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Report commissioned by the North East Assembly on behalf of Sustainability North East (SustaiNE) with support from UKCIP and produced by the Centre for Sustainable Development.

This report uses information from the UK Climate Impacts Programme 2002 (UKCIP02) Scenarios which were produced by the Tyndall Centre for Climate Change Research and Hadley Centre for Climate Prediction and Research (Met Office) with funding from DEFRA. Sponsored by Government Office for the North East.
Although Britons like to complain about the weather, many of us don’t realise just how closely our lives are adapted to the climate. However, there are some who do understand this: farmers and others who work with the land, and people in other sectors, such as construction and insurance, whose work routinely takes into account the seasons, rainfall patterns and extreme weather over many years.

The widespread severe flooding in recent years has given us an appreciation of the hazards and of the disruption that can be caused by heavy rain. We can expect to see more of this sort of flooding in the coming century. The expression “global warming” can make the changes that are likely to occur seem remote and generally benign. In fact these changes will affect us in many ways, some for better, some for worse.

There is an international consensus among scientists that the rise in global temperatures we have seen since the industrial revolution is caused by our use of fossil fuels, such as oil, coal and gas, and the consequent global rise of “greenhouse gases” in the atmosphere. Unless we can reduce drastically our emissions of these “greenhouse gases”, the changes to the climate may increase to dangerous levels.

Yet whatever we do to reduce emissions, some changes will occur, so we shall also need to adapt to those changes, as well as acting to prevent further damage to the climate system. Here in the UK, we are relatively fortunate. The Government has funded research into the possible changes, and set up the UK Climate Impacts Programme to help the different sectors and parts of the UK to explore what these changes might mean, so they can take climate changes into account in their long term planning.

This report outlines the key impacts for the North East, identified by eight working groups following a workshop held in May 2001. Warmer temperatures may bring some benefits, though these may be outweighed by the disadvantages unless we focus our attention on adapting. Subtle changes to lifestyles and consumer behaviour can add up to a very different business market. The challenge for us all is to turn potential threats into opportunities. The sooner we start this process, the better.

Dr. Chris West
Director of UKCIP
In the North East we have already begun to see the effects of climate change across the region such as flooding. It is vital that we prepare working with regional partners in the public and private sectors and look at the impacts and issues and consider the actions necessary to limit the North East’s contribution to this global issue. However, unless this is followed up with action and we tap into the development opportunities of renewable energy, for example, we will have failed future generations.

Jonathan Blackie
Regional Director, Government Office for the North East

This report is intended to be a prompt for action. We are asking everyone to consider and understand how their actions impact on the climate of the region. How does Climate Change affect you and how do you affect Climate Change?

Thanks to this document, we now know what the future could hold for our region’s climate and it is in everyone’s interests to work together to reverse or, at least reduce our impact on it to create a better quality of life now and in the future.

Tony Flynn
Chair, North East Assembly

Sustainability North East is a regional partnership working together for a better quality of life for everyone in the region. We have commissioned this report as the threats posed by Climate Change to our quality of life have become clearer. Our commitment is to help raise a better understanding of the issues amongst the people of the North East and promote good practice and changes in lifestyle to help remedy the problem.

Adapting to Climate Change is our biggest challenge. A collective approach is essential, extending beyond the member organisations of Sustainability North East to the whole community. We need action for today and tomorrow, there are no quick fixes.

Phil Hughes
Chair, Sustainability North East

Climate change will have an impact on the Region and our Region’s businesses. We welcome the publication of this report, which outlines some of the potential issues we will face in the future.

Dr John Bridge
Chair, One NorthEast
INTRODUCTION

THINKING ABOUT CLIMATE CHANGE IN THE NORTH EAST OF ENGLAND

Everybody is affected by climate change. This report is intended to raise awareness of climate change and help those who are preparing policies, plans and projects in the North East take action to address the issue. It aims to encourage everybody to work together to ensure that the negative impacts in the future are minimal.

It sets out the key challenges facing the North East in responding to these impacts. These were developed from the proceedings of a Regional Climate Change Conference held in May 2001 attended by a broad range of interest groups.

The Regional Sustainable Development Framework ‘Quality of Life in the North East’ sets out a Vision for the North East in which:

The North East will be a region where present and future generations have a high quality of life; where there is an integrated approach to achieving social, economic and environmental goals; and where global responsibilities are recognised.

