

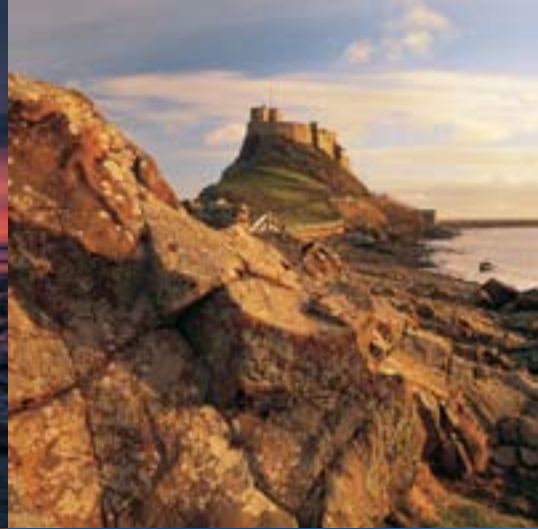


The Heat is On

The Strategic Framework for
Climate Change Planning in Northumberland



Northumberland
Strategic Partnership



Contents

Part one -

Strategic context and response

- Introduction
- Climate change predictions
- Northumberland's vulnerability to flooding
- Wildfire and heat waves
- Key issues impacting on Northumberland's response to climate change
- Climate change: A strategic approach for Northumberland
- Monitoring the framework's influence on climate change planning
- Ten priority areas for action
- Key NSP deliverables

Part two -

Mainstreaming climate change to the Sustainable Communities Action Plan delivery structures

We enjoy a good standard of living: Business, skills and learning for climate change

- Introduction
- Business and regeneration
- Education and skills

We live safely and in comfort: Climate proofing our homes and utilities

- Background
- Vulnerability
- Carbon footprint and mitigation
- Building resilience
- Opportunities
- Next steps

We lead healthier lives: Climate change and delivering health and social care

- Background
- Vulnerability
- Carbon footprint and mitigation
- Building resilience
- Opportunities
- Next steps

We can readily access the things we need:

Managing transport and communications networks in an area of climate change

- Introduction
- Transport
- Telecommunications

We take part in cultural activity: Staging the climate change debate?

- Introduction
- Historic buildings and sites
- Greenspace
- Tourism
- Events and creative industries

We care about our environment

- Economic land use
- Agriculture
- Commercial forestry and other woodlands
- Water resources
- Protected landscapes and biodiversity
- Renewable energy
- Waste

Bibliography and useful websites

Part one

Introduction

Climate change will be central to Northumberland's future place shaping agenda, ensuring that its communities, its local economy and its natural environment can respond effectively to these challenges. Climate change is already happening; over the last decade Northumberland has experienced the more extreme weather patterns attributable to global climate change and research shows that these changes are accelerating.

The Heat is On DVD¹ was produced by the Northumberland Strategic Partnership (NSP) in December 2007 to help kick-start a county-wide debate among policy makers, community representatives and businesses on the implications of climate change for Northumberland. The Strategic Framework for Climate Change Planning in Northumberland seeks to help continue that discussion by presenting an agenda for action; above all this document aims to:

'encourage partners to put in place effective and timely measures at both corporate and community levels to address the causes and implications of climate change in Northumberland by mainstreaming climate change planning within their own core business.'

Climate change predictions

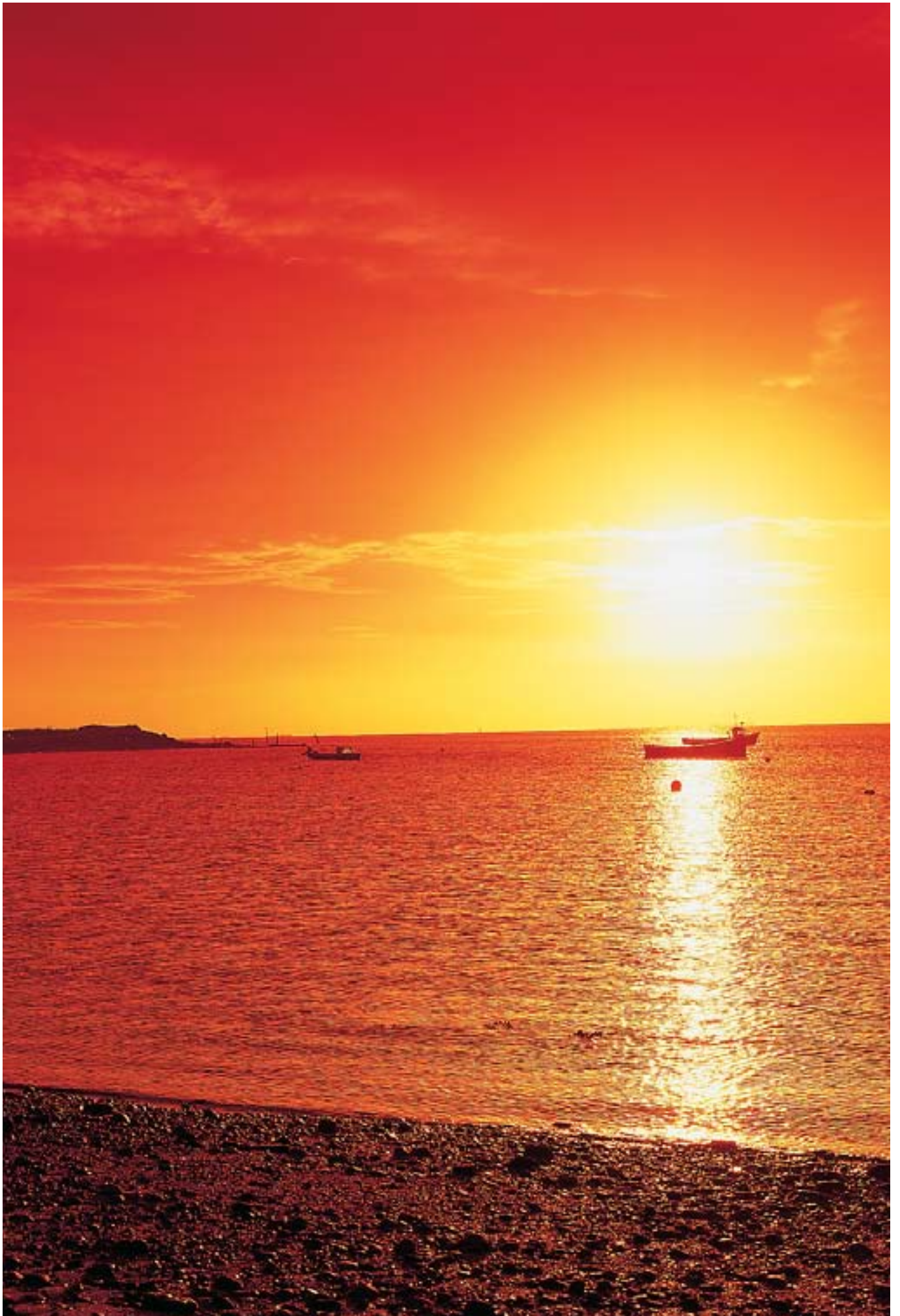
Today the phrase 'climate change' is commonly used to refer to the scientific evidence that the climate is changing as a result of human activities, in particular the burning of fossil fuels and deforestation which both release carbon dioxide into the atmosphere at a much faster rate than it can be consumed. The increased concentration of carbon dioxide and other gases is accelerating the greenhouse effect on the atmosphere and leading to warming of the surface of the earth. Research has demonstrated it typically takes 30 years from the time of the emissions being released before their impact is seen on the earth's climate - the changes the world is experiencing now are seen as attributable to the emissions released during the 1970s.²

New research has mapped predicted climate changes over the next 30 to 40 years and shows that these changes are accelerating and will bring significant challenges to every aspect of our lives, our communities and natural environment. Alongside an increase in overall temperatures, The North East Adaptation Study (May 2008) uses the latest climate modelling techniques to look in more detail at what climate change might mean for the region by 2050. One of study's main findings is the increase in the intensity and frequency of severe weather events notably storms, flooding caused by heavy rainfall and heat waves. Experiences in Northumberland during September 2008 and elsewhere in the UK highlighted the potential these events have for major disruption and potential for damage to buildings and infrastructure and even loss of life. Northumberland's topography and coastal location means that the areas at risk from flooding will extend, with both river and surface water flooding becoming major challenges.³

1 The Heat is On DVD can be viewed at <http://www.slcne.org.uk/ccspweb/heatison.htm>

2 For a detailed discussion on climate change and the international and national policy context, see the climate change background papers on the NSP website.

3 For a detailed discussion on climate change modelling and the detailed implications for Northumberland see the climate change background papers on the NSP website.



The Northumberland climate today

Jan temperatures	July temperatures	Sunshine hours	Rainfall annual average	Days of rain
Min 2.5°C - 2.5°C	Min 7°C - 13°C	1086 - 1250 uplands	1500 - 2100mm. uplands	171 - 207 uplands
Max 1 - 7°C	Max 14°C - 22°C	1451 - 1621 coast	>750mm. lowlands	51 - 71 lowlands

Northumberland's climate is already changing. Over recent years there has been an increasing number of extensive rainfall and flooding events; the period May-June 2007 was the wettest period since records began in 1766. Research by the Environment Agency, using historical weather records, highlights that in the last hundred years there has been a significant increase in rainfall. For example, rainfall records from Catcleugh in the Cheviots show the one day annual maximum rainfall has increased from 32mm. in 1963 to 52mm. in 2008 (64% increase). If this trend continues, by 2050, it could be 72mm. (nearly 100% increase). There are similar trends, but less pronounced elsewhere in the county.

The North East Adaptation Study (2008) highlights the following trends in Northumberland's climate over the next few decades to 2050:

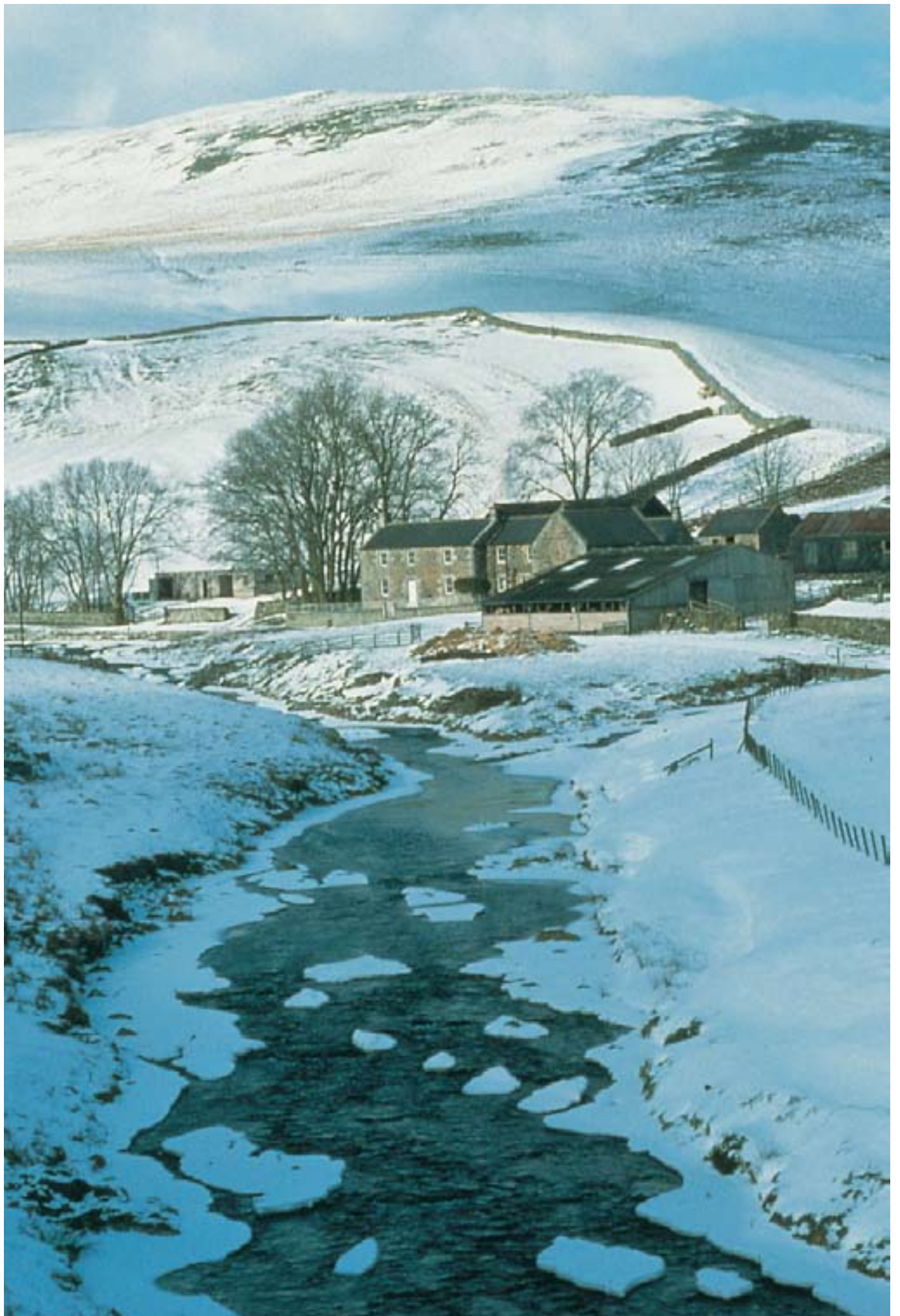
Rainfall: There will be a slight overall reduction in the amount of rainfall which Northumberland receives, but the greatest change will be increased seasonality with more rain falling during the winter months. Upland areas will experience the greatest increases in winter rainfall of up to 14%. Lower lying and coastal areas can expect summer decreases of between 25% and 32%. It is anticipated that there will be drier autumns and springs. There will also be a significant increase in severe rainfall events with increased amounts of rainfall, which will be of longer duration.

Temperatures: Average daily temperatures in Northumberland can expect to increase by 1.7°C to 1.8°C; the average temperature in winter by 1.5-1.6°C with the largest expected increases in summer and winter 1.9°C to 2.1°C. As is currently the case, the coast will be warmer, with temperatures reducing progressively inland. Summer extreme temperatures will increase by around 3°C and summer daily average temperatures are expected to reach 25°C in many parts of the county. The greatest percentage rise in temperatures is likely to be seen around the Cheviots. Heat waves are likely to increase both in duration and intensity - there will more events above the 28°C threshold temperature. The Hadley Centre and Oxford University research estimates that there is a high probability that the risk of abnormally high European temperatures such as the 2003 heat wave will, by the end of the 21st century, occur every other year.

Frost and snow: It is projected that there will be a reduction in frost days. Extreme winter temperatures will move closer to melt point but still remain below zero. Only the Cheviot Hills can expect occasional spring temperatures below zero. Similarly, there will be a major reduction of winter snowfall; this does not mean that snowfall events will be any less dramatic as severe low temperatures will still fall below zero. When coupled with increased winter rainfall, this may also mean that snowfall depths will not differ from those currently seen, but the number of days of snow will be reduced.

Wind: Based on current present available modelling techniques changes in average or extreme wind speed by the 2040s are likely to be small.

Sea level rises: Current research suggests that between now and 2005, there is projected to be an increase in average sea levels of around 0.3 metres along the Northumberland coast. In addition, an increase in sea surge levels of 0.3-0.35 metres is forecast and this increase will be relatively uniform along the entire North East coast. Storm surges are large storm events when mean sea levels are raised by metrological effects such as wind, waves and atmospheric pressure. Larger storm surges could lead to increased coastal erosion, over-tipping, breaching of defences and resultant tidal flooding inland.



