies to mitigate and adapt to climate change in line with the provisions and objectives of the Climate Change Act 2008, and co-operate to deliver strategic priorities which include climate change. The Wiltshire [Core Strategy](#) identifies addressing climate change as a key strategic objective, including policies which will deliver; sustainable growth, build resilient communities, provide a network of green infrastructure, ensure more sustainable transport and reduce the risk of flooding.

[The Natural Environment and Rural Communities \(NERC\) Act 2006 - Biodiversity Duty](#)

As a public authority in England, Wiltshire Council has a duty to have regard to conserving biodiversity as part of our policy or decision making. Conserving biodiversity can include restoring or enhancing a population or habitat.

[Marmot Review - policy targets:](#)

- Improving active travel, and the availability of good quality open and green spaces.
- Improving energy efficiency of housing for all.

[NHS Standard Contract](#)

This is an annual framework reviewed each year by NHS England. The framework often includes provisions for adaptation to climate change, emergency preparedness and business continuity. The 2016/17 [Service Conditions](#) require providers to:

- demonstrate progress on climate change adaptation, mitigation and sustainable development, including performance against carbon reduction management plans, and must provide a summary of that progress in its annual report
- comply with service conditions for emergencies and incidents
- comply with the Civil Contingencies Act
- comply with Emergency Preparedness Resilience and Response guidelines
- co-operate through the Local Health Resilience Partnerships and contribute to the coordinated development and review of any local area Business Continuity Plans and Incident Response Plans

[Sustainable Development Strategy for the Health, Public and Social Care System 2014-2020](#)

The Sustainable Development Strategy describes the vision for a sustainable health and care system by reducing carbon emissions, protecting natural resources, preparing communities for extreme weather events and promoting healthy lifestyles and environments. Having a board approved [Sustainable Development Management Plan \(SDMP\)](#) is one of the cornerstones of the Strategy.

6 The UKCP09 climate projections

The 2009 UK Climate Projections (UKCP09) were published in June 2009 by the Met Office Hadley Centre, and are available at a finer spatial resolution than previously produced, with projections available for 25 km grid squares across the UK, and the introduction of probabilistic projections. This report outlines the likely changes in Wiltshire's climate based on the UKCP09 projections.

There are a number of choices of variables, when presenting findings from the UKCP09 work. These variables are explained in turn below.

Time periods

The projections are available for seven overlapping 30 year time periods, ranging from 2010 up until the end of the century. The time periods are referred to by the central decade for ease of reference (see table 1 below), but it is important to note that the projections for each time period relate to the average climate over the 30 year period. This report presents projections for the 2020s, 2050s, and 2080s in order to give an overview of likely changes through to the end of the century.

Table 1: UKCP09 time periods

Time period	Central decade
2010 – 2039	2020s
2020 – 2049	2030s
2030 – 2059	2040s
2040 – 2069	2050s
2050 – 2079	2060s
2060 – 2089	2070s
2070 – 2099	2080s