This report is seen as contributing to this vision. It is not a prescriptive approach; the variety of partners across the region are being encouraged to take responsibility for action and make progress through their own delivery plans.

It is therefore a prompt for future development and action across the North East. How does our changing climate affect you and what can you do about it?

WHAT IS CLIMATE CHANGE?

We can see changes in our climate now. Global temperatures have risen by approximately 0.6°C since the beginning of the Twentieth Century. Changes in the amount of snowfall, intensity of rainfall, length of growing seasons, ice mass and sea level are also taking place. Changes in the UK climate mean that we now have:

- A rise in Central England temperature of almost 1°C since the beginning of the Twentieth Century
- Warmer coastal waters
- Fewer frosts
- Wetter winters
- A longer thermal growing season for plants
- A rise in average sea level by approximately 10cm since the beginning of the Twentieth Century (after adjustment for natural land movements).

WHY DOES THE CLIMATE CHANGE?

Climate change can occur due to a variety of reasons. However scientific evidence indicates very strongly that recent change can be attributed to the influence of human activities through "global warming". The changes in heavy rainfall, snowcover, total water vapour, mountain glacier extent and ice mass are consistent with these temperature increases.

Changes in our climate can also be caused by natural factors such as, the earth’s orbit of the sun, interactions between the ocean and the atmosphere, sunspots and volcanic activity. Human activities also affect the climate by the emission of greenhouse gases. Since the 1800s carbon dioxide (one of the key greenhouse gases) has increased by approximately 28% in the global atmosphere.

In the Third Assessment Report of the Inter-Governmental Panel on Climate Change it was stated that “...most of the warming observed over the last 50 years is likely to have been due to increasing concentrations of greenhouse gases.” The Hadley Centre modelled the actual rise in temperature against what would be expected as a result of natural factors and human activities individually.
Just looking at the NATURAL FACTORS fails to explain the actual rise in temperatures since the 1970s:

When the likely effects of NATURAL FACTORS and HUMAN ACTIVITIES are modelled together, they correlate closely to the ACTUAL observed temperature change. Because human activity seems to be causing most of the recent global warming, it is likely that the warming trend will continue. To stabilise the atmosphere it is likely that current carbon dioxide emissions would need to be reduced by as much as 60% or 70%. **Even if we could do this immediately temperatures would continue to rise for some time because carbon dioxide remains in the atmosphere for approximately 100 years.**

We need to think not only about how we can reduce emissions of greenhouse gases (known as mitigation) but also how we can adapt so that we can cope with the changes in our climate which will happen.
OUR CLIMATE AND CHANGES WE CAN SEE

CLIMATE CHANGE IN THE NORTH EAST

Increasing Temperatures: +0.5°C in 150 years

Temperature change in the North East has been monitored by Durham University since 1847. These records show that over 150 years there has been a warming trend resulting in an overall increase of 0.5°C. The majority of this ‘warming’ has taken place since 1930. The 1930s and 40s were especially warm. There was a cool trend in the late 1960s and early 1970s, and more recently over the past 15 years very high temperatures have been recorded.5

The upward trend is clearly shown by the changes in average annual minimum temperature calculated against a thirty year average. It is less evident when looking at the average maximum temperatures.

Rainfall

There is no evidence to suggest that average annual rainfall in the North East is increasing.6

However, there does seem to be a trend towards wetter winters as the proportion of annual rainfall that falls during the winter season has increased.

Chart 6: Rainfall

There is also evidence that a greater proportion of winter rainfall is delivered by “intense” events.

Data for different UK regions is shown in chart 8 on the next page. Positive numbers show an upward trend in the proportion of precipitation delivered by intense events. Negative numbers show a reducing trend. Figures for winter are shown in blue, summer is shown in orange.
River Flows, Erosion and Flooding

As winters get wetter and a greater proportion of winter precipitation is delivered in intense events, river flows could become more variable. Greater flows in rivers leads to increased erosion changes in floodplains and sometimes remobilisation of toxic sediments.

High river flows can also cause severe flooding. It is important to recognise that climate change is not the only cause of flooding, many other factors can be relevant, such as land use. Climate change will however, certainly make flooding worse as intense precipitation events become more frequent and sea levels rise.