Northumberland's vulnerability to flooding

Northumberland has suffered a number of floods, but the most significant was in September 2008 when flooding affected Morpeth, Rothbury and the river Till catchment. During a 48 hour period, 150mm. of rain fell onto saturated ground and already full river systems; the equivalent of three months average rainfall. In Morpeth, around 900 homes and 100 businesses were affected, 58 properties were affected in Rothbury and 12 square kilometres of land in the Till valley was flooded, drowning nearly 1,000 animals (mostly sheep), damaging crops, farm buildings and fences. The river Glen and river Breamish changed their course and at various locations throughout the county, roads and rights of way were significantly damaged through flooding and landslides. A number of studies are underway to fully assess the impact of the September floods to help inform future flood plans; these include studies to look at business recovery in Morpeth, future flood protection measures in Morpeth and a study to assess the impact on the rural economy in north Northumberland.

The 2008 floods need to be seen in the context of significant flood events over the last decade which have included Ponteland (2000), Cramlington and Alnwick (2006), Blyth (2007), Belford (2007) and the Tyne Valley (2007). The Environment Agency's flood maps for Northumberland highlight that significant parts of the county have a relatively high risk of flooding.

Areas in Northumberland with a higher vulnerability to river flooding current flood zones

River valley	Potential flooding risk
Coquet	Significant within the valley, especially around and upstream of Rothbury as far as Alwinton. Significant flooding around Felton and Guyzance
Aln	Whittingham, Broome Park and Alnwick
Tyne	Significant potential flooding along the river Tyne and its main tributaries - extensive around Hexham and downstream towards Prudhoe and Wylam, Haltwhistle to Haydon Bridge
North Tyne	Between Lanehead and Bellingham
Rede	Otterburn
Till	Risk particularly around confluence with the river Glen to the north of Wooler
Glen	West Newton, Fenton, Doddington, East Newton and Wooler
Breamish	Powburn, Brandon, East Lilburn and Chatton
Tweed	South banks of Tweed and town situated close to it - Wark, Cornhill-on-Tweed, Norham, Horncliffe and Berwick
Pont	Stamfordham, Fenwick and Ponteland
Wansbeck	Potential flooding in Morpeth and upstream towards Middleton
Blyth	Mostly rural areas

The North East Adaptation Study (May 2008) provides evidence which indicates that the area, currently within Northumberland vulnerable to flooding, will extend and impact on many more householders and infrastructure than current flood maps indicate. Not only will these areas face an increased flood risk, but extreme flood events will become much more common. The increased seasonality of rainfall will lead to the greater saturation of the ground in upland areas during the winter and autumn, when the ground reaches saturation capacity; this will also result in a higher volume and rate of run off flows within river catchments with a high potential flood risk. Despite a general decrease in summer rainfall, the effect is likely to produce more severe high intensity storm events during the summer period. The impacts of summer storms are likely to be magnified by the fact that ground surface may be dry and less able to absorb sudden large amounts of rainfall, leading to additional run off and increasing the risk of flood. Locations in the upland areas of the county will be at greater risk due to faster flood flows and the limited response time available from flood warnings.

At the current time, the Environment Agency is not able to develop models which show surface flooding caused by drainage systems becoming unable to cope with surface run off, but research is underway around Ponteland and Blyth. As recent flood events have demonstrated, surface flooding can be a major problem even in areas away from river flood plains. The Environment Agency estimates that, in 2007, five times as many houses and businesses were affected by flooding caused by overflowing drains and sewers than by river flooding. Low gradient areas within the main towns and low points within the road and rail network are particularly at risk from surface flooding.

Areas within Northumberland which are of increased risk of tidal flooding due to increased sea levels, compounded by storm surge events, include:

- Significant lengths of coastline at Budle Bay near Holy Island impacting on the crossing, the area around Warren Mill and Easington to Haggerston and Goswick in the north;
- Significant potential coastal flooding at the mouths of river Aln and Coquet, impacting on Alnmouth and Warkworth;
- Beadnell Bay, Druridge Bay, and Newbiggin;
- East Sleekburn, Cambois and Blyth, including the area of the current port and former power station.

Climate change impacts will increase the area of flood risk in Northumberland; flooding will have an effect on significantly more properties and critical infrastructure including electrical substations, sewage treatment works and water pumping stations, key sections of the county's strategic transport networks, many healthcare establishments, emergency service stations and educational establishments. Northumberland needs to increasingly prepare itself to better cope with the potential of major flooding events.



Wildfire and heat waves

Drier, warmer weather brings an increased risk of wildfire; during June and July 2006 Northumberland Fire and Rescue Service attended more than 400 rural, grassland and moorland fires. The predictions of much warmer, drier summers will significantly increase the risk of wildfire in Northumberland, as well as increase the impact of summer arson attacks in urban greenspace. This will have major resource issues for the county.

There are significant implications for public health caused by periods of high temperature, with the over 75s, the chronically sick and babies particularly at risk from heat stroke. Current predictions suggest that heat waves, whereby temperatures are over 28°C for a number of days, are likely to be increasingly common. Such heat waves will bring significant challenges for those operating public buildings and services, including schools, hospitals, public transport, as well as work places such as offices and industrial units. Businesses, such as foundries or bakeries, may be particularly affected.

Increased temperatures are also likely to heighten the risk of disease for both humans and livestock, with warmer temperatures leading to a rise in vector borne diseases including Lyme disease, the blue tongue virus, as well as faeco-oral diseases. Higher temperatures will also have an impact on those suffering from cardio-vascular diseases and the thinning ozone layer will increase incidences of skin cancer.

Whilst Northumberland, thanks to Kielder Water, is generally well placed to cope with water shortages, areas such as Berwick, which depend on groundwater supplies, may not be able to meet all their current water requirements from existing supplies. Many farmers in Northumberland rely on ground water supplies to provide water for livestock and to irrigate arable crops. A change in precipitation patterns, leading to much drier summers, will require Northumberland's farmers and others, who require large amounts of water during the summer months, to look at ways of storing excess winter rainfall.

Key issues impacting on Northumberland's response to climate change

There are a number of significant issues which will directly affect the way climate change impacts upon Northumberland and will influence the way the county responds. Many of these issues are not exclusive to Northumberland and indeed many are national or even global phenomena, but all will impact on the dynamic of climate change on Northumberland and the ability of partners to respond. However, the creation of the new unitary authority will facilitate a more coordinated approach within Northumberland to develop innovative ways of responding to climate change, appropriate to the needs of the county. Issues include:

Northumberland's rurality: With a population of to 310,000 people, Northumberland is the least populated county in England. The majority of inhabitants live in the South East corner of the county, or within Northumberland's main market towns, which results in large areas of the county having exceedingly low population densities. Northumberland's rurality means that there are significant challenges in ensuring access to services, affordable homes and employment opportunities to ensure the future sustainability of our rural communities. Accessibility is a key issue for Northumberland's rural communities but transport networks, especially in more rural areas, are particularly vulnerable to major disruption during severe weather events. Much of the research which has considered the impact of climate change has focused on urban communities and though this will be very applicable to the needs of South East Northumberland, there is a real need for Northumberland to also address rurality in its approach to building resilience to climate change. The NSP is co-sponsoring a three year research project to examine the dynamics of rurality and climate change focused on Northumberland.

Social inclusion and deprivation: Northumberland contains significant areas of social exclusion and deprivation. Whilst the majority of these areas are found in wards within South East Northumberland, there are a number of pockets of deprivation within more rural areas. Many of these areas have a significant proportion of working age residents who are excluded from work, a large proportion of households with low incomes and a significant number of young people who are neither in work nor education. Findings pathways to work and supporting young people are key activities for the NSP and its partners. Individuals and households with low incomes or in poor health are those which are generally worst hit by the impacts of extreme weather events - often they have no or low levels of insurance and the damage to their property is proportionately more significant in terms of their overall assets.

Changing demographic profile: Currently, 40% of the population of Northumberland is over 50; projections suggest that this will rise to 50% by 2021 with a significant increase (57%) in the number of people aged over 80. The over 75 population is particularly vulnerable to the impacts of heat waves which are predicted to increase; major flood events will also disproportionately impact on more vulnerable older people who are less mobile and require support. It should be noted that many sheltered accommodation complexes in Northumberland lie within areas with a high risk of flooding.

Peak oil: There is growing awareness of the finite supply of the world's oil supplies, but experts are divided on when the world will have used over half of its available reserves and oil will become in increasing short supply. In October 2008 a report, issued by the Industry Taskforce on Peak Oil and Energy Security, argued that the problem of declining availability of oil will hit the UK earlier than generally expected and could be within the next five years, with potentially devastating implications for the UK economy. Summer 2008 highlighted the potential implications of recent high prices and volatility in the price of oil on a predominately rural county, such as Northumberland, in which many local residents live significant distances from main service centres and are particularly dependent on the private car.

Increasing food prices: Over recent months there has been a significant increase in global commodity prices for key food staples, which is likely to continue due to the impact of the growing global population. The pressure to diversify food crops to biofuels and climate change impacts being felt in some parts of the world, which are already having an effect on agricultural production. The increase in food prices will have a positive impact on Northumberland's agricultural sector longterm. It will also mean that land, previously seen as marginal may be brought into food production, which could have implications for nature conservation objectives. The way in which Northumberland manages agriculture in the future to meet new global market demands will also be important in terms of longer term resilience to climate change.

Economic recession: The current economic downturn is putting significant pressure on the private and public sectors within the county; but as was argued in the Stern report, tackling climate change remains the pro-growth strategy.⁴ It is therefore even more important that, despite these financial pressures, measures to combat the impacts and causes of climate change are not regarded as dispensable additional expenditure, but are incorporated into core business to support future resilience within Northumberland's local economy.

Impacts of UK Climate Change Policy: The UK Climate Change Bill, which is due to receive royal assent by the end of 2008, will introduce the world's first long term, legally binding framework to tackle the dangers of climate change. The legislation will include the recently agreed 80% target reduction for carbon dioxide emissions by 2050, together with a raft of measures introducing carbon budgets and requiring public bodies to assess the risk and take action on climate change. The act is a culmination of a growing body of regulations to move the UK towards a low carbon economy, including measures to encourage renewable energy, sustainable construction, spatial planning, building regulations, transport and local authority performance frameworks.⁵

⁴ Nicholas Stern Economics of Climate Change (2006)

⁵ For a full discussion on the UK climate change policy framework, including the UK Climate Change programme, see the climate change background papers on the NSP website.

Climate change: A strategic approach for Northumberland

The increasing international and national policy dynamic to managing carbon emissions is likely to begin to significantly impact on spatial planning issues, renewable energy policy and business activity. Decoupling economic growth from carbon will be both a major challenge and opportunity for Northumberland. The broader policy agenda, coupled with the likely impacts of climate change, will have far reaching implications - a number of these will require significant cross-sectoral partnership if Northumberland is to develop its resilience to climate change. Areas which will demand a strategic approach will include:

Emergency services: As the September 2008 floods demonstrated, increasingly severe weather events are going to put significant additional pressure on the emergency services, in particular the fire and rescue services, with flooding and wildfire requiring a major coordinated response. The importance of developing such a response was highlighted in the Pitt Review: Lessons from the 2007 Floods (June 2008) which called for urgent and fundamental changes in the way the country is adapting to the risk of flooding. The report contains over 92 separate recommendations, including better information sharing between local authorities and the Environment Agency on flood risk, critical infrastructure, the mapping of drainage systems and reservoir inundation maps, better information and support for householders and changes in the application of the local planning system. Pitt also argues that local authorities should play a major role in the management of local flood risk, taking the lead in tackling local problems of flooding and coordinating all relevant agencies. In particular, more work is required to improve information sharing between the Environment Agency and first and second responders at major events to understand the inter-relationships between transport networks, power and water supplies and the needs of the emergency services. Nationally, the Fire and Rescue Service is lobbying Government to recognise the need for flood rescue as a statutory duty, so that this can be recognised in terms of providing new resources to meet the costs of dealing with a major flood event.

In Northumberland, key partners are already looking at implementing many of Pitt's recommendations ahead of the Government's formal response. In particular, work is ongoing to create a Northumberland Flood Group - this would follow a similar model to that of the pioneering Northumberland Fire Group, which has become a national leader in identifying new approaches to tackling wildfires. This group seeks to respond to the increasing risk of flooding through the delivery of a number of prevention and response activities, aimed specifically at the rural community. This will involve improved coordination between a range of different partners, including Northumberland Fire and Rescue, the Environment Agency, the National Park, landowners and local communities, with a particular focus on improved information sharing, pooling of equipment and training. The group will be looking at developing flood plans for farmers and landowners and working to support more remote rural communities in developing a coordinated response to flood events, using the Environment Agency's local flood group model.

Northumberland Fire Group

The group was set up, in August 2006, to tackle the increasing threat of wildfire and to achieve a much more effective response by sharing equipment, knowledge and personnel. Its members are drawn from the rural community, including gamekeepers, landowners and farmers; public sector land managers from Forest Enterprise, Northumberland National Park, the Ministry of Defence and the Northumberland Fire and Rescue Service. The group has developed specialist training programmes and supported farmers and landowners across the county in developing farm fire plans.

Spatial planning: New thinking is required on land use within Northumberland if the county is to respond to climate change, particularly in relationship to flood management and management of water resources. The EU Water Directive and new Catchment Management Plans provide a useful framework for new thinking on the role of flood plain management in flood alleviation, as well as the role of upland areas through grip blocking, woodland creation and establishment of winter water storage. A green infrastructure strategy for the county, which could look at the wider role of multi-functional greenspace, will research the role greenspace might perform not only in water management, but also in mitigating urban heat islands, particularly in the more built up parts of the county. The South East Northumberland Growth Point is already committed to developing such a strategy, which will address climate change issues and could provide a useful blueprint for other parts of the county. The creation of the new unitary authority represents a major opportunity to integrate climate change considerations into the new core strategy and local planning framework.

Renewable energy: The agreement of the UK to the new EU Renewables 20% target by 2020 will require a major step change in policies if these aspirations are to be realised, given that at the current time it is estimated that between 2-4% of the UK's overall energy needs are met by renewables. It is estimated that even if a significant proportion of this target can be met through the development of off-shore wind facilities, a significant proportion will need to be met through other renewable energy sources. Northumberland is well placed to respond to this policy agenda with a well established renewable energy sector. Ways need to be found to remove the barriers in terms of access to funding, skills shortages and planning restrictions which are limiting the potential of this sector, whilst at the same time ensuring that development is appropriate in terms of impact and scale to the Northumberland landscape. Key areas for Northumberland include biomass (especially wood fuel) and micro-renewables.



Business vulnerability and entrepreneurial activity: There is a very large proportion of Small Medium Enterprises (SMEs) within Northumberland. A joint study by the Environment Agency and the NSP on the potential impact of a major flood event on Morpeth in August 2008 highlighted that many local businesses had low levels of insurance and no business continuity planning. There was no reason to suggest that this was atypical of the rest of the county. The floods which occurred the following month had a devastating effect on the local economy, the full extent and costs of which will have to await the conclusions of a number of studies due to report in early 2009. However, the September 2008 floods served to emphasise the importance of raising of local businesses' awareness of the implications of climate change to ensure that they improve their resilience to the potential impacts of climate change.

Northumberland is well placed to benefit from climate change. Unlike many areas, the county is unlikely to suffer serious water shortages to undermine business activity, nor will large areas of the county be affected by flooding, such as parts of East Anglia. There are real opportunities for Northumberland businesses in a range of sectors to develop low carbon technology, or develop new products and services which respond to climate change. If businesses are to respond to such opportunities, it will be incumbent on all those bodies which provide advice and support, or represent business interests, to become better informed about the implications of climate change for Northumberland.

