



A Summary of Climate Change Risks for North East England

To coincide with the publication of the UK Climate Change Risk Assessment (CCRA) 2012





Introduction

North East England comprises Northumberland, Tyne and Wear, County Durham and the Tees Valley.

It stretches to the upland areas of the Pennines and Cheviot Hills, which extending to the west and north, and the North York Moors and Yorkshire Dales, which span the south. The eastern lowland strip is edged by the North Sea, while the north of the region borders Scotland.

Significant rivers are the Tweed, Coquet, Wansbeck, Tyne, Derwent, Wear, and Tees.

One of the smallest regions in the country, it covers approximately 8700 km², and has a population of just over 2.5 million. Characterised by contrasting landscapes, North East England is home to many historic buildings and the highest number of castles in England, as well as a range of nationally and internationally important habitats and species.

The majority of North East England is rural (Defra 2009b). Nearly a third comprises the Northumberland National Park, the Northumberland Coast, and the North Pennines.

Infrastructure includes the A1, A1(M) and A19, Newcastle international airport, the east coast mainline, and the Tyne and Wear metro system.

Agriculture and forestry make up a significant amount of land use, and makes a significant contribution to tourism and other related industries.

In contrast, Tyne and Wear and Tees Valley are major urban conurbations heavily dominated by commercial and industrial centres.

Housing is characterised by a high proportion of terraced and semi-detached properties, much dating from the 1850s to 1920s.

There are around 130,000 private sector enterprises – the majority being small or medium in size. This sector contributes nearly two thirds of total employment and around half of regional turnover*.

Larger firms in the basic metals, chemicals and manufactured fuels industries, are responsible for a significant proportion of regional employment, and are mainly located around the Tees estuary.

Life expectancy in the North East is lower than the national average, and has a more ageing population than all other UK regions. There are more concentrations of deprivation in North East England than in any other English region*.

UK Climate Change Risk Assessment

The UK Climate Change Risk Assessment (CCRA) is an independent research project, funded by UK Government and Devolved Governments that analyses the main risks and opportunities to the UK, arising from climate change over the coming years. It provides the underpinning evidence to inform discussions on adaptation action needed in such areas as infrastructure, health, environment and business. It will be updated every five years taking account of new climate observations and improved understanding of future climate change and risks.

The CCRA methodology is novel in that it allows for comparison of over 100 risks (prioritised from an initial list of over 700) from a number of disparate sectors based on the magnitude of the impact and confidence in the evidence base. A key strength of the analysis is using a consistent method and set of climate projections to look at current and future risks and opportunities.

The CCRA methodology has been developed through a number of stages involving expert peer review.

The approach developed is a tractable, repeatable methodology that is not dependent on changes in long term plans between the 5 year cycles of the CCRA.

The assessment considered population growth, where relevant, but did not quantify the impacts of other societal changes on future risks, for example due to economic growth, or developments in new technologies, or the full range of planned and potential future Government policies or private sector adaptation investment plans.

Excluding these factors from the analysis provides a more robust 'baseline' against which the effects of different plans and policies can be more easily assessed. However, when utilising the outputs of the CCRA, it is essential to consider that Government and key organisations are already taking action in many areas to minimise climate change risks and these interventions need to be considered when assessing where further action may be best directed or needed.



Key National Messages

Some key findings show why we must act now to prepare ourselves and our businesses for the future impact of climate change. The research reveals that without action we could see:-

- Increases in the frequency of flooding affecting people's homes and wellbeing, especially for vulnerable groups (e.g. those affected by poverty, older people, people in poor health and those with disabilities), and the operation of businesses and critical infrastructure systems. Annual damage to properties in England and Wales, due to flooding from rivers and the sea, rises from £1.2 billion to between £2.1 billion and £12 billion by the 2080s. Without action, a range of important infrastructure such as roads and railways may be affected by a significantly increased risk of flooding based on future population growth and if no adaptive action is taken.
- Summer overheating potentially contributing to heat-related health problems. Premature deaths due to hotter summers are projected to increase (e.g. by between 580 and 5900 by the 2050s). This is likely to place different burdens on National Health Service (NHS), public health and social care services. Other health risks that may increase include problems caused by ground-level ozone and by marine and freshwater pathogens.
- Reductions in water availability, particularly during the summer, leading to more frequent water use restrictions and, in the longer term, water shortages. The gap between demand and availability will potentially widen, impacting homes, businesses,