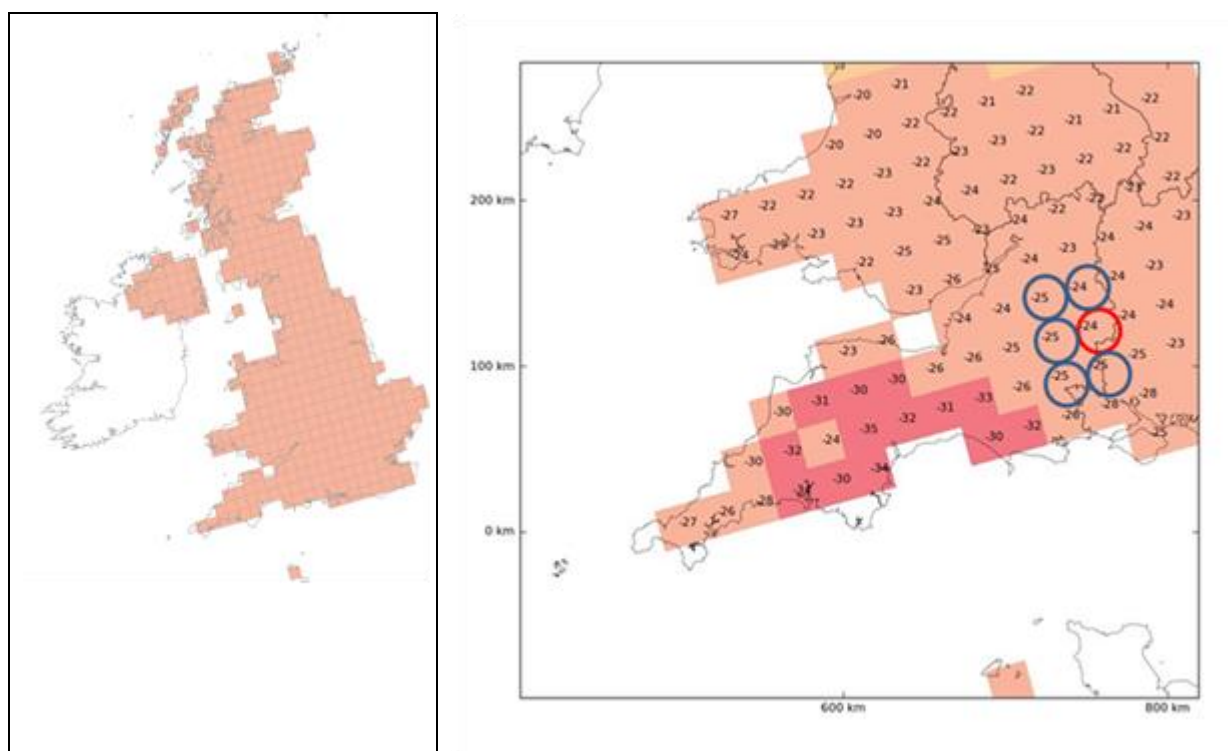
Source: UKCP09 Guidance: Glossary

In all cases, the projections relate to climate changes relative to the 1961 to 1990 baseline period. It should be noted that the gap between the end of the baseline period (1990) and the beginning of the first time period for projections (2010) means that the UKCP09 work does not provide projections for current and near-term (next 5-10 years) climate.

Spatial resolution

The projections are available for the administrative regions, for river basins, and for 25km grid squares. Wiltshire is covered by approximately six 25km grid squares, although these do not correspond exactly to the local authority boundary.

Figure 1: Grid squares covering Wiltshire



Source: UKCP09 User Interface (© UK Climate Projections 2009)

It is not possible to average the projections across the grid squares due to the way in which the models were developed. Where a range of values is given in this report, this represents the range across the six grid squares. The graphs showing the change over time in projections at the 50% probability level relate to the single grid square highlighted in red.

Emissions scenarios

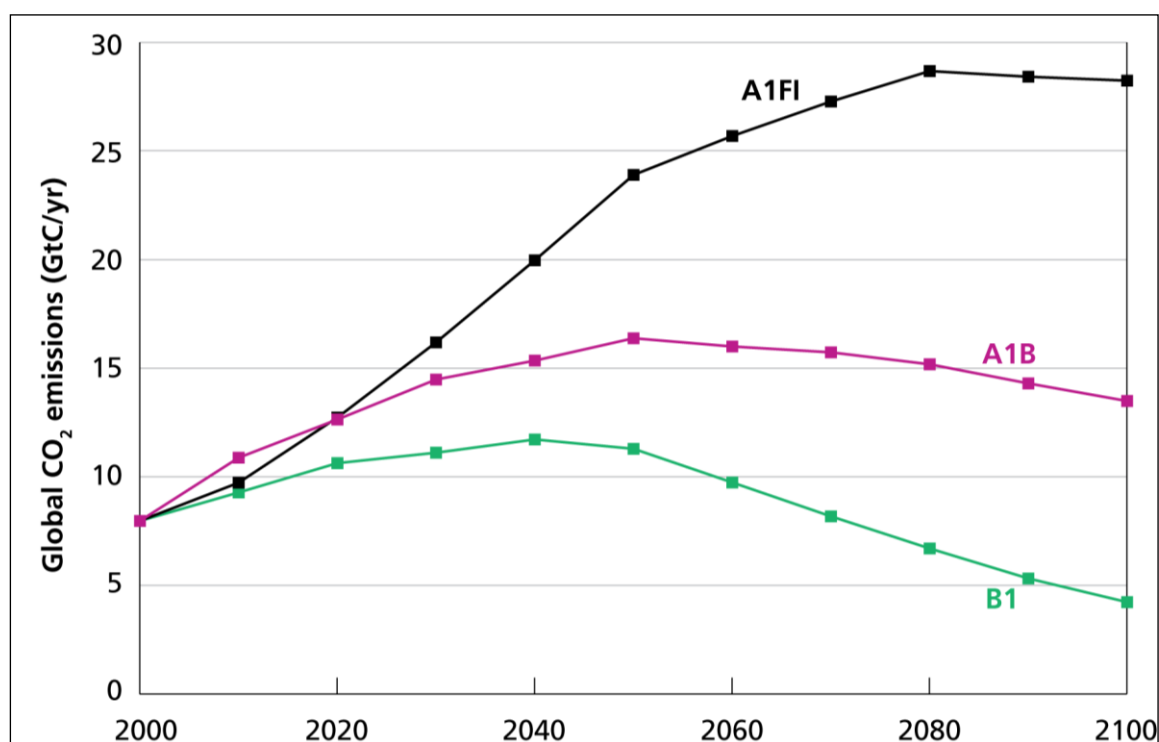
The UKCP09 projections are available for three different emissions scenarios: low, medium, and high, based on socio-economic (SRES) scenarios developed by the Intergovernmental Panel on Climate Change (IPCC). The three scenarios do not take account of policies which may arise in response to concerns over climate change. This report presents projections across the full range of emissions scenarios, in order to give an indication as to the possible variation in future climate change according to future emissions levels. It is interesting to note that there is not much variation between the emissions scenarios for projections covering the earlier time periods (2020s, 2030s, and 2040s). This is because the climate change experienced during these earlier periods will largely be determined by emissions which are already in the atmosphere. Thus we are already locked into a certain degree of climate change, due to past emissions. The three scenarios used for the UKCP09 projections are illustrated in table 2 and figure 2 below.