Protecting the future of the natural environment: Northumberland has a special landscape; around a third of which is designated on the basis of its quality, cultural heritage and biodiversity. Northumberland's landscape is a major asset for the region, not simply as a recreational and tourism resource but also for the eco services it offers. The value of Northumberland's natural environment in supporting the resilience of the North East to climate change needs to be better articulated and understood on its own terms and also within the terms of the next Regional Economic Strategy. The importance of protecting the natural environment needs to be at the very heart of developing a Northumberland approach to climate change so that potential solutions to mitigate against its impacts are properly appraised to look at the wider implications for the environment. Climate change action planning in Northumberland, if it is to be truly sustainable, needs to work in harmony with the natural environment rather than to continue the mistakes of the past in which short term solutions have simply stored up problems for future generations.

Carbon mitigation and carbon trading: Nationally, the Government is committed to looking at mechanisms to reduce carbon emissions. Locally, initiatives such as Northumberland Warm Zone are making a significant contribution in helping the domestic sector improve energy efficiency and this area of work needs to continue and be expanded. It will also be important that the public sector leads by example in reducing its own carbon footprint through the development of carbon management plans. The implementation of the Carbon Reduction Commitment (CRC), scheduled to begin operation in 2010, is a mandatory emissions trading scheme that will cover around 5000 public and private organisations, including government departments, retailers, banks and local authorities, which combined account for 10% of the UK economy's emissions; the scheme will also include local authority schools. From 1 October 2008, public sector occupiers of certain buildings are required to display an annual Display Energy Certificate (DEC) in a prominent place where it is clearly visible to the public. They will also need to have in their possession a valid Advisory Report (AR) which will look at measures which could be introduced to improve the overall energy rating of that building.

Many organisations within the North East have sought carbon neutral status and have off-set their carbon emissions through financial contributions to schemes helping to reduce such emissions. Whilst there have been previous schemes in the region, none of these were designed to benefit projects in Northumberland. A well thought through scheme, with a clear audit trail could be used to support organisations to reduce their carbon footprint, as well as providing resources to further support initiatives to improve energy efficiency or protect existing carbon sinks.

Monitoring the framework's influence on climate change planning

Northumberland has selected the National Indicator on Adapting to Climate Change (NI188) as one of its 35 Local Area Agreement (LAA) indicators. In addition, the National Indicators on Flood and Coastal Risk Management (NI 189) and Fuel Poverty (NI 187) are non-designated indicators within the LAA. These indicators will provide an important impetus and tool to monitor the take-up by partners of climate change planning within the county. Two indicators (NI 185, NI186) which measure carbon emissions as a result of local authority operations and per capita, form part of the Comprehensive Area Assessment and will provide a useful basis for the county to address climate change mitigation.

Ten priority areas for action

A number of key strategic areas for action have been identified within the framework for cross sectoral and multi-agency delivery. These are:

- 1 Leadership:** Northumberland has an important role within the region to develop good practice and actively influence the development of the regional climate change agenda through its involvement in ANEC, North East Regional Climate Change Partnership and the emergence of the Tyne and Wear multi-area agreement on carbon reduction. The public sector in Northumberland should be prepared to lead by example in preparing carbon management plans to reduce its own carbon emissions and contribute to national and regional targets.
- 2 Emergency planning:** An increase in severe weather events is going to put increased pressure on Northumberland's emergency services; it is vital that they have the correct resources, skills and equipment to tackle increasing incidents of flooding and wildfire. Emergency plans need to be continually reviewed to ensure that they reflect the latest research on the implications of a major weather event.
- 3 Transport and utilities:** There is a need to create a multi-agency partnership for Northumberland involving first and second responders, the Highway Authority and the Environment Agency to share information and data to make the county more resilient to the impact of a major weather event. Events elsewhere in the UK have highlighted the interdependence of transport, water, electricity networks, telecommunications and the emergency services.
- 4 Spatial planning:** There is a need to ensure climate change is mainstreamed within the new planning framework for the unitary authority, as well as the new National Park Plan, and the authority needs to adopt an ecosystems approach to the natural environment.
- 5 Delivering for rural areas:** In responding to climate change, the need to rural proof will be particularly important in ensuring the needs of rural communities are properly addressed.
- 6 Business resilience:** A coordinated approach to raise businesses' awareness (particularly SMEs) of the implications of climate change and support continuity planning, as well as identifying the opportunities presented by climate change and its supporting policy framework.
- 7 Protecting our natural environment:** Northumberland's natural environment needs to be recognised as a major international asset to combat climate change, due to its ability to store and absorb carbon. Protection of peatland storing thousands of years of carbon and extension of woodland and other habitats through agri-environmental schemes will support wider climate change objectives.
- 8 Addressing future energy needs:** A major programme to support continued energy efficiency, particularly among Northumberland residents, could make a significant contribution to reducing the county's overall carbon footprint. Policies to actively enable the development of renewable energy could significantly reduce Northumberland's dependence on the national grid.
- 9 Communicating climate change:** An innovative programme involving the education, skills, culture and social marketing sectors should be developed to raise people's understanding about climate change issues and actively encourage them to participate in debate and discussion about the future, as well as encouraging individuals to address climate change in their own lives.
- 10 Trading carbon for community and environmental benefits:** A mechanism needs to be identified to enable off-set payments to be used for the direct benefit of Northumberland in support of energy efficiency measures or protecting and extending its carbon sinks.

Key NSP deliverables

In supporting partners in Northumberland to deliver the Strategic Framework for Climate Change Action Planning, the NSP will seek to action the following key deliverables:

- 1 Continue to disseminate information and research on climate change in ways which are accessible to a range of different partners, by ensuring it is relevant to their area of interest both in terms of area and subject.
- 2 Continue to play an active role in commissioning and shaping climate change research plans through its role in the Regional Climate Change Partnership and ensure, where appropriate, that studies are designed to enable findings to be disaggregated at the sub-regional level, informing and developing Northumberland's knowledge base on the implications of climate change.
- 3 Work to support partners developing regional and local climate change action plans or other related strategies which address climate change issues.
- 4 Translate the proposed actions within this document to specific actions which can be delivered through the Sustainable Communities Action Plan Process.
- 5 Use the LAA process to monitor the county's response to adapting and mitigating against climate change by ensuring that climate change is mainstreamed into all areas of future policy development and delivery.
- 6 Use the findings of the regional carbon emission and trajectories study to inform discussions on carbon emission reduction targets for Northumberland.
- 7 Work with a range of partners to deliver the ten cross cutting key priorities on climate change for Northumberland.



Part two

This framework presents a blueprint for future activity within Northumberland, by providing regional and local partners through the Northumberland Strategic Partnership's Sector Boards with an agenda for action which mirrors the work programmes that have been developed through the Sustainable Communities Action Plan 2008-11 and the Northumberland Local Area Agreement priorities in relation to the six thematic sectors:

- We enjoy a good standard of living
- We live safely and in comfort
- We lead healthier lives
- We can readily access the things we need
- We take part in cultural activity
- We care about our environment

The potential vulnerability to climate change of each sector has been identified, together with ways in which these might be addressed through adaptation and mitigation, as well as potential economic and social opportunities to help partners mainstream climate change planning within their core business.

We enjoy a good standard of living: Business, skills and learning for climate change

Introduction

The impacts of climate change could potentially have a significant impact on Northumberland's local economy, both in the short term through severe weather events such as flooding or drought, or longer term due to disruptions in global markets or in profound changes to their current business environment. Some industries, such as agriculture,⁶ are at the 'sharp end' in directly experiencing some of the changes brought about by climate change, but many small medium enterprises (SMEs), which are the lifeblood of Northumberland's economy, could find themselves particularly vulnerable. Understanding what these vulnerabilities are will be critical in developing Northumberland's economic resilience to climate change.

The Stern report 'A Review of the Economics of Climate Change' (2006) highlighted that tackling climate change is the pro-growth strategy and, whilst his report focused on international action, ultimately this translates to the decisions of individual organisations and businesses in reducing their carbon and other greenhouse emissions globally and locally to deliver the reductions required to reduce the impacts of climate change. Businesses in Northumberland need to be aware that the Government's commitment to reducing greenhouse emissions, shortly to be enshrined in the Climate Change Bill, is likely to be supported by a range of new regulations and fiscal measures and therefore need to anticipate this within their business planning.

Unlike some parts of the world, climate change and its implications in Northumberland over the next few decades is likely to be less dramatic, offering Northumberland a potential competitive advantage. Most of Northumberland has a much more secure water supply than other parts of the UK, coupled with less flood risks than some areas, which will be an important business asset. However, understanding and anticipating changes in the business environment will be central to opening up new export markets, new job opportunities and new technologies for Northumberland's companies, educational establishments and social enterprises.

Education will have a critical role in ensuring that young people will be sufficiently equipped to deal with the consequences of climate change in the future and to enable Northumberland's economy to diversify to ensure residents and employers continue to thrive and prosper.

⁶ Agriculture is explored in the section We care about our environment.



Business and regeneration

Background

Four fifths of Northumberland's businesses employ less than ten people. Such businesses are essential to the social cohesiveness of local communities; they not only provide goods and services, but also employment. Businesses, such as pubs, corner shops and village post offices can often be the lifeblood of a community and a key centre for social networking. The transition from deep coalmining has been a painful one, but other sectors have developed as key employers such as retail, tourism and leisure. The hi-tech industries have also chosen to locate themselves in Northumberland, with the county establishing itself as a focus for developing renewables.

Vulnerabilities

The September 2008 floods highlighted the vulnerability of many of the county's small businesses. This vulnerability was something which was anticipated in the jointly commissioned study to look at the impact of a major flood event in Morpeth by the NSP in partnership with the Environment Agency and Castle Morpeth Borough Council. The findings of this study and those of a number of other studies commissioned following the 2008 floods will be an important resource to help inform planning on how Northumberland businesses might improve their overall resilience. Key issues which emerged in the recent flood events and other extreme weather events in recent years include:

- Many businesses are in communities which are relatively vulnerable to flooding; however whilst many householders have registered on the Environment Agency's flood warning database, few Northumberland businesses are currently registered.
- AXA estimates that many small businesses are inadequately insured, with few having business interruption insurance to enable them to continue to pay wages following a major event leading to disruption in trading e.g. storm damage.
- Many businesses are highly reliant on electronic equipment, which is particularly vulnerable to flood damage. Businesses that have failed to back up their business records and stored these in a secure place could be particularly exposed. 90% of businesses that lose data from a disaster are forced to shut within two years.
- Many businesses will be affected by any disruption in the transport network during a severe weather event, particularly those which rely on 'just in time' delivery by road, rail or sea, or provide mobile services.
- Severe weather events may cause significant disruption to water and power supplies, even to businesses not directly affected by storm damage or flooding - this is likely to have significant consequences for most businesses, but particularly SMEs which are unlikely to have access to a generator.
- Increased winter rainfall will lead to greater structural damage to business premises, either through water ingress on flat roofs or poorly repaired buildings or through inadequate drainage and gutters. It is anticipated that maintenance and repair budgets for most businesses will increase over coming years.⁷
- At the current time there is no maximum temperature for work places, although trade unions are pressing for a temperature threshold of around 27-28°C as a safe limit for staff working inside buildings. Increasing incidents of summer heat waves may present health and safety concerns for employees working in factories, foundries, or even poorly ventilated office blocks. Businesses may need to consider air conditioning with its additional cost implications as well as contributions to carbon emissions.
- Climate change is likely to have a significant impact on global markets and there will be 'winners and losers' within Northumberland.

⁷ This is discussed in more detail under Education and skills.

Carbon footprint and mitigation

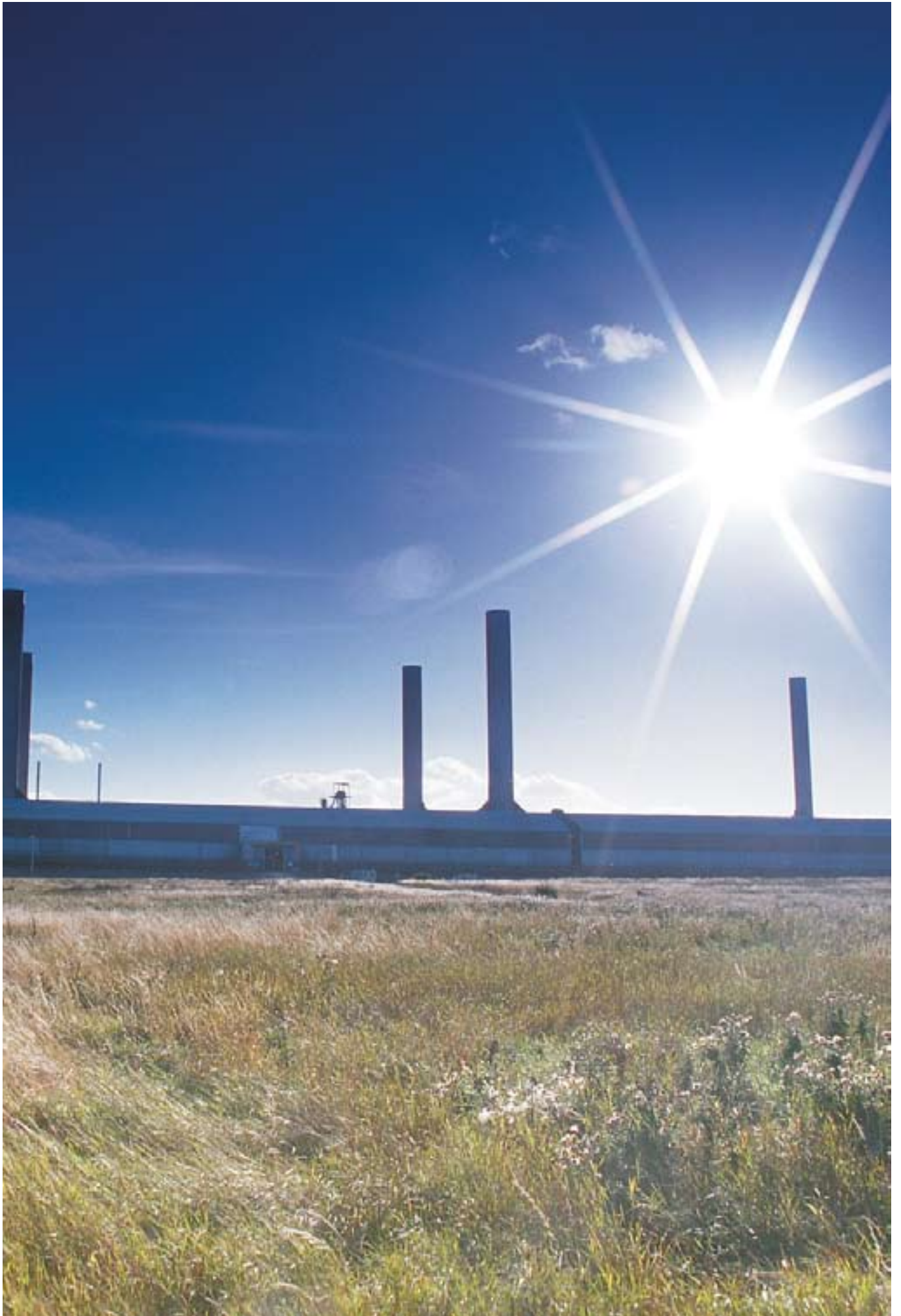
Business in the UK is responsible for approximately 40% of carbon emissions and has an important role to play in tackling climate change. Recent research by the Carbon Trust demonstrated that 60% of SMEs were aware that they could reduce carbon emissions with simple energy efficiency measures costing little or no money, which could nationally save a total of £3 billion a year on energy bills. The introduction of advanced metering alone could save most SMEs over £1,000 a year on their energy bills and reduce carbon emissions by 12%. However, 70% of such businesses have done nothing about it, primarily through lack a time or because they feel that they need to focus on their core business.