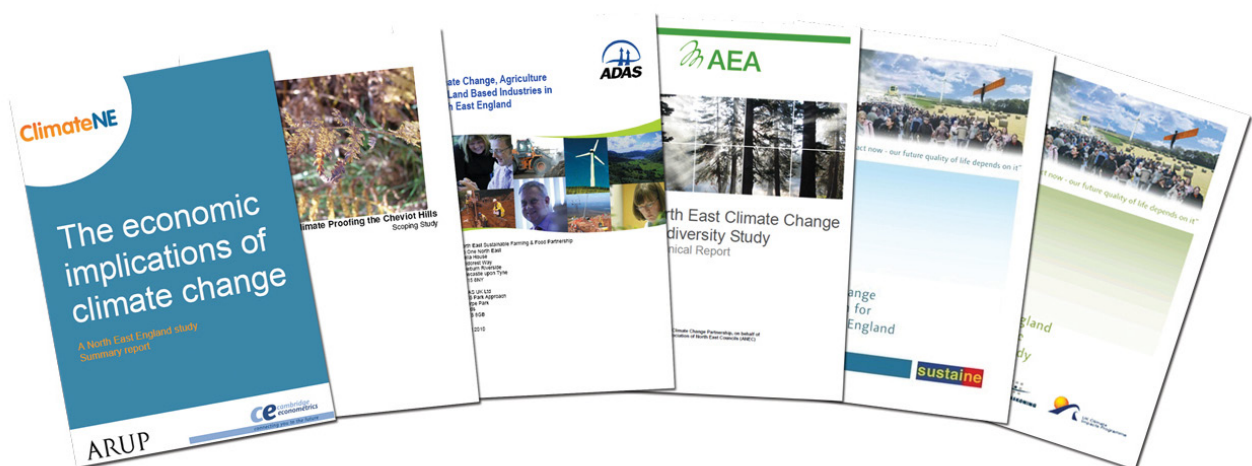
schools and hospitals. By the 2050s, between 27 million and 59 million people in the UK may be living in areas affected by water supply-demand deficits (based on existing population levels). Adaptation action will be needed to increase water efficiency across all sectors and decrease levels of water abstraction in the summer months.

This pack was commissioned to coincide with the publication of the UK's first Climate Change Risk Assessment. While drawing on the CCRA where there is regional or local information (which at times is limited due to lack of data) this pack presents a local perspective of the CCRA risks and opportunities. The pack offers an illustration of what climate change means for people, businesses, community groups, local authorities, and other organisations across key sectors, at the local level, highlighting what is already happening and where there is a strong case for greater local action.

Detailed results from the CCRA are presented in:

- An extensive and comprehensive UK CCRA Evidence Report;
- A suite of technical reports on 11 key sectors.
- The UK CCRA: Government Report, which highlights actions already in place to manage the risk identified in the CCRA, and outlines UK Government plans for the future.

To read these publications, please visit: <http://www.defra.gov.uk/environment/climate/government/>



The climate change risk assessment and our local evidence provide a rich source of intelligence



Key Risks and Implications

Some Key Regional Climate Implications



Business

- Small businesses are most vulnerable, due to limited resources but are becoming aware of the risks and opportunities.
- While one third of North East businesses are already incorporating climate risks into continuity planning, two thirds remain potentially exposed.
- Climate impacts on supply chains and markets, particularly internationally, are likely to be significant but are not yet fully understood.



Health and Wellbeing

- The health impacts of climate change in the North East of England are not well understood. Further research on this is required as a matter of urgency.
- North East England has more areas of deprivation than in any other English region and the highest proportion of workless households in the UK.
- North East England has a more ageing population the majority of other English regions, and life expectancy is lower than the national average.



Buildings and Infrastructure

- Vulnerability of the existing housing stock in North East England to climate impacts presents a significant challenge.
- The frequency of flood events for areas already susceptible is likely to increase, and increasing frequency of intense rainfall events is likely to result in surface water flooding particularly in built-up areas.
- Nationally important and regional infrastructure in North East England is exposed and presents vulnerabilities to current and future climate impacts.