Table 2: Summary of UKCP09 emissions scenarios

UKCP09 emissions scenario	Corresponding IPCC SRES scenario	Summary
High	A1F1	High reliance on fossil fuels
Medium	A1B	Mixed reliance on fossil fuels and new technologies
Low	B1	Increased use of new technologies

Source: Gloucestershire County Council, 2010

Figure 2: CO₂ emissions under the three IPCC SRES scenarios used in UKCP09



Source: IPCC 2007, reproduced in UKCP09 Briefing report

Probability levels

The UKCP09 work provides probabilistic climate projections for the first time. Each projection is accompanied by a 'probability level' which indicates the degree of certainty associated with that projection. Table 3 below explains the meaning of the probability levels most frequently referred to in the UKCP09 work.

Table 3: Probability levels

Probability level	Explanation
10%	Climate change is very unlikely to be less than the projected value
33%	Climate change is unlikely to be less than the projected value
50%	Climate change is equally likely to less than or greater than the projected value
67%	Climate change is unlikely to be more than the projected value
90%	Climate change is very unlikely to be more than the projected value

Source: Adapted from Gloucestershire County Council, 2010

The value at the 50% probability level is referred to as the ‘central estimate’, the range between the 10% and 90% probability levels is the ‘very likely range’, and the range between the 33% and 67% probability levels is the ‘likely range’. This report has used the likely range and the central estimate to illustrate likely climate change in Wiltshire.

Climate variables

This report focuses on the climate variables of temperature and precipitation, and also briefly covers cloud cover, humidity, and shortwave radiation. The definitions of each of the climate variables used in the report are provided in appendix A. It is important to note that there are differing levels of confidence in the projections for different climate variables. The UKCP09 ‘Guiding principles’ state that there is more confidence in projections for temperature than those for precipitation, particularly summer precipitation.

Summary of changes in temperature and precipitation in Wiltshire

The summaries below show the likely changes in temperature and precipitation in Wiltshire for the 2020s, 2050s, and 2080s under the medium emissions scenario. In each case, the figures given represent the ‘likely range’ (probability levels of 33% to 67%), and changes are relative to the 1961-1990 baseline.