The Climate Change Levy (CCL) was introduced in 2001. The levy is added to the energy bills of organisations in industry, commerce and the public sector; the majority of low energy using small businesses are exempt. The levy is designed to encourage companies to use less energy and therefore reduce emissions. In certain high energy using sectors, companies can sign a Climate Change Agreement which makes them eligible for an 80% discount on their levy in return for an agreement to meet challenging targets on carbon emission reductions. The Climate Change Bill, due to become law in 2009, will extend the indirect regulation on businesses' output of carbon via the use of carbon permits and emissions trading schemes. It is therefore increasingly in businesses' interest to make carbon reduction a central part of their business planning.

Many bigger companies, as a result of pressure from their clients and employees are beginning to look seriously at reducing their carbon footprint and an organisation's 'green credentials' are becoming an increasingly important part of their overall offer. A significant number of businesses are seeking to become 'carbon neutral' and this includes major financial businesses, manufacturers and small businesses including dentists, legal practices and retailers. A growing number of organisations are able to provide businesses with advice on reducing carbon emissions and the loans or grants available to support energy efficiency.

Building resilience

- There is a need to encourage businesses in all sectors and of all sizes throughout Northumberland, but particularly in areas with known flood risk, to produce a flood plan which details how a business will respond to a flood and include strategies for protecting property, preventing business disruption and assisting recovery. Businesses should be encouraged to ensure they are adequately insured and that, where required, they have purchased flood products such as sandbags, barriers or boats.
- Recovery plans for businesses need to be developed at a county and community level by multi-agency partners to ensure that there is in-built economic resilience to major weather events by establishing a set of procedures to help local businesses resume trading as soon as possible.
- Businesses should seek to climate proof their premises, particularly when premises are refurbished or relocated. Premises with potential flood risk should be flood proofed e.g. raising electrical circuits and machinery off immediate floor level, water resilient plaster and floor guards. Opportunities could also be sought during refurbishment to incorporate measures to improve energy efficiency of premises to cut future carbon emissions.
- New buildings and refurbished premises should be designed to improve natural air flows and ventilation to minimise discomfort during heat waves. Opportunities to incorporate renewables should also be sought and where applicable water minimisation e.g. use of grey water.



A Regional Climate Change Adaptation Business Advisor was appointed in Spring 2008 to work with businesses across the region. The advisor has been particularly active in Morpeth in helping the recovery of small businesses and advising on longer term resilience. There is scope for partners in Northumberland to use the experience of the 2008 floods to develop a Northumberland climate change tool kit for business which gives advice on producing flood plans and flood proofing business premises, as well as signposting businesses to support to reduce their carbon foot print or achieve carbon neutral status.

Opportunities

There is a need to encourage businesses and entrepreneurs to look at the challenges presented by climate change and identify new business opportunities which can help diversify Northumberland's economy. Wider implications of climate change on the global economy may mean that local economies need to become more self-sufficient and this may also present new opportunities. Key areas which may be supported by policy responses to climate change include:

- Renewable energy, especially micro renewable technology and biomass
- Advice on energy efficiency, low carbon emissions and installation of energy efficient equipment
- Low carbon technology applications to deliver Government targets on zero homes
- Sustainable building construction, including design and materials
- Waste recycling
- Developing and constructing drainage systems for urban settings and water management for agriculture
- Carbon capture and storage



Education and Skills

Background

In Northumberland, there are 45,960 children and young people attending full time education at 202 schools across the county. At the current time the county is in a process of transition from a three tier system to a two tier system which will see the end of some or all middle schools. To support this transition and to ensure that pupils in Northumberland have facilities which meet the educational needs of the 21st century, Northumberland is in the process of developing a major schools building programme. This investment programme will be implemented from 2013 onwards, subject to national funding but work is ongoing designing and putting together specifications for the buildings.

The 2020 Vision for Learning in Northumberland has developed a framework to support skills training within the county. There are a number of priority areas which are focused on developing skills for adults, engaging employers and reducing the number of young people who are no longer in education or work, within a context of developing high quality training facilities either in the tertiary sector or work-based training.

Vulnerability

- Northumberland's current school buildings vary in size and age but many of the buildings are mid twentieth-century of brick or concrete construction with flat roofs. Changing weather patterns and, in particular, increased winter rain or sudden severe rainstorms will bring particular challenges to managing the county's educational building stock. These problems are likely to be similar for other local authority buildings, including other training establishments, council offices, libraries, leisure centres, as well as health and social care facilities. Issues will include:
 - Increased water ingress leading to leaks, damp and potential ponding on flat roofs;
 - Greater corrosion of steel reinforcements with concrete structures;
 - Water ingress leading to problems with fungal infestations;
 - Guttering and drainage of buildings may be inadequate to cope with increased rainfall;
 - In high temperatures, melting of bitumen on felt roofing and cracking of bitumen sealants.
- High temperatures may mean that classrooms become too hot - in 2006 several schools had to close during exceptionally high temperatures. Many school buildings will not be suitable to fit air conditioning and where it is possible may prove expensive to fit and also to run, as well as contributing to greater energy usage and emissions.
- The rural nature of the county means that around a fifth of children travel relatively long distances to school; in extreme weather conditions, such as flooding or snow, school transport services are likely to suffer major disruption.
- Ten schools and four nurseries within Northumberland are situated in locations with high vulnerability to flooding.
- In major weather events, such as storms and floods, schools and college buildings are used as emergency community facilities for displaced people which may further disrupt educational services.

Carbon footprint and mitigation

Nationally, the education sector consumes a vast amount of energy just for its heating and lighting needs. Schools emit 9.3 million tonnes of CO₂ per year, in addition a further 1.2 million tonnes of CO₂ is emitted by people travelling to school by car. Schools account for 15% of all public sector carbon emissions, the equivalent of 2% of UK greenhouse gas emissions.

The education sector's interest in environmental issues and in particular climate change means that many schools are already actively engaged in understanding and seeking to reduce their overall carbon footprint. The Government launched the Sustainable Schools Initiative in 2006, which seeks to embed sustainable development practices within whole-school management practices. The approaches include energy, water, waste, travel and procurement. Progress on introducing a Sustainable Schools programme is now part of the Ofsted inspection and the Government aims for all schools to be sustainable by 2020. This initiative is complemented by the eco-schools programme to which 57 Northumberland schools have signed up; this is a more pupil focused approach but also involves staff (including non-teaching), governors, parents and external organisations, such as the local authority or community groups, in a range of schemes including recycling projects, installation of renewables and green travel plans.

Key areas to reduce carbon emissions and also deliver major energy savings include:

Energy and water: 22% of total school emissions come from the electricity they use. Energy saving audits could significantly reduce usage - opportunities to incorporate renewable energy into new buildings should also be sought.

Travel and traffic: 14% of national school emissions come from travel to school - where possible children should be encouraged to walk or cycle to school.

Purchasing and waste: Emissions relating to furniture and paper, i.e. in their production, account for 10% of CO₂ emissions. Schools also generate large amounts of waste, responsible recycling can reduce the quantity going into land fill.

Food and drink: 6% of total school emissions come from transport through the industrial supply chain; much of which is through food delivery - opportunities for locally procurement should be encouraged.

Building resilience

- Change in rainfall patterns is likely to cause the most significant problems to schools throughout Northumberland. In order to reduce problems, it will be important that there is improved maintenance of all educational buildings - regular inspections, repair and replacement of roofs are required, as well the upgrading of gutters and fascias.
- Climate change should be a key consideration within the schools investment programme in Northumberland; new buildings should be designed to negate the need for air conditioning by promoting air flows and using reflective glass and trees for shade. Where new buildings need to be constructed within an area with known flood risk, these should be constructed with flood resilient measures to limit damage and enable the building to be quickly back in use.
- An education heat wave plan should be developed to provide schools in Northumberland with guidance on how this may impact on their daily activities and to plan for appropriate mitigation measures e.g. establish feasibility of outdoor teaching, development of cool rooms, restructuring the school day, distance learning or closure of school.
- A flood plan should be developed for all schools within Northumberland which have been identified with significant or moderate risk of flooding.

Opportunities

Schools play a key role in raising young people's and the wider community's awareness of environmental issues. In particular, they will provide young people with the skills and knowledge to understand the implications of climate change on their local community and how these challenges will be addressed.

A regional project, the Climate Change Schools Education Project, based at the Science Learning Centre in Durham, is currently working with teachers all over the North East, including over 20 Northumberland schools. The project will develop a wide range of new climate change teaching materials which support National Curriculum teaching across all subject areas in key stages two and three. The materials will be trialled in from Autumn 2008 and then made more widely available during the academic year 2009-10.

Thought needs to be given on how to provide young people with appropriate career advice to ensure they have the right training and skills for the opportunities which climate change might offer (see section on business). Opportunities for careers in sustainable building construction, renewables, agriculture and low carbon technology are key areas which need to be expanded within Northumberland's current skills training sector.



We live safely and in comfort: Climate proofing our homes and utilities

Background

There are just under 131,000 households within Northumberland, a number which is predicted to grow as more people live on their own and the population increases through a combination of migration and demographic change, with an increase in older residents living longer. Significant efforts have been made to improve social housing and attention is increasingly focused on the private sector. Initiatives, such as the Northumberland Warm Zone scheme, have had a huge impact on the number of houses within the county that are insulated and efforts are continuing to ensure maximum take-up, as well as various projects to raise public awareness of other ways to improve their energy efficiency.

A key issue for Northumberland is the provision of affordable homes; at the current time demand is outstripping supply causing significant price increases. There are particular challenges in rural areas where there is growing need not only for houses for young people, but also for older rural residents whose housing requirements may change as they age. As part of Northumberland's bid to increase the supply of affordable homes, an increase of an additional 25% in new dwellings in the South East Northumberland Growth Point is planned through the construction of 12,000 new properties.

Vulnerability

- The main climate change issue for Northumberland residents is their potential vulnerability to extreme weather events, either through direct damage to their property, or through interruption to their energy, water or gas supplies.
- There are a number of communities within Northumberland which have a higher risk of river flooding, including Morpeth, Wooler, Ponteland and communities within the Tyne Valley, including Hexham, Haydon Bridge and Haltwhistle. Other communities are at potential risk from storm surge related flooding, including Warkworth, Alnmouth and Blyth. Work is also ongoing to better understand the additional risks of flooding from the sewer and surface water drainage systems.
- Extreme weather events, such as storms or flooding, may cause disruption for utilities causing interruptions to water supply or power outages.
- As with public buildings, the increased amounts of forecast winter rain may cause increased structural damage to houses and overwhelm existing drains and gutters, increasing ongoing repair and maintenance costs to private householders and landlords.
- Heat islands may impact on some urban centres within Northumberland, causing an additional rise in temperature during summer months.
- Key utility infrastructure within the existing flood risk zone in Northumberland includes 31 electrical sub stations, 48 sewage treatment works, 61 pumping stations and one power generator.

Carbon footprint and mitigation

In the UK, households are responsible for around 27% of national total carbon emissions, although the North East Emissions study calculated that, in 2005, the residential sector was responsible for 6.1 million tonnes of carbon per annum, 16% of the regional total. The Energy Saving Trust estimates that the average household in the UK creates around six tonnes of carbon dioxide a year but could save around two tonnes of carbon dioxide (CO₂) a year by making their homes more energy efficient. The main use of energy in private homes is for heating, creating an average CO₂ emission per household of 1.49 tons a year. The increasing use of energy hungry electrical appliances, such as flat plasma screen TVs and home computers has dramatically increased average households' consumption in energy over the last decade.

Recommendations by organisations, such as the Energy Saving Trust (EST), which provide support to individual householders and businesses, highlight a range of measures which individual householders can do to minimise their energy usage, achieve savings and cut carbon emissions. The Government's promotion of the Code for Sustainable homes in 2007 the Code for Sustainable Homes is intended to promote higher environmental standards in housing ahead of implementation of regulatory standards. It considers not just energy/carbon but a range of sustainability issues such as water, waste and materials.

Alongside the now mandatory rating using the Code for Sustainable Homes for new houses, the Government's policy statement, *Building A Greener Future* (July 2007), sets out a progressive tightening of building regulations to require major reductions in carbon emissions from new homes - by 25% in 2010 and by 44% in 2013 - up to the zero carbon target in 2016. There are similar ambitions for non domestic buildings. The definition of this carbon target is zero carbon (net over the year) for all energy use in the home. This would include energy use from cooking, washing and electronic entertainment appliances as well as space heating, cooling, ventilation, lighting and hot water. The Government is anticipating that this will be delivered by the development of low carbon appliances within the home and the generation of low carbon or zero carbon energy e.g. renewable energy. The policy also encourages greater use of sustainable building materials such as wood, rather than steel or concrete, which will be of benefit to Northumberland's commercial forestry sector.

There are significant challenges on how to improve the overall energy efficiency on existing buildings, which will remain the majority of the county's current housing stock, by encouraging householders to reduce their energy usage, address thermal and energy efficiency of older housing stock and look at other mechanisms, in addition to insulation to reduce domestic energy consumption such as SMART metering. There are opportunities to look at mechanism to improve the targeting of Northumberland's Warm Zone initiative to increase the uptake of home insulation to rural communities and private landlords.

Building resilience

- It is important that households situated in areas with a known risk of flooding are registered with the Environment Agency's Flood Watch system to receive early notification of any potential flood risk; this is particularly important in households where one or more member is in poor health or elderly and requires additional support.
- There are opportunities to improve the resilience of more rural communities to potential flood risk, through training and support on how to respond to flood warnings, using the Environment Agency's local flood group model.
- Where new housing is developed within areas of known flood risk, these should be designed to minimise the impact of flooding, adopting best practice from other parts of Europe and the UK. Measures may include raised electrics and raised sub floor. The Planning White Paper (2007) argues that the precautionary approach should be adopted in areas where there are known physical constraints of environment on development, such as sea level rises and flood risk.
- Strategically plan and implement drainage system improvements in areas of greatest risk, including the introduction of increased pipe sizes for drainage and sewers for new developments.
- Undertake a wider review of the implications of climate change on Northumberland on spatial planning decisions, particularly in relation to new development and approaches to installation of micro-renewables. This should include the protection and creation of greenspace within residential areas to reduce the impact of urban heat islands and recognition of the value of green infrastructure in helping to mitigate the impacts of climate change on communities.
- Look at the feasibility of developing an eco homes demonstration project within a rural context to explore some of the planning issues surrounding sustainable design.
- Develop a multi-agency partnership to address vulnerabilities in the water and utilities system for Northumberland.

Haydon Bridge Local Flood Group

Following the floods of January 2005, the local Haydon Bridge Flood Group was formed with support from the Environment Agency to help local residents should similar events occur in the future. As well as signposting local residents on how to prepare for a future flood, what to do in a flood and the aftermath of a flood, local volunteer wardens monitor river flows to provide early warnings and maintain a list of more vulnerable members of the community who may require additional support during a flood either in securing their property or evacuating it. It is hoped that similar groups can be created throughout the county in communities vulnerable to future flooding.

Opportunities

- Warmer winters will reduce domestic heating bills and help mitigate fuel poverty.
- There is an opportunity for Northumberland to develop its skills base in sustainable construction.



We lead healthier lives: Climate change and delivering health and social care

Background

The health of people in Northumberland shares many of the same characteristics of the North East region, with its legacy of heavy industry and health related behaviour. In particular, there is a link between health inequalities and deprivation which significantly impacts on communities within South East Northumberland, but also in areas of rural deprivation including some wards around Alnwick, Berwick, the Tyne Valley and eastern Castle Morpeth. Those in poorer health and those living in poverty will be the most vulnerable to the effects of climate change. Understanding the implications of climate change on general public health and the ability to deliver health and social care services is crucial if Northumberland is to reduce the vulnerabilities of all its residents but in particular more vulnerable target groups: children and young people, older people, people on no or low incomes and people who are discriminated against.