Agriculture and Forestry

- Agriculture and forestry in North East England face a range of significant threats and opportunities.
- Increasing number and severity of extreme rainfall events may lead to soil erosion, saturation and crop damage.
- The growing season will potentially start earlier, making sowing in spring more viable, with potential for new crops and better and earlier ripening.



Natural Environment

- Climate change is already affecting the natural environment in North East England.
- Increasing temperatures may threaten fragile eco-systems, while wildfires are likely to increase during protracted dry periods.
- Changing agricultural practices, driven by climatic and socio-economic factors, may pose a significant threat to a number of species.



Key Risks and Implications

Key National Risks from the UK CCRA 2012

- Climate change represents a potentially significant issue for all UK business sectors.
- Main climate challenges to businesses include flooding and coastal erosion, increased competition for water, and disruption of transport and communication links.
- The degree to which individual organisations are affected depends upon their level of vulnerability and adaptive capacity.
- There are potentially significant commercial and competitive advantages to be gained for those businesses taking on the challenge.



Business

- Climate change could have significant implications for the health and wellbeing of the UK population.
- Implications affect public health, the continuity of health and social care services both within the NHS and beyond, the resilience of local emergency services, and the most socially vulnerable.
- There may be some welcome benefits, but there are likely to be outweighed by a range of negative effects.



Health and Wellbeing

- The built environment and infrastructure are already vulnerable to extreme weather such as flooding, storms, heatwaves, and droughts.
- Most of today's buildings were designed for the climate that existed when they were built and are not necessarily equipped to cope with current and future climates.
- Around 70% of buildings that will be in use in the 2050s already exist, but there may be opportunities for innovative building services and urban planning in the UK and overseas.
- The government has already prioritised the need to improve the long-term resilience of new and existing infrastructure networks in the energy, ICT, transport and water sectors.



Buildings and Infrastructure

- Agriculture and forestry are sensitive to climatic conditions; changes in climate have a profound impact on productivity and economic viability.
- Climate change may alter the impact that agriculture and forestry have on the natural environment and the value of the ecosystem services provided.
- Warmer temperatures and carbon fertilisation may present some opportunities to increase yields, in the short term.
- Low water availability in the summer, increased flooding and coastal erosion, increased prevalence of pests diseases, and frequent wildfires may limit opportunities in the longer term.



Agriculture and Forestry

- Climate change may exacerbate and/or alter the pressures placed on the natural environment, especially those caused by human activity.
- Heightened impacts may in turn affect the way humans are able to use the environment – for example growing crops or obtaining high quality drinking water.
- The natural environment is crucial to our ability to adapt, reducing flood risk, cooling cities and storing water.



Natural Environment



Business



© Environment Agency

The main threat to business activity in North East England is associated with flooding³

A changing climate presents a range of impacts and opportunities for North East businesses.³

All aspects of businesses are affected, including fixed assets, workforce, procurement (raw materials, supply chains, logistics), operations (supply of services, customer demands, regulation), and environmental and social performance.¹

Small businesses are most vulnerable due to limited resources, however, they are becoming increasingly aware of the risks and opportunities⁴

There are around 130,000 private sector enterprises – the majority being small or medium in size. Over two thirds are sole traders or self-employed owner-managers¹. This sector contributes nearly two thirds of total employment and around half of regional turnover.²

Over 60 percent have been affected by extreme weather in the past three years⁴

Larger firms in the basic metals, chemicals and manufactured fuels industries, are responsible for a high proportion of regional employment, and are mainly located around the Tees estuary with its associated risks. Climate impacts on supply chains, particularly internationally, and markets are likely to be significant but are not yet fully understood.



Threats

- The main threat to business activity in North East England is likely to be flooding associated with intense rainfall. This will have significant implications for business transport, staff availability, increased damage to commercial property and business continuity. ^{3,1}
- Failure to adapt is projected to cost North East England's economy in excess of £600m annually in terms of Estimated Annual Damage by 2050 (minimum). ³
- Approximately one third of North East businesses are already (or planning to start) incorporating weather / climate risks into continuity planning, leaving two thirds potentially exposed. ⁴
- A lack of effective adaptation will impede the ability of the North East to realise the economic opportunities presented by climate mitigation and adaptation and is likely to have a detrimental impact on the North East's unique identity and sense of place. ³
- We have no clear understanding of potential impacts that may fall outside the UK but impact the regional economy. For example, the impact of climate change on security of supply regarding energy, on external markets affecting import and export conditions, supply chain vulnerabilities, and so on. ^{3,1}
- Research indicates possible impacts on the tourism sector resulting from potential damage and degrading of natural and cultural heritage. ³

Opportunities

- The cost of adaptation for the North East is projected to be in the region of £80-100m annually by 2050 – providing a 7 to 1 benefit to cost for adaptation, and presents potential opportunities for business. ³
- Development of new adaptation products and services. Nearly a third of businesses surveyed in the region believe that climate adaptation presents opportunities to their business. ⁴
- Encouraging businesses to consider and address longer-term threats presented by climate change can benefit resilience to a variety of other impacts.