Likely changes for the 2020s

Temperature

- Increase in annual mean temperature by between 1.2 and 1.7°C
- Increase in summer mean temperature by between 1.2 and 2.0°C
- Increase in winter mean temperature by between 1.0 and 1.6°C
- Increase in temperature of warmest summer day by between 0 and 2.7°C

Precipitation

- Annual precipitation stays roughly the same
- Decrease in summer mean precipitation by between 1 and 15%
- Increase in winter mean precipitation by between 2 and 10%
- Increase in precipitation on the wettest winter day by between 2 and 11%

Likely changes for the 2050s

Temperature

- Increase in annual mean temperature likely to be between 2.2 and 2.9°C
- Increase in summer mean temperature by between 2.3 and 3.5°C
- Increase in winter mean temperature by between 1.8 and 2.6°C
- Increase in temperature of warmest summer day by between 0.9 and 4.4°C

Precipitation

- Annual precipitation stays roughly the same
- Decrease in summer mean precipitation by between 10 and 28%
- Increase in winter mean precipitation by between 9 and 22%
- Increase in precipitation on the wettest winter day by between 6 and 21%

Likely changes for the 2080s

Temperature

- Increase in annual mean temperature likely to be between 3.1 and 4.1°C
- Increase in summer mean temperature by between 3.3 and 4.9°C
- Increase in winter mean temperature by between 2.4 and 3.5°C
- Increase in temperature of warmest summer day by between 1.2 and 5.8°C

Precipitation

- Annual precipitation stays roughly the same
- Decrease in summer mean precipitation by between 13 and 34%
- Increase in winter mean precipitation by between 12 and 29%
- Increase in precipitation on the wettest winter day by between 11 and 29%

Summary of likely trends

The likely climate change trends in Wiltshire over the period up until the end of the century are summarised below. These trends are derived from detailed projections for annual, summer and winter changes, as set out in the following sections.

Long-term/seasonal changes:

- Increase in annual average temperature
- Hotter, drier summers
- Milder, wetter winters

Extreme events

- More hot days
- Fewer frost days
- More dry spells
- Increase in temperature of warmest day
- Increase in precipitation on wettest day

Projected annual changes

Tables 4 and 5 below show that the annual mean temperature in Wiltshire is likely to increase compared to the 1961 to 1990 baseline. The change in annual precipitation in Wiltshire is likely to be small, with table 6 indicating a likely change of a few percent compared to the baseline. However, precipitation is predicted to decrease in the summer months, with a corresponding increase during winter. Projections for the summer and winter seasons are detailed in the next sections below.

Table 4: Projected changes in annual mean temperature in Wiltshire (figures show the likely range, 33% to 67% probability levels)

Time period	Low emissions scenario (°C)	Medium emissions scenario (°C)	High emissions scenario (°C)
2020s	1.2 to 1.7	1.2 to 1.7	1.2 to 1.7
2050s	1.9 to 2.6	2.2 to 2.9	2.4 to 3.2
2080s	2.4 to 3.3	3.1 to 4.1	3.8 to 5.1

Data source: UKCP09 User Interface (© UK Climate Projections, 2009)

Table 5: Projected changes in annual mean precipitation in Wiltshire (figures show the likely range, 33% to 67% probability levels)

Time period	Low emissions scenario (%)	Medium emissions scenario (%)	High emissions scenario (%)
2020s	-1 to 3	-2 to 2	-2 to 3
2050s	-1 to 2	-2 to 2	-2 to 2
2080s	0 to 4	-2 to 3	-2 to 4

Data source: UKCP09 User Interface (© UK Climate Projections, 2009)

Projected changes in summer

Summers are likely to become hotter, with higher mean temperatures (table 6), higher daily maximum temperatures (table 7), and higher temperatures on the warmest day (table 8). Summer precipitation is predicted to decrease, as shown in table 9.

Table 6: Summer mean temperature

Projected changes in summer mean temperature (°C) in Wiltshire (covered by 6 grid squares) compared to the 1961-1990 baseline across a range of probability levels, and for the 2020s, 2050s and 2080s time periods.