Northumberland's rurality already presents significant challenges to the delivery of health and social care; climate change will only compound these challenges. Increased extreme weather events will cause major disruptions to Northumberland's road network, which could have profound implications not only for access to health services, but the delivery of services in the community including social care for vulnerable older people and those with long term health issues.

Vulnerabilities

The potential significance of climate change on public health is wide ranging and can only be addressed if it is mainstreamed within health and social care planning. However, there are a number of areas which require a more focused approach.

One-off events

- Emergency care required after an extreme weather event, for example injuries and traumas suffered through a major flood event.
- Public health risks following a major flooding incident, including chemical and biological pollution.
- Ongoing mental health and wellbeing problems triggered by the experience of major weather event e.g. depression.
- Implication to service providers of a major power outage or disruption to water supplies caused by extreme weather events. Whilst hospitals may have emergency generators, there may be major implications for locally based services or home care e.g. patient dialysis machines.
- Major disruption to the transport network caused by flooding, road melt or wind blown debris and damage to key strategic routes which may prevent patients accessing acute or regular care or service delivery.
- A number of health facilities within the county are located in areas with high flood risk - these include three ambulance stations (including Morpeth), 11 care homes, 17 community centres and 21 doctors' surgeries.

New risks

The instances of heat waves are predicted to significantly increase over the next few decades. The NHS Heat Wave Plan defines a heat wave as when threshold day and night temperatures average temperature of 28°C and 15°C night. A national monitoring programme has already been established which operates between 1 June - 15 September; a system of alerts has been developed depending on the length of time these temperatures continue. During the 1976 heat wave actual heat-related deaths totalled 4,651 in all regions of Britain; 2,101 in South-East England, 2,392 in the rest of England and Wales and 158 in Scotland. Northumberland (though not necessarily the North East as a whole) is likely to mirror Scotland with a much lower mortality rate than other parts of England.

Nevertheless, people who are particularly vulnerable to excess heat are those over 75 years of age living on their own or in a care home, people suffering from mental ill health and dependent on others for day to day care, babies and young children. The over 75 population is predicted to increase significantly in Northumberland by 2050. In 2003, heat wave excess deaths in London among the over 75s increased by 59%.

- There are approximately 1,000 private water supplies in Northumberland looked after by environmental health departments. Many are springs or shallow boreholes and are susceptible to changes that climate change will bring. There will be problems with adequacy and quality in some cases. This will be due to drier summers and increased sudden rainfall events which could increase the number of incidents of contamination of supplies, which need to be addressed in future resilience planning.

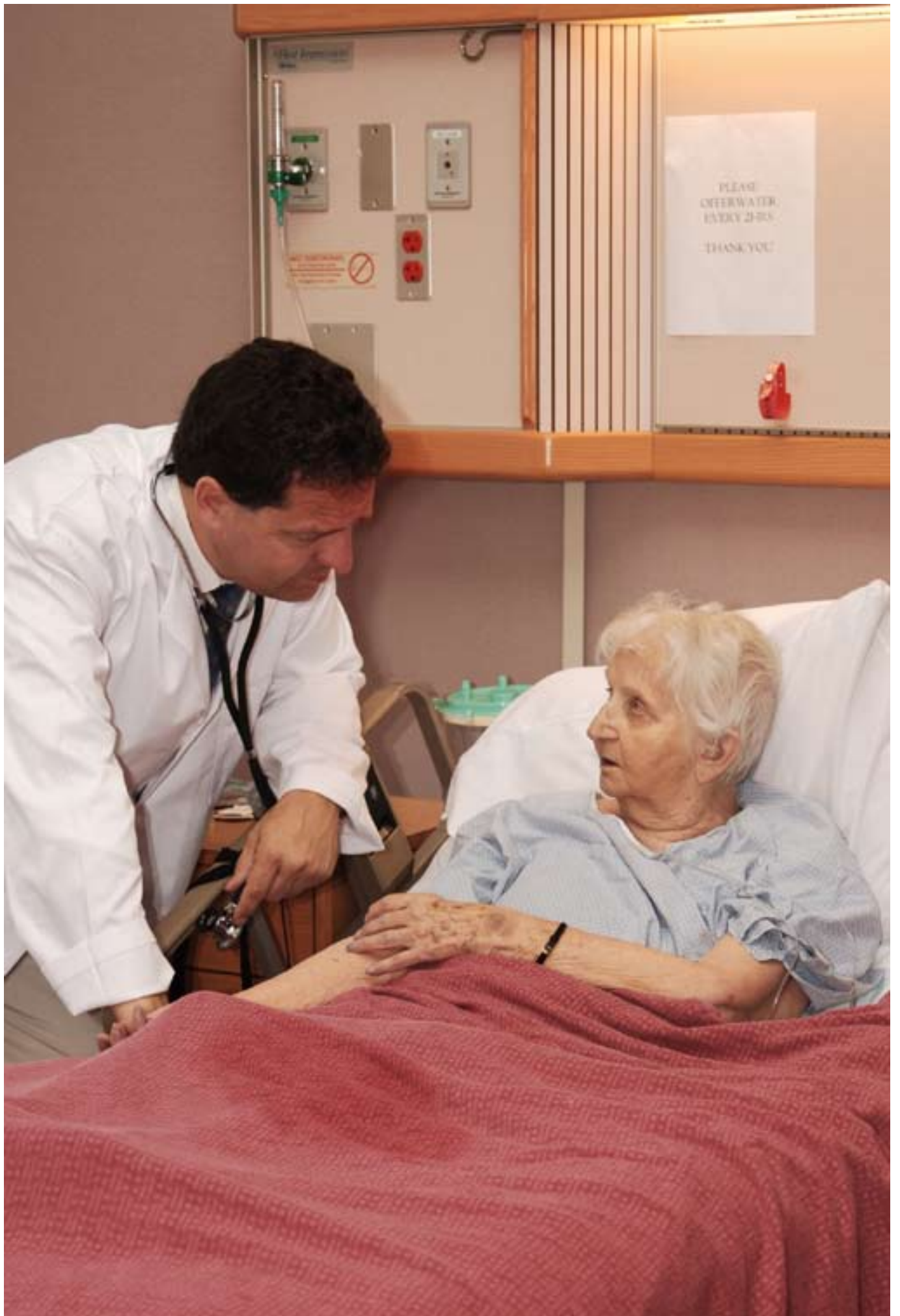
Increased summer temperatures and changing rainfall patterns will also bring:

- Greater risk of heat stroke and dehydration, particularly in certain work places such as bakeries, foundries, or public buildings with poor ventilation.
- Incidences of wildfire and arson attacks are likely to increase with high summer temperatures. Smoke from wildfires can pose a significant risk to persons with respiratory or cardiac problems.
- Greater risk of sunburn and skin cancer due to the thinning of the ozone layer
- Greater risk of temperature related food poisoning (although overall incidence is declining due to improved central processing of food and action by local environmental health departments).
- Increased risk of respiratory problems linked to the impact of pollen in warm weather; there will also be some impacts on air quality although, overall, this is expected to improve.
- New diseases from insect vectors, such as Lyme disease carried by ticks.
- Potential increased risks from some conditions such as cryptosporidium in water supplies (both public and private).

Vulnerability of infrastructure

A significant implication for health and social care providers of climate change is also the impacts of changing weather patterns on existing and new infrastructure. Northumberland Health and Care Trust Estates include a wide range of buildings which vary in size and age but many are mid twentieth-century of brick or concrete construction with flat roofs. Changing weather patterns and, in particular, increased winter rain or sudden severe rainstorms will bring particular challenges to managing the trust's building stock. Greater monitoring of all buildings to tackle repairs and the upgrading of many drainage systems will be required, because of:

- Increased water ingress leading to leaks, damp and potential ponding on flat roofs;
- Greater corrosion of steel reinforcements with concrete structures;
- Water ingress leading to problems with fungal infestations;
- Guttering and drainage of buildings may be inadequate to cope with increased rain fall;
- In high temperatures melting of bitumen on felt roofing and cracking of bitumen sealants.



High temperatures may mean that treatment rooms and other healthcare facilities become too hot. Many buildings will not be suitable for retrospective air conditioning and, where it is possible, the costs to fit and run such system may significantly impact on running costs; air conditioning requires significant energy and therefore will also increase carbon emissions. New buildings should be designed to maximise passive winter solar gain but avoid summer solar gain and use summer solar energy to provide cooling. Tinted windows and planting of trees for shade can also be used to increase protection against the sun. Some facilities, such as care homes, may benefit from the development of cool rooms and there could be a need for portable air condition units for use with home based patients/clients.

Carbon footprint and mitigation

As a major employer and a key generator of carbon emissions through waste, transport and buildings, the Northumberland Health and Care Trust and its partners are well placed to demonstrate a high level of corporate responsibility in all areas of activity. Nationally the Carbon Trust has worked with a number of health trusts to develop carbon management plans to reduce overall emissions; such plans have also delivered major savings on energy costs which have benefited the trusts and reduced carbon emissions by an average of 15%. Recommendations have focused primarily on heating, ventilation and waste minimisation. The draft NHS Strategy on Carbon Reduction Strategy Saving Carbon, Improving Health (2008) which proposes at least a 60% reduction in carbon emissions from the NHS will be an important stimulus to further activity within this area.

Building resilience

- Work is ongoing through the Local Resilience Forum to plan appropriate responses to events, such as extreme weather. Greater coordination with first and second responders is required to share information on potential vulnerable infrastructure, including power and water systems, if appropriate planning is to be in place.
- The Health Care Trust needs to work with the Environment Agency to highlight health facilities most at risk from flooding and identify mechanism to increase the reliance of the facility or if required to re-locate it. Flood data for the county's transport system should also be studied to identify key strategic routes which may be vulnerable and subsequently impact on health and social care delivery.
- Explore ways in which the resilience to climate change in Northumberland could be improved through the delivery of some services locally, particularly in more remote rural communities, whilst delivering on other health and social care objectives.
- Develop a heat wave plan for Northumberland which also addresses responses in health and social care facilities, including hospices and private care homes.

Opportunities

Milder winters will have a positive impact on public health reducing the number of excess winter deaths triggered by cold.



We can readily access the things we need: Managing transport and communications networks in an era of climate change

Transport

Northumberland has over 5,000 kilometres of roads; of these a number of routes have key strategic importance regionally and locally, these include the following - the A1 between Tyneside and Scotland, the cross country A69 and the A68 linking Northumberland to Durham and the Scottish borders; the A697 and A696 which are also important arterial routes within Northumberland. Any major obstruction on any of these routes could have profound implications for a large number of rural communities as alternative routes may be lengthy or not available. It should also be noted that nearly one third of Northumberland's workforce commutes into Tyneside and any major disruption to key routes could have significant consequences for the wider region.

The key rail route in the county is the east coast mainline running between Newcastle and Edinburgh. In addition, the Tyne Valley line provides an important cross-country route for both passengers and freight, as well being used as a diversionary route for problems on either the east or west coast mainlines. In addition to the express services operated on the east coastline, local services run between Newcastle and Alnmouth and regional and local services are provided between Newcastle and Carlisle on the Tyne Valley line.

There are significant number of bridges within Northumberland carrying road and rail connections. The Highways Authority is currently responsible for over 200 bridges, as well as 200 miles of retaining wall, a huge number of culverts and drainage ditches. Network Rail and the Highways Agency also have responsibility for a large number of additional bridges, as well as cuttings, embankments and culverts.

Despite Northumberland's size and rural nature, the county is fortunate to have a fairly comprehensive bus network which is complemented by community transport services; such services provide an important life line for those without access to a car. A significant proportion of the bus network is commercial, however many of the more rural services and those operating at weekends and evenings require public subsidy. In addition, nearly 10,000 children in primarily rural Northumberland are taken safely to and from school every day by bus, coach, or taxi. School Travel Northumberland also recognises the importance of public transport in developing more sustainable forms of travel and is committed to developing school travel plans to increase walking and cycling to schools by 2010.

At 3,800 miles (4,959 km) Northumberland also has one of the finest and most extensive rights of way networks in England. The majority are public footpaths but around a third also provide routes for cyclists and horse riders. Northumberland continues to work in close partnership with organisations such as Sustrans to continue extending its cycling provision.



Vulnerabilities

- There was widespread damage to Northumberland's highways and public rights of way network during the September 2008 floods, which included a major landslide at Powburn on the A697 and damage to verges.
- All transport routes will be increasingly vulnerable to the impacts of flooding and increased severe rainfall. NCC has already identified increasing retaining wall failures along highways in recent years due to increased episodes of heavy rainfall. This is likely to continue in future years, which will significantly impact on all transport infrastructure. Bridges, which have suffered damage in previous flood events, will be particularly vulnerable, as will rights of way close to river banks and the shore line.
- Many of Northumberland's rural roads are constructed using sprayed bitumen and surface dressing. This type of road is particularly vulnerable to road melt where surfaces soften during high temperatures. Increased summer temperatures will mean that instances of road melt will increase. This will not impact on roads such as the A69 which are constricted with bitumen macadam.
- Whilst snow will be much rarer, the county will still continue to experience snowfall or icy conditions, this means that winter roads crews and gritting vehicles will still need to be on stand by during the winter months
- High summer temperatures will bring increased risk of rail buckling and overheating of overhead equipment; power cables are particularly prone to sagging during high temperatures which can reduce their capacity.
- A section of the east coast mainline north of Berwick is close to the coastline and has been identified as vulnerable to future coastal erosion as a result of future storm surge events.
- Extreme weather conditions may cause major disruption to bus and rail services, including school transport.
- Extreme weather events may also damage associated transport infrastructure including stations, bus shelters and signage.
- There will be more erosion to the county's rights of way network due to increased winter rain, which will make paths surfaces more vulnerable, especially those on a gradient or heavily used.

Mapping highway vulnerability

Northumberland County Council is recording all major highway flooding incidents over recent years and comparing this with Environment Agency flood maps to highlight sections of route which are particularly vulnerable to heavy rainfall or poor drainage. This will be an increasingly important data base, as more work is done on the risks of surface flooding helping to inform future emergency planning and maintenance and investment decisions.

Carbon footprint and mitigation

Transport is a major energy user and currently the large majority of our transportation needs are met by oil. The combustion of oil gives rise to emissions of carbon dioxide, the greenhouse gas responsible for the majority of human induced climate change. In 2005, the latest year for which figures are available, carbon dioxide emissions from the domestic transport sector in the UK were 35.2 million tonnes Carbon (MtC) - approximately 23% of total UK carbon emissions. This figure excludes emissions from international aviation and shipping, but if these are included using figures based on sales of aviation and marine fuels for international journeys departing from the UK, transport would equate to approximately 28% of total UK carbon emissions. Carbon emissions from domestic transport have risen by 10% between 1990 and 2004 and current trajectories suggest they this will continue to rise. In the North East in 2005, road transport accounts for 12% of the regional total (4.6 million tonnes).⁸

Whilst the national policy is to encourage more sustainable patterns of travel behaviour, through greater use of walking, cycling and public transport, in a predominantly rural county, such as Northumberland, car travel will remain the main mode of transport. The policy of reducing the need to travel through spatial planning and service delivery could have greater relevance for a rural county like Northumberland which in recent years has seen a growing centralisation of services including healthcare, retail and education. Opportunities need to be sought to encourage greater home working and tele-conferencing to reduce the need to travel; the reconfiguration of services in both the creation of the new unitary authority and the Northumberland health and social care will have a key influence on future travel patterns.

There has been progress in the design of vehicles to reduce the amount of carbon emissions and average emissions of new cars in the UK have declined in recent years, reaching 169.4 grams CO² per kilometre in 2005, a reduction of 20g/km, or 10.7%, since 1997. The Government is encouraging car drivers to move towards lower emission cars through the vehicle tax system, by having a lower rate for small engine cars. Other initiatives have been to encourage the use of alternative fuels such as LPG and biofuels; there is also ongoing research looking at the viability of hydrogen powered cars, and electric vehicles. There are increasing issues about the wider environmental implications of biofuels, suggesting such alternatives can only be part of the solution.