“Two thirds of businesses have been impacted by severe weather”



Nearly a third of businesses in North East England believe climate adaptation presents opportunities. ⁴

1 - UK CCRA 2012

2 - State of the Region Report (2009, NERIP)

3 - The Economic Implications of Climate Change - a North East England Study

4 - Business attitudes, perceptions, exposure and vulnerability to climate change and related legislation - Benchmark Survey 2010



Health and Well-being



The elderly and those with health problems are disproportionately vulnerable

The impact of climate change on health and wellbeing in North East England is not currently well understood; further research is urgently needed.

However, national and international research indicates that socially deprived groups, and those with health problems, are disproportionately vulnerable to the impacts of climate change. Recent flood events in the North East of England have highlighted this issue, long after the flood waters have receded. Intangible flood impacts are often more severe than the tangible, and the trauma of being flooded is disproportionately felt by the elderly, lower income households and those with lower social resilience. ⁷

North East England has a population of about 2.5 million people but has a more ageing population than all other UK regions, except the South West. Life expectancy is lower than the national average. ²

North East England has the highest proportion of workless households in the UK. ²

There are more concentrations of deprivation in North East England than in any other English region.² Areas significantly affected are Tyne and Wear and Tees Valley, with distinct deprivation in and around the towns of Bishop Auckland and Consett. ³



Threats

- The health impacts of climate change in the North East of England are not well understood. Further research on this is required as a matter of urgency.
- An increased frequency and severity of flooding events presents risks associated with potential fatalities and well-being impacts, both during and post flooding.^{4, 1}
- Public health costs are a significant portion of the cost of flooding. This includes the potential for fatalities and physical harm arising from severe flood events, emotional distress, and the longer term psychological impacts of flood victims. Direct costs include loss of life and personal injury; indirect costs include longer term psychological effects. Regional research indicates that public health, fatalities and well-being impacts may incur an Estimated Annual Damage in the region of £51million.⁴
- Recent heat waves in the UK and Europe have demonstrated the impact heat waves have on mortality and morbidity rates. For example, the July 2006 heat wave event saw the NHS Heat Plan Health Watch Warnings for the North East reach Level 3. July 18 2006 was the first time the NHS Heat Plan thresholds were breached in the North East (day threshold temperature of 28°C and night threshold temperature of 15°C).⁶ However, relative to population size, the mortality rate for London is projected to be approximately twice that of the North East.¹
- Potential for increased likelihood of tick-borne diseases such as encephalitis and Lyme disease.⁵

Opportunities

- It is considered possible that there will be an economic benefit from avoiding public health impacts of colder winters. The estimate is highly uncertain and requires refinement and further detailed analysis of how mortality and morbidity rates will be change. Regional estimates of reduced cold related mortality and morbidity provide an Estimated Annual Damage of £7.5million benefit*.

“ It was really frightening it has left an emotional scar; I have never seen a river get so violent so quickly. I don't think we will ever get over it. It has taken us a long while to feel safer”⁸



Flooding in Morpeth, Northumberland 2008
The Heat is On, courtesy of Northumberland Strategic Partnership

- 1 - UK CCRA 2012
- 2 - State of the Region Report (2006, NERIP)
- 3 - Health Compendium of North East England Housing and Population Data Version 3 Updated March 2009
- 4 - The Economic Implications of Climate Change - a North East England Study
- 5 - North East Climate Change Adaptation Study
- 6 - Rapid Evaluation of 2006 Heatwave, HPA 2006
- 7 - Werrity et al (2007)
- 8 - The Cheviots Flood Impacts Study



Buildings and Infrastructure



Erosion of southern bridge abutment at Ingram during flood in September 2008

Energy and transport infrastructure have significant exposure to damage from weather events. ¹

The North East of England is developing a good understanding of this exposure and the potential climate change impacts on its built environment.