	Low emissions scenario	Medium emissions scenario	High emissions scenario
2020s (10% probability)	0.7	0.5 to 0.6	0.5
2020s (33% probability)	1.3 to 1.4	1.2 to 1.3	1.2
2020s (50% probability)	1.7	1.6	1.5 to 1.6
2020s (67% probability)	2.0 to 2.1	2.0	1.9 to 2.0
2020s (90% probability)	2.8 to 2.9	2.8 to 2.9	2.7 to 2.8
2050s (10% probability)	1.1 to 1.2	1.3 to 1.4	1.5
2050s (33% probability)	2.0 to 2.1	2.3	2.5 to 2.6
2050s (50% probability)	2.5 to 2.6	2.8 to 2.9	3.2
2050s (67% probability)	3.1 to 3.2	3.4 to 3.5	3.8 to 3.9
2050s (90% probability)	4.2 to 4.5	4.7 to 4.8	5.2 to 5.4
2080s (10% probability)	1.4	2.1 to 2.2	2.7 to 2.8
2080s (33% probability)	2.4 to 2.5	3.3 to 3.4	4.1 to 4.3
2080s (50% probability)	3.0 to 3.1	4.0 to 4.1	5.0 to 5.2
2080s (67% probability)	3.7 to 3.8	4.8 to 4.9	6.0 to 6.2
2080s (90% probability)	5.1 to 5.3	6.6 to 6.7	8.2 to 8.4

Data source: UKCP09 User Interface (© UK Climate Projections, 2009)

Table 7: Summer mean daily maximum temperature

Projected change in summer mean daily maximum temperature (°C) in Wiltshire (covered by 6 grid squares) compared to the 1961-1990 baseline across a range of probability levels, and for the 2020s, 2050s and 2080s time periods.

	Low emissions scenario	Medium emissions scenario	High emissions scenario
2020s (10% probability)	0.7 to 0.8	0.5 to 0.6	0.6
2020s (33% probability)	1.6 to 1.7	1.5 to 1.6	1.5
2020s (50% probability)	2.1 to 2.2	2.0 to 2.1	2.0
2020s (67% probability)	2.6 to 2.7	2.5 to 2.7	2.5 to 2.6
2020s (90% probability)	3.6 to 3.9	3.6 to 3.9	3.5 to 3.7
2050s (10% probability)	1.2	1.4	1.7
2050s (33% probability)	2.5 to 2.6	2.8 to 2.9	3.2 to 3.4
2050s (50% probability)	3.3 to 3.4	3.6 to 3.8	4.1 to 4.3
2050s (67% probability)	4.1 to 4.2	4.4 to 4.7	5.0 to 5.3
2050s (90% probability)	5.9 to 6.1	6.3 to 6.7	7.1 to 7.5
2080s (10% probability)	1.3 to 1.4	2.1 to 2.2	3.0
2080s (33% probability)	3.0 to 3.1	4.0 to 4.2	5.2 to 5.4
2080s (50% probability)	3.9 to 4.1	5.1 to 5.4	6.5 to 6.8
2080s (67% probability)	4.9 to 5.1	6.2 to 6.7	7.9 to 8.3
2080s (90% probability)	7.1 to 7.5	8.8 to 9.5	11.1 to 11.7

Data source: UKCP09 User Interface (© UK Climate Projections, 2009)

Table 8: Temperature of warmest summer day

Projected change in temperature (°C) of the warmest summer day in Wiltshire (covered by 6 grid squares) compared to the 1961-1990 baseline across a range of probability levels, and for the 2020s, 2050s and 2080s time periods.

	Low emissions scenario	Medium emissions scenario	High emissions scenario
2020s (10% probability)	-1.7 to -2.3	-1.6 to -2.2	-1.8 to -2.0
2020s (33% probability)	0 to 0.4	0 to 0.4	0.3 to 0.4
2020s (50% probability)	1.2 to 1.5	1.2 to 1.5	1.5 to 1.7
2020s (67% probability)	2.4 to 2.7	2.4 to 2.7	2.7 to 2.9
2020s (90% probability)	4.8 to 5.1	4.8 to 5.1	5.2 to 5.5
2050s (10% probability)	-1.5 to -1.8	-1.3 to -1.9	-1.3 to -2.3
2050s (33% probability)	1.0 to 1.2	0.9 to 1.3	1.0 to 1.8
2050s (50% probability)	2.5 to 2.7	2.4 to 2.7	2.9 to 3.5
2050s (67% probability)	4.1 to 4.3	4.0 to 4.4	4.8 to 5.4
2050s (90% probability)	7.4 to 7.8	7.6 to 7.9	8.8 to 9.5
2080s (10% probability)	-1.8 to -2.6	-1.7 to -2.4	-1.3 to -2.5
2080s (33% probability)	0.7 to 1.1	1.2 to 1.7	1.7 to 2.4
2080s (50% probability)	2.5 to 2.7	3.1 to 3.6	4.1 to 4.7
2080s (67% probability)	4.4 to 4.6	5.3 to 5.8	6.8 to 7.3
2080s (90% probability)	8.4 to 8.7	10.1 to 10.8	12.5 to 13.4

Data source: UKCP09 User Interface (© UK Climate Projections, 2009)

Table 9: Summer mean precipitation (% change)

Projected percentage change in summer mean precipitation in Wiltshire (covered by 6 grid squares) compared to the 1961-1990 baseline across a range of probability levels, and for the 2020s, 2050s and 2080s time periods.