Flash flooding is also becoming more common as a result of increasing precipitation intensity, for instance in the July 2001 thunderstorm at Hexham, in Northumberland, a gauging station that had been in place for thirty years was washed away.
Sea Level Rise & Coastal Erosion

Between 1900 and 2000 the North Shields tide gauge recorded a sea level rise of approximately 20cm.

The impact of extreme tides and storms and sea level rise could increase erosion. Beaches such as Alnmouth, in Northumberland, are eroding rapidly.

Species Distribution

Species can both benefit and lose out from climate warming. The Comma butterfly has expanded its range through the North East since the 1970s. However some species may be unable to take advantage of beneficial climate changes because of habitat loss or fragmentation.

Thermal Growing Season

The thermal growing season is getting longer as spring events happen earlier. Data collected since 1950 show that garden snowdrops in Northumberland are now flowering earlier in the year. This is similar to trends elsewhere in the UK.

Recent Flooding Events in the North East

<table>
<thead>
<tr>
<th>DATE</th>
<th>RIVER FLOODING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>River Tyne</td>
</tr>
<tr>
<td>1995</td>
<td>River Wear</td>
</tr>
<tr>
<td>Jun 2000</td>
<td>River Gaunless (1 in 100 year flood event, 400 properties flooded at South Church &amp; West Auckland)</td>
</tr>
<tr>
<td>Nov 2000</td>
<td>River Pont (1 in 16 year flood event, 147 properties flooded at Ponteland)</td>
</tr>
<tr>
<td></td>
<td>River Tees</td>
</tr>
<tr>
<td>Feb 2001</td>
<td>River Gaunless</td>
</tr>
<tr>
<td></td>
<td>River Tees</td>
</tr>
</tbody>
</table>

Chart 10: Flowering date of snowdrop
(Source: UK Phenology Network Woodland Trust/Centre for Ecology & Hydrology www.phenology.org.uk)
THE UK CLIMATE NOW

Within the UK the coldest winters are found in the uplands of Scotland and the North of England with the average temperature in some areas dropping close to 0°C. Parts of Cornwall have the warmest winters with an average temperature of 8°C.

During the summer warmest temperatures can be found in the South of England at approximately 18°C. Coldest summers can be found in some parts of Scotland where the average temperature is below 10°C.

These maps use the recorded 1961-1990 average temperature figures.

The wettest winters in the UK are found in the mountainous west especially in Scotland where rainfall can be more than 600-mm. Driest winters are found in the South East with as little as 100mm of rain.

Summer precipitation follows a similar pattern.

One way that climate change is monitored nationally is via a set of indicators. Indicators of climate change specifically for the North East have not yet been developed. Many factors which may affect climate change (be they natural factors or human activity) are monitored through the Regional Sustainable Development Framework, Regional Planning Guidance and the Regional Economic Strategy. This information, over time, will be compared with indicators of the effects of climate change (cause and effect) enabling decision making and policy development to be better informed.
### The Future Climate

#### How The UK Climate Could Change

It is difficult to predict how the climate will change because there are many uncertainties. We can be surer about some things than others. The UKCIP 02 scientific report attaches levels of confidence to statements about how the climate could change and these are shown below.

<table>
<thead>
<tr>
<th>High Confidence</th>
<th>Medium Confidence</th>
<th>Low Confidence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Annual temperatures will be warmer</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>By the 2080s the annual temperature will have increased.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warming will be between 1°C to 5°C depending on the geographical location and emissions scenario used.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sea-surface temperatures will increase around all UK coasts although not as rapidly as over land.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>High summer temperatures will become more frequent. Very cold winters will become rarer</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The number of very hot days will increase especially in summer and autumn. The number of very cold days will decrease especially in winter.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heating “degree-days” will decrease everywhere. Cooling “degree-days” will increase everywhere.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The thermal growing season will become longer.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Winters will become wetter</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>There will be a greater contrast between seasonal precipitation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The amount of precipitation will increase in winter.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>There will be specific humidity increases throughout the year.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snowfall will decrease. Large parts of the UK will experience long runs of snowless winters</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Global-average sea level will continue to rise</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>This will continue to rise for several centuries and probably longer. The West Antarctic ice-sheet will contribute relatively little to sea level rise in the present century</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Around the UK there will be significant regional differences in relative sea level rise because of the continuation of historic trends in vertical land movements.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storm surge return periods by the 2080s will reduce by an order of magnitude for some coastal locations and some emissions scenarios.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Other changes which may take place</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UK sea level rise will be similar to the global-average.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cloud cover may reduce in summer and autumn and there will be an increase in radiation. Winter cloud cover may increase slightly.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storm tracks may alter. Winter depressions, including the deepest ones, may become more frequent.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The North Atlantic Oscillation may tend to become more positive in the future giving more wet, windy, mild winters.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Heating “degree-days” relate daily temperature to the demand for energy to heat buildings and to maintain a comfortable minimum temperature.