Historic buildings include two world heritage sites – Durham Cathedral and Castle and Hadrian’s Wall alongside the highest number of castles in England.

Housing is characterised by a high proportion of terraced and semi-detached properties, much dating from the 1850s to 1920s.

The vulnerability of the existing stock to climate impacts presents a significant challenge.

Nationally important infrastructure includes the A1 and A1(M), the east coast mainline, and Newcastle international airport.

Regional infrastructure includes the A19, A66 and A69, and the Tyne and Wear metro system.

Taking only the A1 and east coast mainline into account, there are over 100 bridges.

This infrastructure is exposed and presents vulnerabilities to current and future climate impacts.

“Maintenance costs are likely to increase for some assets if they are to cope with climate change impacts” ¹

Threats

- Failure to adapt the built environment and infrastructure is projected to cost the North East of England's economy in excess of £600m annually in terms of Estimated Annual Damage by 2050 (minimum).²
- Although the extent of river flooding is unlikely to be considerably wider due to climate change, the frequency of flood events for areas already susceptible is likely to increase. This has potentially significant impacts for transport, energy and water infrastructure, residential and commercial properties and the historic environment.^{3, 1}
- Increasing frequency of intense rainfall events is likely to result in surface water flooding due to overloading of the drainage systems, particularly in built-up areas.³
- A significant proportion of existing housing stock was built between 1850 and 1920 to standards unlikely to be suitable for the future climate without intervention. Relatively low house values make such interventions difficult to finance.^{3, 1}
- Degradation of our historic assets resulting from increased intensity of rainfall, heave and flooding may adversely impact the tourism industry and lead to increased maintenance costs.^{1, 2}
- Maintenance and inspection regimes, particularly of infrastructure assets, may need to be enhanced to minimise damage and disruption.³

Opportunities

- It is estimated that a significant proportion (over 50 percent) of expected climate impacts can be avoided through cost-effective adaptation. For example, climate-proofed building and infrastructure design standards, changes to land management practices and adaptive capacity building.³
- Adaptation costs for North East England are estimated at £80 to 100 million per annum and the cost of non-adaptation at around £600 million per annum by 2050 this gives a (minimum) benefit to cost ratio of 7 to 1 (minimum).³
- There is significant commercial opportunity presented in the adaptation response, for instance retro-fitting of existing homes and commercial properties to improve resilience.³

“The cost of non-adaptation in North East England is estimated at around £600million per year by 2050 (minimum)”²



1 - UK CCRA 2012

2 - The Economic Implications of Climate Change - a North East England Study

3 - North East Climate Change Adaptation Study



Agriculture and Forestry



Erosion due to intense rainfall in North East England

Agriculture and forestry are sensitive to atmospheric and climate conditions, including CO₂ concentrations, temperature and seasonal precipitation, which combine to influence yields and quality. ¹

Research indicates that agriculture and forestry in North East England face a range of significant threats and opportunities from a changing climate. ²

Agriculture makes up 71 percent, and forestry 12 percent, of land use, and contributes to other important industries in the region such as tourism. ²

Around 12,000 people are employed in the agricultural sector. Two thirds of agricultural land is pasture and the remainder is arable. The distribution of these farming types is due to landscape, climate, soil types and historical farming tradition. ²

Pasture and livestock farming are concentrated to the west and arable to a 12-mile strip extending inland from the East coast. ²

Three quarters of woodlands in North East England are located in Northumberland and are made up of large coniferous plantations including Kielder Forest, Europe's largest plantation supporting over 2,000 jobs. ²

“Agriculture and forestry face a range of significant threats and opportunities” ²

Threats

- Increasing number and severity of extreme rainfall events may lead to soil erosion, saturation and crop damage. ^{1, 2}
- Natural water sources may become inadequate for livestock on moors and uplands. ²
- Increased risk of wildfires on moorland, rough grazing and forest areas. ^{1, 2}
- Reduced soil moisture in summer may lead to erosion of soil. ^{1, 2}
- Potential for increased water stress in crops and grassland. ^{1, 2}
- Wetter winters may delay stock turnout to avoid structural damage to soils, increasing housing and feed costs. ²
- Warmer winters may impact on the required germination temperatures affecting cropping potential. ²
- Potential requirement for species mix to be adjusted due to changes in rainfall and temperature. ^{1, 2}