	Low emissions scenario	Medium emissions scenario	High emissions scenario
2020s (10% probability)	-24 to -25	-26 to -27	-23 to -25
2020s (33% probability)	-13 to -14	-14 to -15	-11 to -12
2020s (50% probability)	-7	-7 to -8	-4 to -5
2020s (67% probability)	0	-1	3
2020s (90% probability)	13 to 14	14 to 15	17 to 19
2050s (10% probability)	-37 to -39	-40 to -43	-42 to -45
2050s (33% probability)	-22 to -23	-26 to -28	-27 to -29
2050s (50% probability)	-14	-19 to -20	-19 to -20
2050s (67% probability)	-4 to -5	-10 to -11	-10 to -11
2050s (90% probability)	16 to 17	7 to 8	8 to 9
2080s (10% probability)	-39 to -41	-48 to -50	-56 to -59
2080s (33% probability)	-23 to -25	-32 to -34	-38 to -41
2080s (50% probability)	-15 to -16	-23 to -24	-29 to -30
2080s (67% probability)	-6 to -7	-13 to -14	-18 to -19
2080s (90% probability)	13 to 14	7	5

Data source: UKCP09 User Interface (© UK Climate Projections, 2009)

Cloud cover

The UKCP09 projections indicate that total cloud cover is likely to decrease in summer. Under the medium emissions scenario summer cloud cover in Wiltshire is likely to decrease by between 7 and 15 % by the 2050s, compared to the 1961-1990 baseline (the central estimate is a decrease of 11%).

Humidity

The projections indicate that relative humidity is likely to decrease in summer. Relative humidity in the summer in Wiltshire is likely to decrease by between 4 and 10% by the 2050s under the medium emissions scenario.

Shortwave radiation

Shortwave radiation is likely to increase in summer. Under the medium emissions scenario, total downward surface shortwave flux in summer in Wiltshire is likely to increase by between 6 and 19% by the 2050s.

Projected changes in winter

Winters are likely to become warmer, with projected increases in mean temperature shown in table 10. The increases in winter temperature are likely to be smaller than those for summer temperature. As an example, winter temperatures are likely to increase by between 1.8 and 2.6°C by the 2050s under the medium emissions scenario, whilst summer temperatures are predicted to increase by between 2.3 and 3.5°C.

Winters are also predicted to become wetter, with projected increases in both mean precipitation (table 11) and precipitation on the wettest day (table 12).

Table 10: Winter mean temperature

Projected changes in winter mean temperature (°C) in Wiltshire (covered by 6 grid squares) compared to the 1961-1990 baseline across a range of probability levels, and for the 2020s, 2050s and 2080s time periods.

	Low emissions scenario	Medium emissions scenario	High emissions scenario
2020s (10% probability)	0.5	0.6	0.5
2020s (33% probability)	1.0	1.0 to 1.1	1.0 to 1.1
2020s (50% probability)	1.2 to 1.3	1.3	1.2 to 1.3
2020s (67% probability)	1.5	1.5 to 1.6	1.5 to 1.6
2020s (90% probability)	2.0 to 2.1	2.1	2.1 to 2.2
2050s (10% probability)	0.9	1.1 to 1.2	1.3 to 1.4
2050s (33% probability)	1.5 to 1.6	1.8	2.0 to 2.1
2050s (50% probability)	1.8 to 1.9	2.1 to 2.2	2.3 to 2.5
2050s (67% probability)	2.2 to 2.3	2.5 to 2.6	2.7 to 2.9
2050s (90% probability)	2.9 to 3.1	3.2 to 3.4	3.5 to 3.8
2080s (10% probability)	1.4	1.6 to 1.7	2.0 to 2.1
2080s (33% probability)	2.1 to 2.2	2.4 to 2.5	2.9 to 3.1
2080s (50% probability)	2.5 to 2.6	2.9 to 3.0	3.4 to 3.6
2080s (67% probability)	2.9 to 3.0	3.3 to 3.5	4.0 to 4.2
2080s (90% probability)	3.7 to 3.9	4.4 to 4.6	5.2 to 5.6

Data source: UKCP09 User Interface (© UK Climate Projections, 2009)

Table 11: Winter mean precipitation (% change)

Projected percentage change in winter mean precipitation in Wiltshire (covered by 6 grid squares) compared to the 1961-1990 baseline across a range of probability levels, and for the 2020s, 2050s and 2080s time periods.