** Cooling “degree days” relate daily temperature to the energy that is required to maintain buildings at a comfortable maximum temperature.
THE CLIMATE CHANGE SCENARIOS

The Climate Change Scenarios illustrate how our climate may change in the future. UKCIP based the scenarios on projections from the Inter-Governmental Panel on Climate Change (IPCC) of the likely greenhouse gas emissions depending on how the world develops. Population, lifestyle choices, energy sources and methods of transportation all affect the level of greenhouse gas emissions. To cover the range of projections UKCIP produced four scenarios (Low, Medium-Low, Medium-High and High) of how our climate may change.

The Low Emissions Scenario is based on carbon emissions throughout the 21st Century causing atmospheric carbon dioxide concentrations of 525 parts per million (ppm) and giving a global temperature rise of 2.0°C by 2100. The High Emissions Scenario is based on projections that by 2100 there will be concentrations of 810 ppm and that this will increase global temperature by 3.9°C by 2100.

There is no assessment of which IPCC projection or UKCIP scenario is most likely to happen. Only the Low and High Emissions Scenarios are used here so the range of possibilities can be seen without losing the overall picture.

The scientific uncertainties involved in modelling mean that it is possible that the climate could fall outside the range of possibilities given by the scenarios. The UKCIP02 Scenarios are based on a group of climate models developed by the Hadley Centre. The UKCIP02 Scenarios report has compared these with other global climate models based on different assumptions of how the climate responds to emissions.

The following pages show the changes in climate likely in the UK and the North East region. The North East area stretches from Northumberland to Teesside as shown on the map.

The North East in the 2080s?

<table>
<thead>
<tr>
<th></th>
<th>Low Emissions Scenario</th>
<th>High Emissions Scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Annual Temperature Increase</td>
<td>1.5°C to 2.0°C</td>
<td>3.0°C to 4.0°C</td>
</tr>
<tr>
<td>Average Winter Temperature Increase</td>
<td>1.0°C to 2.0°C</td>
<td>2.5°C to 3.0°C</td>
</tr>
<tr>
<td>Average Summer Temperature Increase</td>
<td>1.5°C to 2.5°C</td>
<td>3.5°C to 4.5°C</td>
</tr>
<tr>
<td>Average Winter Precipitation Increase</td>
<td>5% to 15%</td>
<td>15% to 30%</td>
</tr>
<tr>
<td>Average Summer Precipitation Reduction</td>
<td>-15% to -25%</td>
<td>-30% to -50%</td>
</tr>
<tr>
<td>Sea Level</td>
<td>6 cm</td>
<td>66 cm</td>
</tr>
<tr>
<td>Snowfall Reduction</td>
<td>-45% to -60%</td>
<td>-90% to 100%</td>
</tr>
<tr>
<td>Changes in average length of thermal growing season</td>
<td>30-50 days</td>
<td>70-100 days</td>
</tr>
</tbody>
</table>

Where seasons are referred to these are Winter (December, January & February); Spring (March, April & May); Summer (June, July & August) and Autumn (September, October and November).
THE FUTURE CLIMATE

TEMPERATURE AND PRECIPITATION CHANGE USING THE LOW EMISSIONS SCENARIO

This scenario demonstrates the potential minimum change to our climate in the future.