Opportunities

- Growing season will potentially start earlier, making sowing in spring more viable. ²
- Increased and earlier flush of Spring Grass could have positive impacts on productivity. ¹
- Potential for new and more tender crops. ^{1, 2}
- Potential for better and earlier ripening. ²
- Potential for increased outdoor lambing and calving resulting in reduced feed and housing costs. ²

1 - UK CCRA 2012

2 - Climate Change, Agriculture and Land Based Industries in North East England (April 2010)

“Northumberland National Park: 30% increase in forest fire danger index by 2080” ¹



© Forestry Commission

Following a slight increase in the next rotation, Sitka Spruce yield will reduce significantly by 2080” ¹



Natural Environment



Puffins are just one of many species facing significant challenges³

Recent changes in the natural environment have been driven principally by land use change and management. However, climate change is expected to play a bigger part in driving change in the natural environment, impacting biodiversity and ecosystem services more in the future.¹

Recent research indicates that climate change is already affecting the natural environment in North East England.³

Characterised by contrasting landscapes, North East England is home to a range of nationally and internationally important habitats and species.

This is of economic and environmental importance; the natural environment contributes 25 percent of the region's GVA (One North East 2010), and supports an extensive tourism industry, worth £3.9 billion per year and employs 60,000 people.²

The majority of North East England is rural (Defra 2009b). Nearly a third comprises the Northumberland National Park, the Northumberland Coast, and the North Pennines.

North East England features over: a fifth of England's upland heathlands and blanket bogs; two thirds of England's Magnesium Limestone Grassland; and over two fifths of England's upland hay and meadows.²

Conifer woodlands, particularly Kielder Forest, are important habitat for red squirrels.³



Threats

- The distribution of birds and other wildlife is already changing, altering their range and making them less able to adapt. For example, Puffins, and Kittiwakes face significant threats from warming seas and the changing distribution and abundance of plankton and sand eel on which they, and many other species, feed. ^{3, 1}
- Seasonal changes may lead to a mismatch between species. For instance, warmer weather may affect the availability of food supplies for newly hatched chicks. ^{3, 1}
- Increasing temperatures may threaten fragile eco-systems. For example, Teesdale's unique arctic alpine flora faces serious pressures. ³
- Wildfires are projected to increase during protracted dry periods. ^{3, 1, 4}
- Higher water temperatures, lower flows and reduced oxygen levels in rivers during summer months, together with an increase in intense precipitation events and related flooding, would be detrimental to fresh water pearl mussel, trout and salmon. ^{3, 1}
- Changing agricultural practices, driven by climatic and socio-economic factors, may pose a significant threat to a number of species. ^{3, 1}

Opportunities

- New species could migrate from the south to North East England. For example, several new species of butterfly have arrived since 2000 including the White Letter Hairstreak, Small Skipper and Brown Argus. ³

1 - UK CCRA 2012

2 - Climate Change, Agriculture and Land Based Industries in North East England (April 2010)

3 - Climate Change and Biodiversity in North East England (2010)

4 - North East Climate Change Adaptation Study

“Climate change is already affecting the natural environment in North East England”



Reduced oxygen levels during summer months are likely to present serious issues for the aquatic environment ³

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Where next?

ClimateNE is the climate change partnership for North East England. It is a key source of intelligence and support, assisting the move to a low-carbon and climate resilient economy and positioning North East England to avoid risk and realise commercial opportunities.

We bring together a wide range of organisations committed to taking action to tackle the causes and effects of climate change in the North East, working to promote action on both adaptation and the reduction in the North East's contribution to greenhouse gas emissions.

The ClimateNE Business Hub is a dedicated website providing support and information for businesses to increase resilience, save money, and support the growth of commercial opportunities relating to climate change.

ClimateNE also run ConnectFriday networking events, which bring together like-minded businesses to see how they can share information and intelligence on the green, climate resilient and low-carbon agenda.

Further information:

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Website: www.climatenortheast.com

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This information pack was commissioned by the Department for Environment, Food and Rural Affairs (Defra) to coincide with the publication of the UK CCRA 2012. The content of this pack represents the initial interpretation of the North East Climate Change Partnership drawing on the CCRA and other local evidence.