	Low emissions scenario	Medium emissions scenario	High emissions scenario
2020s (10% probability)	-3 to -4	-4	-2 to -3
2020s (33% probability)	3	2 to 3	3 to 4
2020s (50% probability)	6 to 7	5 to 6	6 to 7
2020s (67% probability)	9 to 11	9 to 10	9 to 11
2020s (90% probability)	16 to 19	17 to 19	17 to 19
2050s (10% probability)	0 to 1	2	2 to 3
2050s (33% probability)	7 to 8	9 to 11	10 to 12
2050s (50% probability)	11 to 13	14 to 16	15 to 18
2050s (67% probability)	15 to 18	18 to 22	21 to 24
2050s (90% probability)	25 to 29	29 to 35	33 to 39
2080s (10% probability)	3 to 4	3 to 4	6 to 7
2080s (33% probability)	10 to 12	12 to 15	17 to 20
2080s (50% probability)	15 to 18	18 to 22	24 to 29
2080s (67% probability)	20 to 24	25 to 29	33 to 39
2080s (90% probability)	32 to 38	41 to 49	53 to 64

Data source: UKCP09 User Interface (© UK Climate Projections, 2009)

Table 12: Precipitation on wettest winter day

Projected percentage change in precipitation on the wettest winter day in Wiltshire (covered by 6 grid squares) compared to the 1961-1990 baseline across a range of probability levels, and for the 2020s, 2050s and 2080s time periods.

	Low emissions scenario	Medium emissions scenario	High emissions scenario
2020s (10% probability)	-5 to -7	-4 to -6	-3 to -10
2020s (33% probability)	2	2	-2 to 4
2020s (50% probability)	5 to 7	5 to 6	3 to 8
2020s (67% probability)	9 to 13	9 to 11	8 to 13
2020s (90% probability)	18 to 24	16 to 20	19 to 22
2050s (10% probability)	0 to -5	-4 to 3	-4 to 3
2050s (33% probability)	5 to 8	6 to 11	7 to 11
2050s (50% probability)	10 to 12	12 to 15	13 to 17
2050s (67% probability)	15 to 17	18 to 21	20 to 23
2050s (90% probability)	25 to 29	28 to 32	31 to 36
2080s (10% probability)	-1 to 3	0 to 6	0 to 8
2080s (33% probability)	9 to 11	11 to 16	14 to 21
2080s (50% probability)	15 to 17	17 to 22	22 to 28
2080s (67% probability)	20 to 23	24 to 29	32 to 37
2080s (90% probability)	31 to 37	38 to 44	50 to 58

Data source: UKCP09 User Interface (© UK Climate Projections, 2009)

Cloud cover and shortwave radiation

The projections indicate that total cloud cover is only likely to change by a few percent in winter. As an example, winter cloud cover in Wiltshire is likely to change be between -1 and 1% by the 2050s under the medium emissions scenario.