TEMPERATURES - LOW EMISSIONS

Annual mean temperatures are expected to increase by:
- 0.5°C to 1.0°C during the 2020s
- 1.0°C to 1.5°C during the 2050s
- 1.5°C to 2.0°C during the 2080s

Winter mean temperatures are expected to increase by:
- 0.5°C to 1.0°C during the 2020s
- 0.5°C to 1.5°C during the 2050s
- 1.0°C to 2.0°C during the 2080s

Summer mean temperatures are expected to increase by:
- 0.5°C to 1.0°C during the 2020s
- 1.0°C to 2.0°C during the 2050s
- 1.5°C to 2.5°C during the 2080s

Chart 14: Detail of annual mean temperature changes in the North East (Source UKCIP02 Scenarios)

Chart 15: Temperature changes nationally (Source UKCIP02 Scenarios)
PRECIPITATION - LOW EMISSIONS

Winter precipitation
is expected to increase:
- 4% to 6% during the 2020s
- 7% to 10% during the 2050s
- 10% to 15% during the 2080s

Summer precipitation
is expected to reduce by:
- -7% to -10% during the 2020s
- -13% to -17% during the 2050s
- -18% to -24% during the 2080s
THE FUTURE CLIMATE

TEMPERATURE AND PRECIPITATION CHANGE USING THE HIGH EMISSIONS SCENARIO

This scenario demonstrates the greatest change in our climate in the future.

TEMPERATURES - HIGH EMISSIONS

Annual mean temperatures
are expected to increase by:
0.5°C to 1.0°C during the 2020s
1.5°C to 2.5°C during the 2050s
3.0°C to 4.0°C during the 2080s

Winter mean temperatures
are expected to increase by:
0.5°C to 1.0°C during the 2020s
1.5°C to 2.0°C during the 2050s
2.5°C to 3.0°C during the 2080s

Summer mean temperatures
are expected to increase by:
0.5°C to 1.5°C during the 2020s
2.0°C to 2.5°C during the 2050s
3.5°C to 4.5°C during the 2080s

Chart 20: Detail of annual mean temperature changes in the North East (Source UKCIP02 Scenarios)

Chart 21: Temperature changes nationally (Source UKCIP02 Scenarios)
PRECIPITATION - HIGH EMISSIONS

Winter precipitation
is expected to increase:
5% to 7% during the 2020s
11% to 16% during the 2050s
19% to 28% during the 2080s

Summer precipitation
is expected to reduce by:
-9% to -11% during the 2020s
-20% to -27% during the 2050s
-35% to -47% during the 2080s
The Future Climate

Sea Level Change 2080s

Sea Level Change 2080s (cm) relative to 1961-90 after taking into account Regional Isostatic Uplift or Subsidence. (In the case of North East England +0.3 Isostatic Uplift)

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Low Emissions Scenario</th>
<th>High Emissions Scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Average</td>
<td>9 cm</td>
<td>69 cm</td>
</tr>
<tr>
<td>North East England</td>
<td>6 cm</td>
<td>66 cm</td>
</tr>
<tr>
<td>London (greatest increase)</td>
<td>26 cm</td>
<td>86 cm</td>
</tr>
<tr>
<td>South West Scotland (lowest increase)</td>
<td>-2 cm</td>
<td>58 cm</td>
</tr>
</tbody>
</table>

(Source: UKCIP02 Scenarios)

Average Winter Snowfall Change 2020s, 2050s and 2080s

The Low Emissions Scenario suggests Winter snowfall in the North East by 2080 could reduce by 40% - 60%

The High Emissions Scenario suggests Winter snowfall in the North East by 2080 could reduce by 90% -100%
Changes in Average Length of Thermal Growing Season 2020s, 2050s and 2080s

By the 2080s the **Low Emissions Scenario** suggests the average length of the thermal growing season could extend by 30-50 days.

By the 2080s the **High Emissions Scenario** suggests the average length of thermal growing season could extend by 70-100 days.

*Chart 27: Thermal growing season change (Source UKCIP02 Scenarios)*
HOW COULD THE NORTH EAST BE AFFECTED?

It is impossible to predict how the North East could be affected by climate change but there are many things that could happen.

The Natural Environment

- Damage to important habitats eg. relic alpine heath habitats in upper Teesdale.
- Damage to coastal habitats.
- Migration of new species into the North East.
- Detrimental impact on some fauna including fish populations.