⁸ North East Regional Emissions Study (2008)



Building resilience

- The implications of climate change for Northumberland's transport system need to be fully recognised within the county's next local transport plan. In particular, work needs to be undertaken to develop a capital programme to strengthen bridges and other key infrastructure which have previously suffered weather-related problems or are prone to scouring, as well as improve drainage systems.
- More frequent inspections of all transport infrastructure, including earth works and carriage surfaces and a regular maintenance regime to ensure problems can be identified and rectified before they become a risk.
- Network Rail is already employing climate change experts to work with its engineers to improve the resilience of the rail network. Over the next few years design standards for 'short life' infrastructure, such as rails and electrification, will evolve to meet the predicted future changes. However, major engineering works are likely to be required on significant infrastructure vulnerable to extreme weather impacts, due to their location, for example within an area of high flood risk or close to the coast.
- Sections of roads which are particularly vulnerable to surface melting in high temperatures because of their location, should be resurfaced with bitumen macadam.
- Popular footpaths and cycleways may require hard surfacing or improved drainage to cope with additional winter rainfall.

Opportunities

The need to develop low carbon technology for transport is potentially a growing sector, for those looking at the development of biofuels, or cutting edge technology e.g. hydrogen cells. One North East is currently developing a low carbon vehicle strategy.

The need to reduce private car use for short journeys offers the opportunity to develop attractive safe routes for walking and cycling, which will meet wider objectives for health, community cohesion and enhancement of local communities. Work needs to continue on the development of green travel plans for schools and other major employers to support increased walking and cycling. The development of a green infrastructure strategy for Northumberland could be a key component in delivering new opportunities to enhance traffic free routes.



Telecommunications

Communication is a key element in enabling Northumberland residents to access the services they need, either through the telecommunications network or through local information centres and the media. Communications include television and radio transmissions, telephone and internet provision, mobile phone networks, including TETRA used by the emergency services.

Vulnerabilities

- Communications networks rely on steel structures to transmit signals. High winds can cause problems for steel masts, particularly those sited on the crest of hills.
- A number of steel masts are also sited within areas vulnerable to flooding and could be damaged as a result.
- Three telephone exchanges in Northumberland are sited in areas vulnerable to flood risk.
- A major power outage caused by an extreme weather event can interfere with communications and make it difficult to coordinate emergency planning activities.
- The general public increasingly use the internet to source information. In severe weather events elsewhere in the UK, some websites providing support information have collapsed as they were unable to cope with the number of hits they were receiving.

Building resilience

- The local resilience forum and the emergency planning officer need to continue to work with the telecommunications network to develop appropriate contingency plans as a result of extreme weather events. Flood data from the Environment Agency should be used identify those sites which may be at risk from extreme weather events.
- Those providing websites containing public service information should review their capacity in the light of a major event.



We take part in cultural activity: Staging the climate change debate?

Historic buildings and sites

Background

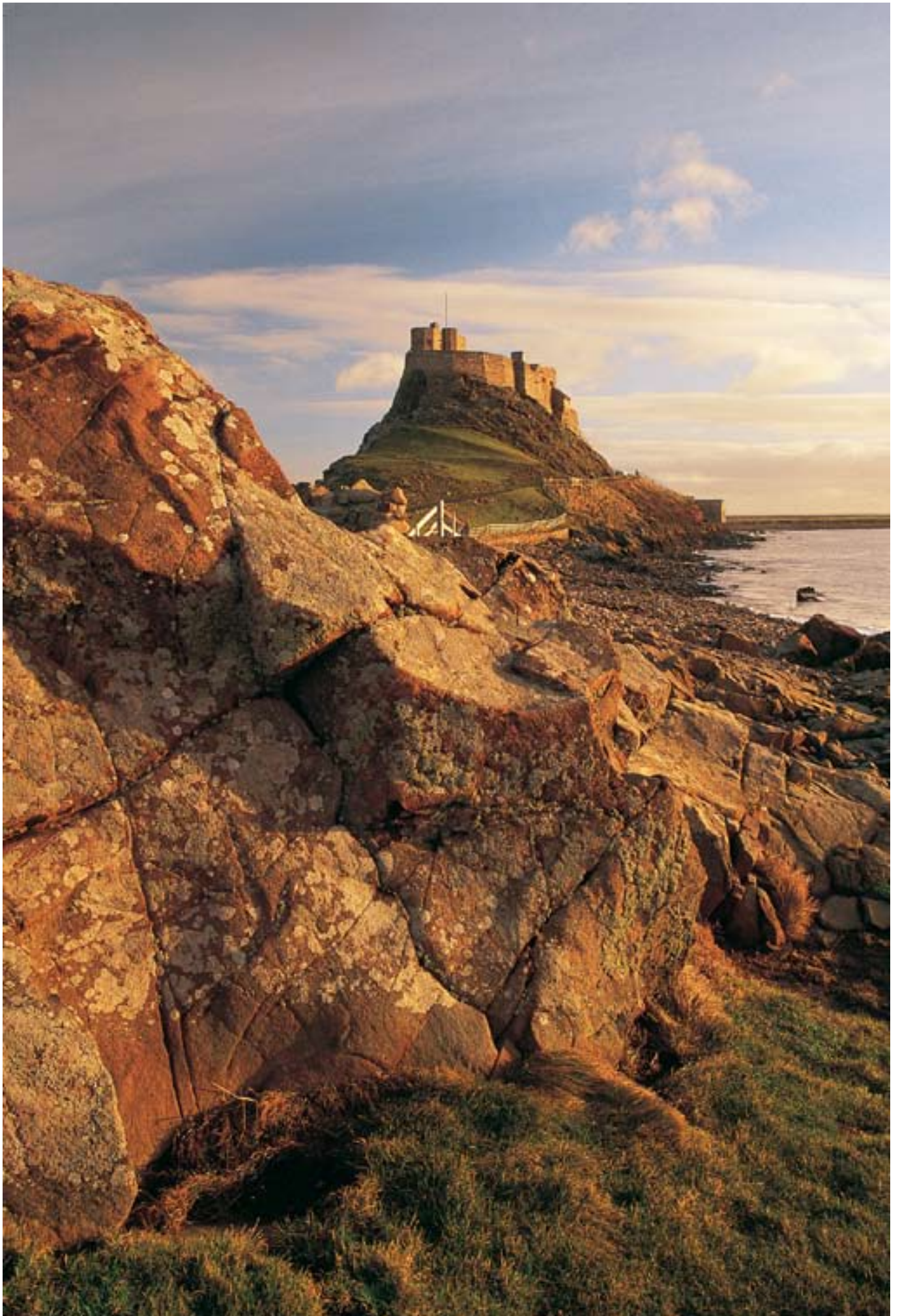
Northumberland has a rich built environment which dates back to pre-historic times. The county contains over 40 Iron Age hill forts, plus a range of Bronze Age and Romano-British settlements. Hadrian's Wall is now a World Heritage Site and Northumberland's medieval legacy of early Christian settlements and fortifications, such as those at Lindisfarne and Warkworth, are of national value and importance. Northumberland has 172 Grade I listed buildings which range from fine country houses such as the National Trust's Cragside, a wealth of medieval churches to the humble remains of the lead mining industry in the North Pennines. In addition, there is a large number of important historic sites in Northumberland, including nine battlefields linked to the Border Wars.

Some of the observations about the impact of climate change on this sector will also be valid for the county's museums, archives and libraries. Some of the issues for more modern buildings are identified in reference to educational establishments.

Vulnerabilities

Increases in the amount of rainfall received in winter, together with projected increase in intensity of rainfall events, will bring significant challenges to those maintaining historic buildings and sites.

- Heavy rainfall will bring increased rainfall penetration with the potential to damage the internal fabric of buildings, including wall coverings and furnishings. There may be problems incorporating improved drainage in listed buildings because of the restrictions of adapting existing roof coverings and rain water goods or issues of cost.
- Short sharp rainfall is likely to cause greater erosion on historic earthworks and monuments. More freeze thaw events could also cause problems linked to stone fracture.
- Fungal infestations (such as wet and dry rot) and insect attack, including wood boring insects may increase in humid conditions and impact on timber structures or vulnerable decorative surfaces. Some conservators in the UK have already noticed an increase in occurrences of webbing clothes moth and carpet beetle.
- Milder weather will extend the growing season in historic gardens, but may also limit the future of many traditional garden plants, which are less tolerant to higher summer temperatures and drought.
- Ornamental lakes fed by springs could dry up in warmer summer months or could be affected by algae bloom.
- Drier summers can also lead to increased soil erosion, which may have impacts on scheduled monuments which include earth works.
- Milder weather could see the extension of the visitor season, but this could mean that more vulnerable parts of the site could be more susceptible to visitor pressure, such as grass-sward paths which will not have the chance to recover before the beginning of the next season.
- A number of historic, buildings and churches as well as libraries are vulnerable to flooding, which could have significant consequences for their building fabric, as well as their contents.



Building resilience

In managing potential threats to historic buildings and sites, the following measures will need to be considered to help secure and protect Northumberland's heritage.

- There is a need to share knowledge and good practice on ways in which historic buildings and scheduled monuments can be better protected or made more resilient to climate change. It will be important for a mechanism to be identified in which good practice developed by organisations such as English Heritage, the National Trust and larger private sector owners, such as the Northumberland Estates, can be shared with owners of historic properties from the private and community sector.
- A multi-agency group, of heritage organisations, landowners and the Environment Agency, needs to undertake a detailed assessment to identify which sites and buildings of historic and cultural significance are at particular risk from flooding or coastal erosion and develop a strategy to support their future management.
- Effect minor repairs more regularly instead of infrequent major repairs.
- More rigorous and frequent inspection, maintenance and monitoring of the physical fabric of structures
- Developing action plans for emergency response and business continuity plans for services such as archives and libraries.
- Deciding whether to relocate artefacts away from sites under immediate threat.
- Deciding on a site by site basis whether to accept certain losses of the fabric of the site caused by coastal erosion or flooding through a managed retreat and careful recording of the site, or to introduce engineering solutions to protect the site.
- Introduction of sympathetically designed irrigation systems for historic gardens.
- Diverting paths or constructing routes out of more robust materials close to archaeological and historic monuments to reduce additional erosion problems caused by a mix of heavy rainfall and dry summers.

Greenspace - play, sport, and countryside access

The vulnerabilities of Northumberland's rights of way network and cycle routes are discussed under transport in their role as important tourism assets and wider community resources for active recreation. Similar issues will also impact on other greenspace within the county, whether formal sports facilities such as golf courses, footpath pitches and stadia, or informal play space, parks and allotments.

Some of the specific issues which will affect Northumberland's greenspace include:

- Longer growing seasons will increase the amount of times grass has to be cut to maintain sports facilities and public greenspace, as well as clearing other vegetation.
- Drier summers and drought will make it more difficult to maintain grass play surfaces and lawns in public gardens.
- Combinations of increased wet weather in winter and heavy use will increase the erosion of footpaths and cycle paths. Much of the county's off-road cycling network is constructed of hardcore dusted with shale, which is particularly vulnerable to intensive rain events or heavy use following a very dry period.
- Stiles, park benches, non-treated fences and other wooden infrastructure will be more vulnerable to decay caused by increased wetting and drying.

There is an increase body of good practice being developed at a national level to support those involved in the management of greenspace and to look at the implications of climate change. One of the key implications for these managers will be the increased resources which will be required to maintain public facilities and greenspace, subject to increasing pressure from severe weather events.

Greenspace has an important role to play within a broader Green Infrastructure Strategy for Northumberland not simply because of its value to the local community, but also because of its multi-functionality which allows it to be both a space for informal recreation and part of a wider flood management strategy.



Tourism

The visitor economy is one of Northumberland's most important economic sectors and in recent years it has also been its fastest growing major industry. An independent assessment has concluded that, in 2006, the county attracted 1.76 million tourist visits (involving at least one overnight stay) - a 21% increase from 2000. The county also attracted 7.99 million day visits. Collectively, these visitors spent £621 million in the county, resulting in the employment of more than 14,000 people. Over 1,000 new jobs were created by the Northumberland visitor economy in the four years from 2000.

It is generally believed that climate change will have a positive impact on tourism within Northumberland, as the unreliability of warm summers has been seen as a key variable influencing the domestic holiday tourism market; this is coupled with the fact that traditional holiday destinations overseas, such as Spain and Greece will become unpleasantly hot and suffer from water shortages due to higher summer temperatures. Whilst it is reasonable to assume that Northumberland will see increased visitor activity as a result of climate change, it is also important to be aware of other variables which may impact on tourism, including rising fuel prices and impact on global markets as a result of climate change.

Vulnerabilities

Climate change impacts may affect tourism infrastructure through a combination of severe weather events, but also through natural processes such as sea level rise, which may cause the erosion of beaches and coastal infrastructure such as coastal footpaths, golf courses, and car parks, as well as natural habitats which attract nature based tourism. Tourism businesses face many of the same issues as other businesses in the region and the importance of developing business continuity plans to cope with severe weather events such as flooding, heat waves and storms, apply as much to this sector as other small medium enterprises.⁹ Caravan parks, many of which lie in river flood plains and along the coast, are particularly vulnerable to flooding and, because of the nature of the structures, the implications for the safety of those in caravans during a major flood event can be very serious. There are currently 157 caravan sites vulnerable to flooding and a further 24 camp sites in Northumberland; the Environment Agency is so concerned about the potential loss of life in a major incident, it is currently running a proactive campaign with caravan site owners to develop flood warnings and flood procedures to enable the quick evacuation of sites.

One other factor relating to climate change is that the time window for crossing the cause-way to Holy Island will be reduced.

Opportunities

Increased tourism activity will be no doubt be beneficial to the local economy and alongside providing new job opportunities, may also encourage inward investment. This needs to be balanced by the additional pressures increased tourism might bring on Northumberland's natural and built heritage, its roads and water resources (particularly in the northern part of the county). Awareness of the potential negative impacts of increased tourism activity can ensure that Northumberland places the development of sustainable tourism development at the heart of its agenda. Northumberland Tourism has actively promoted green tourism schemes and organisations, such as Northumberland National Park, are actively examining the potential of visitor pay-back schemes. There are opportunities to encourage the greater take-up of renewable energy in this sector and to develop tourism opportunities which build on Northumberland's outstanding natural environment to support its future protection.

Building resilience

- Northumberland Tourism needs to work with tourism businesses and operators to make them aware of the impacts of climate change and immediate risks of flooding to ensure they develop their business' resilience. This should include continuing work with caravan park owners, as well as other communities with a strong tourism sector, which are vulnerable to flooding.
- Work with One North East to develop and disseminate research from other parts of the UK on the potential impact of climate change on tourism markets and the implications for the region.
- Continue to identify new mechanism for developing new green tourism initiatives, which actively demonstrate their low carbon credentials, as part of the tourism offer.

⁹ See section 5 for a full discussion on business vulnerability and the importance of business continuity planning.

Events and creative industries

Northumberland has an active events and festivals programme designed as a showcase for the county's heritage and diversity and to actively encourage greater participation in cultural events by all its residents, as well as celebrate creativity and local pride.

Creative industries are increasingly important to the North East economy; a recent study for One North East indicated that the sector was worth over £800 million. The sector includes advertising, design and brand communication, performing arts, publishing, new media, games and software, film, TV and video and music. In Northumberland, the creative industry sector is primarily represented by small businesses either operating as sole traders or employing one or two employees. The impact of climate change for such businesses will be much the same as those identified within the for the business sector (see section 5), however, they potentially have an important role in finding new ways to communicate and engage individuals and organisations within and beyond Northumberland on the climate change agenda. In some cases individual businesses may be involved in direct contractual arrangements to work with organisations on raising public awareness, but the creative industries, in their role as opinion formers, can have a positive influence in the climate change agenda in the way they conduct their business. The National Trust's Wallington Estate is looking at a range of initiatives to reduce its carbon footprint, whilst the Alwick Garden and Woodhorn are both seeking to incorporate climate change within their education programmes and exhibitions.