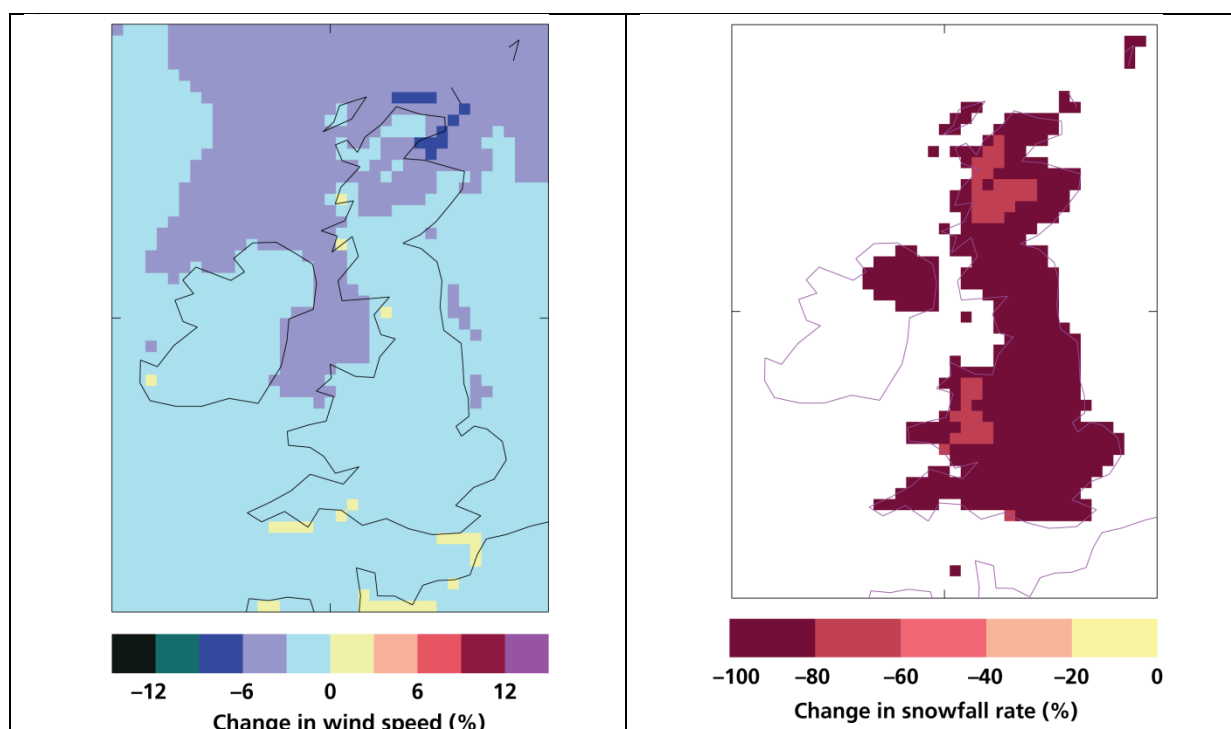
Changes in shortwave radiation in winter are predicted to be similarly small.

Other climate variables

Snowfall and wind speed

The UKCP09 projections do not include probabilistic projections for changes in snowfall or wind speed. However, non-probabilistic projections for snowfall and wind speed have been generated using the Met Office Regional Climate Model (RCM). The maps in figure 7 below show projected changes in wind speed and snowfall in winter by the 2080s, under the medium emissions scenario. These maps show average projections based on 11 runs of the RCM. Projected changes in wind speed are small, whilst snowfall is likely to decrease significantly by the 2080s.

Figure 3: Projected changes in winter wind speed (left) and snowfall (right) by the 2080s under the medium emissions scenario



Source: UKCP09 Climate Change Projections report

Storms and anticyclones

The UKCP09 'Climate Change Projections report' states that projected changes in storms and anticyclones are "very different in different climate models". The projections do not therefore cover storms or anticyclones.

7 Glossary of climate variables

The definitions of the main climate variables discussed in this report are provided below. These definitions are taken from the UKCP09 User Interface, the UKCP09 Guidance: Glossary, and the UKCP09 Climate Change Projections report.

Mean temperature: 30-year average of annual/seasonal average air temperature at 1.5 metres. The projections present mean daily temperature, which is the average of the daily maximum and daily minimum temperatures. The mean daily temperature is referred to as simply mean temperature.

Precipitation: Annual/seasonal average precipitation rate. Precipitation is water falling in some form, and includes rain, snow, sleet and hail.

Mean daily maximum temperature: 30-year average of annual/seasonal average of daily maximum air temperature at 1.5 metres.

Temperature of the warmest day: 99th percentile of 30 years daily maximum air temperature at 1.5 metres.

Total cloud cover: Annual/seasonal average total cloud cover.

Relative humidity: Annual/seasonal average relative humidity at 1.5 metres. Relative humidity is ratio of the amount of water vapour in the air to that which would be needed to saturate it at the same temperature. It is usually expressed as a percentage, so saturated air has a relative humidity of 100%.

Total downward surface shortwave flux: 30-year average of annual/seasonal average of total downward surface shortwave flux.

Precipitation on the wettest day: 99th percentile of 30 years daily precipitation rate.