The Biodiversity Audit for the North East identifies priority habitats which are directly threatened by climate change as
- Lowland dry acid grassland
- Blanket bog
- Lowland raised bog (decreasing rainfall associated with climate change)
- Purple moor-grass and rush pasture
- Reedbeds (sea level rise)
- Coastal saltmarsh (sea level rise)
- Coastal sand dunes (sea level rise)
- Mudflats (sea level rise)
- Sea-grass beds (if there are warm sea temperatures and low levels of sunlight)³⁰

Climate change may also indirectly affect other habitats, for instance flood prevention measures could prevent development of new wet woodland.

Some of the species that may become LESS common in the North East:
- Flat Sedge (Blysmus rufus)
- Variegated Horsetail (Equisetum variegatum)
- Wood Cranesbill (Geranium sylvaticum)
- Bog Rosemary (Andromeda polifolia)
- Cloudbury (Rubus chamaemorus)
- Large Heath Butterfly (Coenonympha tullia)
- Twinflower (Linnaea borealis)

Some of the species that may become MORE common in the North East:
- Stemless Thistle (Cirsium acaulon)
- Yellow Wort (Blackstonia perfoliata)
- Globe Flower (Trollius europaeus)
- Great Burnet (Sanguisorba officinalis)
- White-Beaked Sedge (Rhynchospora alba)³¹

11

REAL WORLD IMPACTS

Damage to important habitats eg. relic alpine heath habitats in upper Teesdale.

Damage to coastal habitats.

Migration of new species into the North East.

Detrimental impact on some fauna including fish populations.

The Biodiversity Audit for the North East identifies priority habitats which are directly threatened by climate change as

- Lowland dry acid grassland
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- Lowland raised bog (decreasing rainfall associated with climate change)
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- Stemless Thistle (Cirsium acaulon)
- Yellow Wort (Blackstonia perfoliata)
- Globe Flower (Trollius europaeus)
- Great Burnet (Sanguisorba officinalis)
- White-Beaked Sedge (Rhynchospora alba)³¹
Agriculture and Forestry

- Some crops and tree varieties may be less suitable to climate.
- Times of planting & harvesting may change as growing season lengthens.
- Arable farming may become viable in some areas.
- Increased irrigation/drainage may be required to deal with water shortages and water logged land.
- Soil erosion may increase.
- Different pest species.
- Increased risk of forest fires.
- New methods of livestock and crop management may need to be developed.

Water Resources, Flooding and Sea levels

- Domestic water requirements may increase.
- Industrial water requirements may alter.
- Flooding events may become more common.
- Sewers may not have the necessary capacity and overflow.
- Erosion of river banks may increase.
- Cliff and beach erosion may increase.
- Costs of maintaining sea defences may increase.

Lifestyles and the Built Environment

- Lower winter heating bills.
- Increased demand for water and air conditioning.
- Disruption to transport networks through weather events.
- Condensation, damp and mould could increase.
- Damage to building fabric.
- Increased subsidence.
- Street trees become water stressed.
- Effects on historic building.
- Development of new building designs.
- Coastal property damage.
Commerce and Industry

- Increased tourism.
- New business opportunities as lifestyles change.
- New insurance products required.
- Skills of environmental specialists in greater demand.
- Increase in insurance claims and cost of insurance owing to weather events.
- Disruption to business through facilities, suppliers, employees and customers being affected by weather events.
- To maintain suitable indoor temperatures it may be necessary to make adjustments to air conditioning and heating systems.
- Additional cooling may be required in industrial processes.

Energy Resources

- Disruption to supply through weather events.
- Increased demand for energy to cool temperatures.
- Reduced demand for energy to warm temperatures.

Health and Safety

- The health care system should be prepared for injuries from gale force winds, flooding and other extreme weather events.
- Skin cancer and cataracts will increase.
- Food poisoning will increase.
- Respiratory problems associated with traffic pollution and sun.
- Increased stress from impacts of climate change.
THE CHALLENGE FOR NORTH EAST STAKEHOLDERS

To cope with the effects of climate change we as regional partners need to work together to ensure the following key objectives are met.

If we do nothing...  

**Natural Environment Objectives**

1. Monitor biodiversity to assess and mitigate against the impacts that climate change may have on vulnerable species and habitats.

2. Make provision in all plans to increase wildlife, habitat and landscape diversity.

3. Proactively link with neighbouring regions when planning, to encourage widespread diversity of habitats and landscape throughout the region.