Carbon neutral events, imaginative use of recycled materials and high quality design, which encompasses sustainable development principles, are all mechanisms where the creative industries in Northumberland can play an important role as ambassadors for climate change within their existing offer. Northumberland's events and festival programme can be used to help find new and innovative ways to engage a wide range of residents in understanding and taking part in responding to climate change. In particular, the creative industries could have a particularly effective role in engaging young people, Northumberland's future decision makers. The Creative Industries Partnership is currently working with some schools in Northumberland, focusing on climate change themes and the Tyne Salmon Trail, led by the Environment Agency, is focused on flood defence design and raising awareness about wider environmental issues, through public art.

The value of the cultural sector as a whole in engaging and awareness raising and encouraging greater dialogue and debate about the challenges which present Northumberland, in regard to climate change, is identified as one of the key priority cross-sectoral actions for the NSP and its partners in future climate change activity.



We care about our environment

Climate change has the potential to have wide-reaching impacts on the land use, biodiversity and physical landscape of Northumberland, but a considered and carefully planned approach to spatial planning in Northumberland could enable the environment to provide a crucial role in supporting the county's future resilience to climate change. Northumberland's rurality means that traditional land use industries have a much greater significance than elsewhere in the region, both in terms of actual land use but also their economic importance.

Agriculture

Background

Agriculture is a key land use within Northumberland and, together with forestry and fishing, supports 12,000 direct or indirect full time jobs in rural Northumberland; 20% of employment. Much of Northumberland's agricultural economy is built around the breeding of sheep and cattle, which are raised in the uplands and then exported to various parts of the UK for fattening. Grouse moorland is also a significant part of the economy and to a lesser extent fly and coarse fishing. In the lowlands, in areas such as Millfield Plain and the Tweed valley, arable farming is the main activity providing wheat and barley for animal feed, oil seed rape, potatoes, oats and soft fruits. Agriculture is particularly vulnerable to the impacts of the weather and was demonstrated in September 2008 when 12 square kilometres of the Till valley were flooded, drowning sheep, cattle and destroying crops.



Vulnerability

- It is anticipated that there will be an increased frequency in flooding, particularly along major river courses resulting in damage to crops and loss of grazing land due to water-logging, although in Northumberland the topography of relatively narrow river valleys will reduce these risks.
- Increased rain in winter will increase soil moisture levels - this will make it more prone to damage from livestock and may require livestock to be kept indoors for longer increasing costs.
- Increased summer temperatures, particularly heat waves, will increase the incidents of heat stress in animals. This will have particular implications for transport of livestock and, to a lesser extent, the housing of livestock. Longer term increased temperatures have been shown to reduce milk and egg yields, as well as fertility. Trout and salmon fishing will also be affected by increased summer temperatures as this will reduce the levels of oxygen in the water and impact on the welfare of the fish.
- Predicted increased summer temperatures for the Cheviots and North Pennines could have a profound impact on heather moorland and significantly impact on grouse shooting activity. The RSPB's Climatic Atlas of European Birds suggests that red grouse may only be found in Scotland by the end of this century.
- Warmer winter temperatures can also significantly reduce wheat yields and will impact on other crops, such as apples and other fruit which require cold weather to encourage flowering.
- Reduced rain in summer is likely to have significant consequences for agriculture. Many farms depend on their own water supplies (spring or aquifer fed) - some of these are predicted to dry up in the coming years, which will have implications for livestock farming as well as supporting crops which are more water intensive, such as potatoes and other vegetables. The licences to take water out of existing supplies in environmentally sensitive areas will be reduced, which may impact on the ability of farmers to use irrigation systems. Reduction in river flows during warmer summer months may also make it difficult for farmers to adhere to the nitrates directorate under the Water Framework Directive, which could have a negative impact on water quality.
- Drier springs and summers will reduce soil moisture content and increase the risk of soil erosion, particularly during high winds; this is a particular issue for arable areas. There will also be an increase in the risk of wildfire, with moorland and woodland being particularly vulnerable.
- Changing climate conditions will bring new pests and diseases as it will alter the distribution patterns of vectors (e.g. insects) and carriers (rats). Threats include an increase in Lyme disease, carried by ticks and Blue Tongue Virus, or diseases such as potato blight. Changes in land use, husbandry and breeds/crops in response to climate change are also likely to bring new diseases. Warmer conditions also encourage invasive species such as bracken which can displace livestock forage - in recent years there has already been a significant increase in the area of bracken within the National Park.
- The rural location of most farms within the county make them vulnerable to disruption in power supplies and transport networks.



Carbon footprint and mitigation

In 1990, agriculture contributed to 12% of UK greenhouse gases. It is anticipated that by 2010, emissions will have been reduced by 23%. Much of the reduction has been caused by structural changes in farming and land use, but there are significant opportunities for agriculture to further reduce its emissions and be directly involved in carbon sequestration. The Carbon Accounting for Land Managers (CALM) is a free web-based calculator to help land managers work out the balance of greenhouse gases emitted by their farming business and carbon stored in their trees and soil, available through the CLA website.

Key areas for the agricultural sector in terms of managing its carbon footprint include:

- Cattle and other farm animals have been identified as a key producers of methane accounting for around 20% of global methane emissions. The gas is a potent source of global warming because, volume for volume, it traps 21 times as much heat as the more plentiful carbon dioxide. Research has begun on vaccines to reduce the level of methane produced by livestock and developing different grass mixes for fodder. Traditional hay meadow mixes have been shown to reduce levels of fermentation in cattle compared with rye grass.
- The application of manure on land to act as a fertiliser releases nitrous oxide into the atmosphere, a very potent greenhouse gas. Many fertilisers are also nitrogen based. The timing of applications of fertilisers and manure and more rigorous nutrient budgeting could significantly reduce the application of nitrogen fertilisers and reduce costs for farmers.
- Farms use large amounts of machinery such as milking parlours, combine harvesters and tractors and therefore have relatively high energy costs; a key energy use is housing stock for cattle. An increasing number of farms are undertaking energy audits to improve energy efficiency and thus reduce carbon emissions. Better insulation of housing for stock and the use of anaerobic digestion to produce on-farm energy for heating are part of a range of solutions.
- Soils act as a carbon sink and the greater the organic content the more carbon can be stored. Converting arable to agro-forestry increases carbon storage by 3.1 tonnes and arable to grassland by 0.8 tonnes. The National Trust's Wallington Estate is currently calculating the amount of carbon locked in its estate and identifying future land management options to increase current carbon stores.
- The value of grassland, hedgerows and peat needs to be recognised as a carbon sink and farmers and other land managers need to be encouraged to maintain these in good condition. Hedgerows and shelter belts can also be important mechanisms for reducing soil erosion, acting as wind breaks, as well as meeting biodiversity objectives.

Building resilience

- Work needs to be done to identify new breeds and crops which are more resilient to predicted weather patterns, in particular livestock breeds which are more heat and drought tolerant.
- Farmers, including tenant farmers, should be encouraged to undertake energy audits to identify ways in which they can increase energy efficiency, but also identify opportunities to generate their own energy supplies. Opportunities to support development of anaerobic digestion to produce heat, or renewable energy should be explored.
- All farms in Northumberland with vulnerable land should be encouraged to develop fire plans to manage wildfire and place this with the Fire and Rescue Service. Plans should be reviewed at regular intervals to reflect changes on the farm or water supplies. Farms should also consider the production of flood plans.
- Change in seasonal rainfall patterns will require farmers to investigate methods to collect excess winter rain which could then be used during the summer. Improved water efficiency will be required including identifying leaks or erecting technology to clean dirty water for livestock.
- Examine opportunities for enhanced field drainage and building soil absorption capacities during the winter months. Maintain hedgerows and field margins to act as wind barriers but also provide habitat for natural predators to control pests and identify new crops to combat future soil erosion and which are more tolerant to drought conditions
- Maintain hedgerows and field margins to act as wind barriers but also provide habitat for natural predators to control pests and identify new crops to combat future soil erosion and which are more tolerant to drought conditions

Cheviot Futures

Following the production of the scoping study *Climate Proofing the Cheviot Hills* (March 2008), a working group has been established to develop a series of demonstration projects to extend the adaptive capacity of agriculture and associated land uses such as forestry and tourism, whilst supporting nature conservation and water quality and management issues. These demonstration projects have been selected for their wider applicability beyond the Cheviots and have adopted a water catchment approach and will address issues relating to peat restoration, wildfire, flooding, new crops, water storage and farm management practice.

Opportunities

Over the last two years there has been a significant increase in commodity prices, particularly for wheat, and the prediction is that as some areas in the world become more marginal and less productive for farming due to climate change, areas like Northumberland are likely to benefit. This will mean that land formally set-aside may well be brought into production, warmer climatic conditions may also allow arable farming to be undertaken at higher altitudes, but this will have implications for landscape character and biodiversity. The nature of agriculture is that it does not operate within a vacuum, but any changes in the farming practices will have an impact on the landscape, biodiversity and water resources. For Northumberland to embrace the very opportunities that climate change may offer in the next few decades, a holistic view of land management needs to inform future farming decisions. The role of Natural England, the Environment Agency, the Rural Development Programme for England (RDPE) and organisations such as the CLA and NFU, as well as landowners will be crucial to ensure an integrated approach is developed.

Opportunities for agriculture will include:

- Increased winter temperatures will allow lambing and calving to occur earlier in the season without housing. It may also no longer be necessary to remove sheep and cattle from uplands in winter enabling more animals to be finished in Northumberland.
- Changing weather patterns may enable new crops to be developed, in particular maize, as well as fruit and vegetables.
- Increased summer temperatures may enable the area supporting forage to be expanded, which may facilitate the expansion of livestock farming, as long as this is not accompanied by drought.
- Growing awareness of the value of peat, woodland and wetland habitats for carbon sequestration may enable farmers to receive payment for its good management.
- Use of land holding to also support renewable energy to supply their own farm, but also neighbouring communities e.g. anaerobic digestion, wind turbines.



Commercial forestry and other woodland

Background

Kielder Forest Park covers 60,000 hectares - one of the largest plantation forests in Europe; 75% of the Kielder is Sitka spruce. Kielder produces 400,000 cubic metres of timber per year and about 5% of all domestically grown wood in the UK, which supplies local saw mills and is also used for chipboard, pulp and wood fuel. There are a number of other smaller commercial woodlands in the county, including Thrunton, Simonside and Holystone. However, beyond Kielder, Northumberland has relatively low woodland cover, with much of the semi-natural and ancient woodlands widely dispersed and fragmented; however, these have high biodiversity and amenity value. Northumberland National Park and the Forestry Commission have an active programme to increase native woodlands and in particular upland oak and ash and mixed broadleaf woodlands habitats.

Vulnerability

The Forestry Commission anticipates that because of the upland nature of much of Northumberland's woodland, the impacts of climate change on woodland which will be experienced in the Midland and Southern England are likely to be much less pronounced in the North East. However, they acknowledge that plantations closer to the coast may require the introduction of new species which are more drought tolerant, such as Scots Pine or Corsican Pine and are able to cope with warmer temperatures.

Potential issues for commercial forestry and woodland generally include:

- Warmer temperatures encourage trees to come into leaf earlier, which can alter competitive interactions and impact on other woodland species.
- Climate change will increase the risk of disease and pests, for example redleaf needle blight and great spruce bark beetle, and new pests such as the oak processionary moth. Increased temperatures will also see a rise in fungal activity. Trees are much more vulnerable to disease during periods of drought.
- Increased water logging of soils in winter can lead to rotting especially for trees on clay soils with poor drainage, resulting in greater instability particularly in summer drought.
- Some tree species such as beech are particularly susceptible to drought.
- Flash flooding can damage trees particularly those sited close to rivers or in steep upland areas.
- Warmer, drier summers will see an increase risk of forest fires.

Carbon footprint and mitigation

Forest and woodlands have the potential to mitigate climate change by acting as a carbon sink through carbon sequestration. It is estimated that Kielder Forest absorbs 140,000 tonnes of carbon dioxide a year. However, the longevity of this storage can vary as it is vulnerable to being released back into the atmosphere as carbon dioxide through clear-felling, forest fires and die-back caused by droughts and disease.

The value of forestry to carbon mitigation can best be achieved through the protection and enhancement of existing woodland, the re-establishment of forests and sustainable harvesting. Silvicultural measures such as longer rotation, increased stock densities, reduced impact logging, together with extending the times logged wood remains in use, can increase the storage potential of woodland.

Wood produces less carbon dioxide than fossil fuels when it is burnt and the generation of wood burning stoves has significantly increased the heating capacity of wood. Wood is also a less energy hungry building material than steel and carbon and is therefore an excellent substitute to help meet low carbon building targets.

Building resilience

- Ensure the research work of the Forestry Commission on the impact of climate change on woodland is disseminated to all landowners with woodland interests relating to both species and silviculture measures. Good forestry practice can reduce tree stress caused by the predicted changes in temperature and moisture regimes within Northumberland. An increase in species in woodland is increasingly regarded as good forestry practice as monoculture increases the risk of disease in woodland.
- The maintenance of fire plans for all forest holdings within Northumberland is a key mechanism to protect them from fire damage; such plans provide vital information on water sources and layout to support emergency teams to tackle forest fires.

Opportunities

- The value of woodland as part of an approach to carbon sequestration is an important area for future research.
- Trees have been shown to be of increasing value in managing the impacts of urban heat islands, which will be exacerbated by the predicted increase in heat waves.
- In some circumstances, trees can before an important role in support flood management and reducing the risks of soil erosion.
- The role of wood as a crop for sustainable building construction is becoming increasingly recognised.
- Develop the opportunity of wood as a renewable resource through the North East New Heat group.



Water resources

Background

The majority of water supplies in Northumberland come from Northumbrian Water's Kielder Resource Zone. Kielder Reservoir opened in 1982 and is the largest manmade lake in Europe with a capacity of 200 billion litres of water which is discharged down the River North Tyne and, in addition to communities in Northumberland, supplies water to the major urban conurbations in Tyneside, Wearside and Teesside. At part of this zone there is a series of other reservoirs, including Catcleugh, Hallington, Whittle Dean and Fontburn, which are linked through a variety of supply routes to provide water to Morpeth, Redesdale and Alnwick.

The Berwick and Wooler Supply Zone is heavily reliant on groundwater rather than surface water for the supply of water to towns, such as Berwick-upon-Tweed and Wooler. In addition, there is a large number of isolated communities and farms which are dependent on their own springs and aquifers.

The EU Water Directive, which came into force in 2003, will be a key tool in helping to address the implication of climate change on water resources. The directive uses ecological indicators to determine environmental quality and seeks to encourage a holistic approach to water management.

Vulnerabilities

Climatic changes will have a significant impact on water resources both on the physical demand and supply of water and the physical, chemical and biological component of water.

It is the Berwick and Wooler Supply Zone, together with other isolated communities or properties dependent on ground water supply, which are likely to suffer the most serious consequences of climate change. Reduced winter rain and increased intensity of precipitation events will not enable water recharge of ground water supplies; this will be exacerbated by growing demands during warmer summer months from public supply, industry and agriculture.

Climate change impacts can be expected to include:

- Higher temperatures will increase the demand for water from people and livestock for drinking and other usage, at the same time as reducing water supply;
- Warmer temperatures will affect the chemical and biological component of rivers and lakes, such as increase algae bloom;
- Increasing competition for water supplies can reduce river flows leading to a deterioration in water quality which is detrimental to aquatic health;
- Water shortages can have a significant impact on irrigator systems such as those in the Till catchment and therefore directly impact on the agricultural sector;
- Many water treatment systems are close to rivers and many gravity feed pumps are in remote areas and not protected from flooding and may therefore be vulnerable.