If action is taken...

If we do nothing...  

**Agriculture & Forestry Objectives**

1. Enable better informed decisions to be made by assessing the impacts of climate change on agriculture and forestry.

2. Encourage land managers to address climate change impacts by looking at the whole picture (for instance, in the case of floods using flood management rather than flood defence schemes).

3. Increase woodland cover in the North East (using incentives and market opportunities) from 11% to 20%.

If action is taken...
If we do nothing...

Water Resources, Flooding and Sea Levels Objectives

1. Encourage water saving at home and in the work place, possibly through an advisory body.

2. Adopt an integrated approach to land development through greater partnership working between democratic bodies, regulators and water companies.

3. Create research partnership to co-ordinate and share research relevant to flood defence investment.

If action is taken...

Lifestyles & the Built Environment Objectives

1. Encourage individuals to take greater responsibility for their choices about where they live, work and how they travel.

2. Ensure that at all levels of planning and urban regeneration greater account is taken of the impacts of climate change.

3. Lobby for changes in legislation that will lead to improved energy standards for planning, building and design.
If we do nothing...

**Commerce and Industry Objectives**

1. Raise awareness among the business sector of the threats and opportunities created by climate change and promote the region as a low risk area for business location.

2. Encourage businesses to create their own climate change programs drawing on good practice examples.

If action is taken...

If we do nothing...

**Energy Resources Objectives**

1. Improve public awareness of energy issues.

2. Increase opportunities to minimise energy usage and to obtain energy from renewable resources.

If action is taken...

If we do nothing...

**Health and Safety Objectives**

1. Surveillance systems link climate, environment and health indicators.

2. Encourage “joined up” approaches to improving health.

3. Promote sun safety, food safety and mental well being.
If we do nothing...

**Perceptions and Education Objectives**

1. Create a regional framework of values and principles for a high “quality of life”.

2. Obtain baseline information on public perceptions of climate change and raise awareness.

3. Collate information on climate change in the North East and make it accessible to all.

4. Enable and support organisations and networks to act on climate change information.

If action is taken...

**Other Objectives you may have thought of**

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THE CHALLENGE?
ADAPTING TO CLIMATE CHANGE

Climate Change Action

Durham County Council hosted a Climate Change conference in May 2001. Based on the challenge formulated at this conference groups have been set up to investigate the effects climate change has had on individual sectors.

The following actions are already being progressed by key organisations. (This is not a comprehensive list):

- Review of effects of climate change on wetland habitats (English Nature).
- Survey of largest water users to establish the importance of water to the economic development of the region. (Northumbrian Water).
- Review of sewer flooding. (Northumbrian Water).
- Review of 100 year flood plan. (Environment Agency).
- Assessment of new road designs in connection with drainage and run-off (Durham County Council).
- Production of the sustainable construction guide ‘Building in Sustainability’. (SustaiNE, Durham County Council).

Local Authorities

Four North East local authorities are signatories of the Nottingham Declaration on Climate Change which includes a commitment to creating a plan by December 2002 to address the causes and effects of climate change and to secure maximum benefit for their communities. They will work with key providers to assess the potential effects and identify ways in which we can adapt. The progress of the plan will be monitored against actions needed and the results published.

- Easington District Council
- Gateshead MBC
- North Tyneside MBC
- Sunderland City Council

What Next?

Topic Action Groups - Topic Groups covering a wide range of issues will be given the leading role in setting the agenda for the delivery of action to tackle the Challenges for the North East.

Individual Action - To lead by example the Board of Sustainability North East will commit themselves through their respective organisations to picking up the Challenges outlined.

Climate Change Indicators - In order for the North East to monitor progress made in terms of action to prevent climate change, a regional set of indicators will be developed. These will be monitored as part of the overall ‘Quality of Life’ monitoring for the Regional Sustainable Development Framework.

Baseline Data - Establish regional base data sets to form the basis for assessing the effectiveness of action. Baseline and future data sets for the North East are available through UKCIP for research and analysis - see http://www.ukcip.org.uk/scenarios/. Information about the timing of natural events (phenology) is compiled by the UK Phenology Network and can be accessed at www.phenology.org.uk. This will shortly be available on a regional basis for analysis and monitoring of climate change.

Sector Focus - Link into sectors to raise awareness, educate and encourage action that seeks to meet the challenges outlined.
HOW COULD CLIMATE CHANGE AFFECT YOU?

How would it affect you if by the 2020s the North East has

- 0.5°C to 1.0°C higher annual temperatures
- 0.5°C to 1.5°C higher summer temperatures
- 0.5°C to 1.0°C higher winter temperatures

How would it affect you if by the 2050s the North East has

- Up to 20% more winter precipitation
- Up to 30% less summer precipitation

How would it affect you if by the 2080s the North East has

- 40% to 100% less snowfall
- 30 to 100 days longer thermal growing season
- 6 to 66cm rise in sea levels

How will floods, storms and extreme weather events affect you?

**Can you cope with whatever the weather throws at you?**
2. Hulme, M., Jenkins G.J. & T urnpenny, J. (2002) Climate Change Scenarios for the United Kingdom The UKCIP02 Briefing Report, Tyndall Centre for Climate Change Research, School of Environmental Sciences, University of East Anglia, Norwich, UK.

National Indicators of Climate Change

- Air Temperature in Central England
- Seasonality of Precipitation
- Precipitation Gradient Across the UK
- Predominance of Westerly Weather
- Dry and Wet Soil Conditions in Southern England
- River Flows in NW and SE Britain
- Frequency of Low and High River Flows in NW and SE Britain
- Groundwater Storage in the Chalk in SE Britain
- Sea Level Rise
- The Risk of Tidal Flooding in London
- Atmospheric Ozone Levels in Summer in Rural England
- Domestic Property Insurance Claims for Damaging Weather Events
- Supply of Gas to Households
- Domestic Holiday Tourism
- Scottish Skiing Industry
- Number of Outdoor Fires
- Incidence of Lyme Disease in Humans
- Seasonal Pattern of Human Mortality
- Use of Irrigation Water for Agriculture
- Proportion of Potato Crop that is Irrigated
- Potato Yields
- Warm-weather Crops: Grapes
- Warm-weather Crops: Forage Maize
- Late Summer Grass Production
- Date of Leaf Emergence of Trees in Spring
- Health of Beech Trees in Britain
- Date of Insect Appearance and Activity
- Insect Abundance
- Arrival Date of the Swallow
- Egg-laying Dates of Birds
- Small Bird Population Changes
- Marine Plankton
- Upstream Migration of Salmon
- Appearance of Ice on Lake Windermere

12. The conference report is available from the Centre for Sustainable Development, EnCams, 20 Landsdowne Terrace, Gosforth, Newcastle Telephone: 0191 284 4883
15. Other Regional Studies

East Midlands Sustainable Development Round Table 2000 The potential impacts of climate change in the East Midlands Technical Report (Also Summary Report)
North West Regional Chamber 1998 Everybody has an Impact : Climate Change Impacts in the North West of England Summary Report
Scottish Executive Central Research Unit 1999 Climate Change: Scottish Implications Scoping Study
The National Assembly for Wales 2000 Wales: Changing Climate, Challenging Choices. The Impacts of climate change in Wales from now to 2080 Summary Report
Yorkshire Futures Regional intelligence network 2002 Warming up the region. Yorkshire and Humber Climate Change Impact Scoping Study.
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ENCAMS
English Nature
Environment Agency
Federation for City Farms & Community Gardens
Gateshead MBC
Local Agenda 21 Officers Group
North East Assembly
Northumberland County Council
Northumbrian Water
Redcar & Cleveland Borough Council
RPM
Sedgefield Borough Council
Sunderland City Council
Sunderland University
The Northern Energy Initiative
University of Durham

For further information on adapting to climate change in the North East please contact:

The Principal Sustainability Officer
North East Assembly
The Guildhall
Quayside
Newcastle upon Tyne
NE1 3AF
Tel: 0191 261 7388
Fax: 0191 232 4558
Email: enquire@sustaine.com
Website: www.sustaine.com

UKCIP helps organisations assess how they are affected by climate change. For more information in other regions/sectors contact:

UK Climate Impacts Programme
Union House
12-16 St Michael Street
Oxford
OX1 2DU
Email: enquiries@ukcip.org.uk
Website: www.ukcip.org.uk