Carbon footprint and mitigation

Providing a public water supply uses large amounts of energy through pumping stations and treatment works. Companies such as Northumbrian Water are looking at increased energy efficiency to reduce their carbon footprint and meet challenging targets set by Government. Despite these efforts, energy usage may have to increase within the water industry to meet new water quality standards (especially those relating to water coloration) contained in the new Water Directive Framework. However, Northumbrian Water like other water companies will need to implement effective strategies that will reduce the energy needs of treatment processes and cut their overall carbon footprint to comply with forthcoming carbon reduction commitment.

Building resilience

Assessments suggest that with good water management there should not be any major water shortages within the Kielder Supply Zone by 2050, however there will be significant issues for the Wooler and Berwick areas dependent on ground water supply. There is therefore a need for more research and modelling of groundwater stores within the county to better understand the implications of climate change of these water supplies. The feasibility of developing desalination plans powered by renewable energy should be explored to meet future water needs.

Improved water efficiency is also key to building the county's resilience and the following should be encouraged:

- Harvest rainfall for winter storage reservoirs, water capture and storage for stock and domestic use. Such systems should be integrated into flood management measures.
- Promotion of technology to use dirty/waste water.
- Improve domestic efficiency through water efficient appliances and introduction of hosepipe bans when required.



Biodiversity and protected landscapes

Background

Northumberland has a landscape and biodiversity of national and international importance which is recognised through designations to protect and enhance landscape quality, as well as protect rare and endangered species. Northumberland contains some of Europe's most important ecological habitats including blanket bog, hay meadows, ancient woodland and heather moorland. In addition to the Northumberland National Park and the two Areas of Outstanding Natural Beauty, Northumberland's biodiversity has international status through special areas of conservation, special protection areas and RAMSAR sites. There are also 113 Sites of Special Scientific Interest (SSSIs) – covering 56,307 hectares, six national nature reserves, which are managed by Natural England and a large number of local wildlife sites.

The natural world is increasingly regarded as being a sentinel to help monitor the impacts of climate change, as relatively minor climatic changes can have a significant impact on the distribution and phenology (the study of annually occurring natural phenomenon) of some species e.g. times of flowering or migration.

Vulnerability

Changes in the climate will have an impact on species' range, behaviour and preferred habitat. Climatic factors directly influence the geographic distribution of species. Due to the relatively rapid nature of climate change, species are not having time to evolve and are therefore changing their distribution patterns. In the UK, research such as MONARCH (Modelling Natural Resource Responses to Climate Change) and The Climatic Atlas of European Birds (2008) has demonstrated the northward shift of many species into suitable climate space. The atlas shows that for the average bird species the potential distribution by the end of this century as a result of predicted climate change will shift 550 km north east. The atlas anticipates a significant decline in the range of three quarters of all Europe's nesting birds. Already, existing changes to the UK climate has meant that Britain is seeing the arrival of new species which have been previously only seen in mainland Europe, such as Black Kite and Hoopoe. Research is indicating that climate will have the following implications on Northumberland's biodiversity:

- Species' distribution shifting north and uphill.
- Changes in the timing of seasonal events which could lead to ecological mismatch. For example, early flowering could mean that there is no available food for young birds.
- Impact of extreme weather events - storms and drought will kill individuals. Periods of significant cold, wetness, inundation and starvation will have an impact on the overall population and species levels.
- Changes in species' distribution could alter the competitive advantage of species within particular local eco-systems; it could lead to an imbalance enabling the invasion of some species and the loss of others.
- The change to land use and management - though new practices in farming and forestry and water management will have a direct impact on biodiversity, some of these changes may directly threaten particular habitats. Species at risk include cloudbury, wood cranesbill and large heath butterfly.
- Sea level rise is likely to have a significant impact on Northumberland's coastal habitats, in particular salt marsh, reedbeds and mud flats which support thousands of migrating birds. Sand dunes are also at risk from coastal erosion.
- Reduced rainfall in summer months directly threatens peatland, including blanket bog and wet woodland and, in the former's case, increases its vulnerability to wildfires.
- The loss of particular habitats through climate change will fundamentally change the character of Northumberland's protected landscapes.

The full implications of what climate change means for species and the complex interactions between themselves and the natural environment is not fully understood and will require ongoing research to ensure these inform spatial planning and future land management. A regional study to look at biodiversity and climate change impacts is due to report in 2009.

Carbon footprint and mitigation

The natural environment is an important carbon sink; large amounts of carbon are stored in the county's soils, woodlands and vegetation. Removal of woodland, clearance of vegetation and soil erosion make net contributions by removing storage capacity.

One of the most important carbon stores is peat which contains 5,000 tonnes of stored carbon per hectare; in Northumberland there are 34,000 hectares of peat storing 170 million tonnes of carbon. When peat bogs dry out they lose stored carbon directly to the atmosphere as carbon dioxide or into streams with sediment giving the water its characteristic brown colour. The ability of peat to store large amounts of carbon requires it to be in good condition, drainage and overgrazing means that thousands of years of stored carbon is potentially at risk of being released over the next few decades. The peatscape project in the North Pennines is working to conserve and restore peatland by removing drainage grips and peatland creation.

Building resilience

The key action to build resilience within Northumberland's existing biodiversity is to strengthen and sustain existing populations by restoring habitats. This will ensure that populations of key species are healthy and better able to cope with the stresses of climate change, enabling them to adapt or move to new climate space.

The second related action is to look at mechanisms to help facilitate movement through the wider countryside as species move to new climate space; transition corridors which create coherent networks are central to this approach. Underpinning this approach is the work of BRANCH (Biodiversity Requires Adaptation in North West Europe under a Changing Climate), a multi-agency partnership of specialists from England, France and the Netherlands led by Natural England. The three year study highlighted that fragmented landscape in Europe has the potential to prevent many species from relocating to a more favourable climate. BRANCH demonstrated the role spatial planning to create networks of high quality, well connected habitats which in turn make wildlife more resilient to climate change.

In addition:

- Northumberland needs to recognise the international importance of its peat reserves as a carbon store. The peatscapes project, currently focused on the North Pennines, needs to be extended to include the rest of the county's major peat reserves.
- Continuing work is required to document change on the impacts climate change is having on the county's wildlife to enable more detailed modelling on the distribution of climate space and the complex interaction between different species to determine how best transition corridors can be developed to meet their requirements.
- The National Park and Areas of Outstanding Beauty are important areas for a more detailed examination of the implications of climate change on the county's finest landscape and biodiversity. Climate change should be a key strand in the revised managed plans of all these areas.

Opportunities

- Agri-environmental schemes have the potential to mitigate climate change by supporting the county's biodiversity and protection of its landscape and habitats.
- Land use planning to help wildlife respond to climate change by securing habitats and features to support biodiversity.



Renewable energy

Background

The UK's agreement to adopt the EU Renewables target of obtaining 15% of the country's total energy needs from renewable sources by 2020 included heat and transport: with little opportunity for these two sectors to play a significant role in meeting this target, it leaves the UK needing as much as 40% of its electricity to be generated from green energy sources. At the current time it is estimated that renewables provide around 4% of UK energy requirements, so for the UK to meet EU targets will require a significant step change over the next few years in investment and planning policy. However, the issues surrounding peak oil and the predictions of significant reductions in global oil and natural gas reserves also makes it increasingly desirable for the UK to diversify its energy production for economic as well as environmental reasons.

Northumberland's rurality means a significant number of households are not on the mains gas network and either rely on bottled gas or solid fuel to heat their homes. A significant number are beginning to turn towards renewable energy. The predicted increase in severe weather events in Northumberland could disrupt power supplies as a result of storm or flood damage. Moving away from a predominantly centralised power generation towards micro-generation may also improve the resilience of rural communities to the impacts of climate change.

It is estimated that centralised power generation wastes around two thirds of primary energy. There are therefore vast efficiencies to be gained by avoiding the national grid; in other words generating and transmitting energy at the point where it is required. Government guidance highlights the opportunities of developing locally-based heat and power systems to heat and cool municipal buildings, social housing and town centre businesses.

Northumberland has sought to develop a vibrant renewable energy sector; the county hosts a major research centre, NaREC at Blyth and one of Europe's leading centres for renewable skills training, Northumberland College. More effort is required at all levels of the county if the potential to develop renewable technology and its wider adoption by households and business is to be realised.

Building resilience

- The application of micro renewable technology to a variety of different sectors is still at a relatively early stage. The role of exemplar projects to act as ambassadors for renewable energy is key in helping the uptake of renewable energy schemes. Mechanisms to support businesses and community groups through the development of grant schemes and advice should be identified.
- Northumberland should seek to encourage the incorporation of renewable energy in new housing developments to meet the new planning requirements for such sites to be carbon neutral by 2016; South East Northumberland growth point could be used as an exemplar project to meet this requirement.
- Building on work by the Energy Saving Trust in Northumberland, opportunities should be explored to develop a green homes service which also can provide advice and funding support for householders to fit appropriate renewable energy generators.
- To develop a revised strategy for renewable energy generation in Northumberland which addresses the planning concerns surrounding future development of on and off-shore wind and marine/tidal energy.



Waste

Background

Each year around 177,000 tonnes of municipal waste is generated in Northumberland, it is estimated that this amount is growing by around 3% a year. In 2003, 95% of the county's waste was disposed at landfill sites with the remaining 5% being either recycled or composted. Over the last five years, Northumberland has significantly increased the amount of waste reused, with over a third now recycled and composted in order to move away from its reliance on landfill sites for the disposal of municipal waste.

Vulnerabilities

- There may be an increase in garden waste and municipal waste due to the extended growing season.
- There may be smell and health implications for waste disposal and transfer in warm conditions.
- There could be significant waste disposal issues following extreme weather events such as flooding - this could include chemical and biological (deceased farm animals), as well as significant additional waste from flooded households and businesses. The removal of nearly 1,000 drowned farm animals in September 2008 was a major operation which required support from One North East to commission a national fallen stock contractor, the cost of which would normally have fallen on individual farmers.
- During extreme weather events, such as storms or flooding, obstruction of the road network may make it difficult to maintain waste disposal services.
- The growing risk of diseases, such as blue tongue, means that the county needs to be prepared for the potential of a major outbreak and subsequent disposal of affected animals.
- One of Northumberland's waste management centres in the Tyne Valley is currently within a flood risk area and is therefore very vulnerable to flooding, which may also contaminate surrounding areas.

Carbon footprint and mitigation

Significant greenhouse gases can be traced to landfill sites used for the disposal of waste, due to the creation of methane gas as the material slowly decomposes. Waste minimisation and recycling are tangible ways of directly tackling climate change. In May, the Government published its Waste Strategy for England 2007, which emphasised the contribution that taking action on waste can make to tackling climate change and, in particular, reduce carbon dioxide emissions. The key objectives of the new strategy are to decouple waste growth in all sectors from economic growth and put more emphasis on waste prevention and re-use. In particular the strategy requires:

- Local authorities to meet and exceed the landfill directive landfill diversion targets for biodegradable municipal waste in 2010, 2013 and 2020;
- An increase in diversion from landfill of non-municipal waste and secure better integration of treatment for municipal and non municipal waste;
- Securing the investment of infrastructure needed to divert waste from landfill and for the management of hazardous waste;
- Maximising the environmental benefit from the investment in new infrastructure through increased recycling of resources and recovery of energy from residual waste using a mix of technologies.

Northumberland has made significant progress in reducing the overall amount of waste generated and is moving away from the use of landfill sites. Around a third of Northumberland's waste is currently recycled or composted. The securing of £46.8 million PFI agreement is enabling Northumberland to modernise its waste management facilities. By 2012, 45% of its municipal waste will be recycled and a further 47% used to generate electricity; only 8% will go to landfill. Northumberland aims to achieve zero waste growth through the promotion of waste avoidance and minimisation activities.

Opportunities

- More economic opportunities linked to recycling, for example the re-use of electric equipment (supported through the Waste Electrical and Electronic Equipment (WEEE) Regulations) or paper pulp which is of too poor quality to be used for recycled paper, for example for use in production of various incontinence products.
- Use gas from existing landfill sites to generate energy. At the current time all landfill sites in Northumberland have energy production.
- Encourage the development of anaerobic digestion schemes to support energy and heating requirements in rural settlements linked to agricultural enterprises.

Building resilience

- Work with the emergency planning officers to continue to update and revise planning for waste disposal following a severe weather event within the county; this should also include plans for the waste facilities.
- Continue to develop a partnership approach between the public and private sector to support recycling and waste reduction opportunities in the commercial sector throughout the county.
- Northumberland Council and its partners will continue to increase public awareness of waste issues and increase active participation in re-use, recycling and composting schemes. A detailed study is planned to examine recycling behaviour and attitudes of household.
- Eco-Start Waste programme targeted at first schools to raise awareness of waste issues with children and their families. Over 70 schools have currently participated in the programme. There is a need to continue this programme alongside a general public awareness campaign.





Useful sources of information on climate change

Nottingham Declaration Partnership -

www.nottinghamdeclaration.org.uk

UK Climates Impact Programme -

www.ukcip.org.uk

Defra -

www.defra.gov.uk/adaptation

Environment Agency -

www.environment-agency.gov.uk

Local Government Association -

www.lga.gov.uk

Local Government Association Climate Change Commission -

<http://climatechange.lga.gov.uk>

Association of North East Councils Green Manifesto -

<http://www.northeastcouncils.gov.uk/global/assets/documents/asset20080922094423.pdf>

Key findings and recommendations of the ANEC climate change task and finish group

<http://www.northeastcouncils.gov.uk/global/assets/documents/asset20080318120017.pdf>

Climate Change adaptation by design -

A guide for Sustainable Communities Town and Country Planning Association (2007)

www.tcpa.org.uk/bydesign.asp

North East Improvement and Efficiency Partnership -

<http://www.northeastcouncils.gov.uk/iep/index.cfm>

The North East Climate Change Adaptation Study -

www.adaptne.org

The North East Climate Change Action Plan -

www.climatene.org.uk

Sustainable Communities North East Initiative -

www.brighterfuturestogether.co.uk

Carbon Calculator -

<http://actonco2.direct.gov.uk>

Your Home in a Changing Climate Retrofitting Existing Homes for Climate Change Impacts, Three Regions Climate Change Group (2008)

www.london.gov.uk/trccg

Thanks to the following for their support for this climate change initiative, including permission to reproduce images

Northumberland Wildlife Trust
County Landowners Association
New and Renewable Energy Centre (NaREC)
Northumberland National Park
Forestry Commission
The Kielder Partnership
Northumberland Fire and Rescue Service
Digital Voice
Country Land and Business Association
Environment Agency
Forestry Commission
Home Housing
ITV Tyne Tees

One North East
ncjMedia – Evening Chronicle
NaREC - New and Renewable Energy Centre Ltd
NASA
National Trust
National Union of Farmers
Natural England
Newcastle University – Centre for Rural Economy
Northumberland Biodiversity Partnership
Northumberland County Council
Northumberland Fire and Rescue Service
Northumberland National Park Authority

Northumberland Warmzone
Northumberland Wildlife Trust
Northumbria Water
North East Ambulance Service
Rentokil
Regional Climate Change Partnership
Tynedale Council and Helen Smith
Stock.XCHNG
Wansbeck District Council
Woodhorn Northumberland Museum, Archives & Country Park





Northumberland
Strategic Partnership

9 Telford Court
Morpeth
Northumberland
NE61 2DB

Tel: **01670 500 630**
Fax: **01670 513 482**
Email: **enquiries@nsp.org.uk**

www.nsp.org.uk