



A Summary of Climate Change Risks for Yorkshire and Humber

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





Introduction

Located in the north of England, Yorkshire and the Humber has a very strong cultural identity and enjoys many environmental assets. The unrivalled quality of life is founded on a combination of cosmopolitan urban centres surrounded by beautiful countryside. This includes three national parks, two areas of Outstanding Natural Beauty, as well as a stunning heritage coastline. The principal rivers in the region are the Derwent, Ouse, Hull, Aire, Calder and Don.

Yorkshire and the Humber is home to a population of more than five million people living in over two million households. The region has three of the five most populated local authority areas in the UK in Leeds, Sheffield and Bradford. Smaller cities and towns with historical significance include York, Wakefield and Harrogate and there are several market towns such as Northallerton and Pickering located in more rural areas.

Urban areas tend to have higher numbers of younger people, with older populations found more in coastal and rural areas. Around 79% of households are in private ownership and 21% are social housing.¹ Around a third are solid wall properties – particularly in rural areas. Approximately 15% of all households are in fuel poverty.² Health inequalities remain a significant issue in the region, with people in most of our Primary Care Trust

(PCT) areas experiencing poorer health and having a greater likelihood of premature death than the average for England.³ Projections indicate that by 2026 we might see 400,000 more households with a population of over six million residents.

The region has a strong logistical infrastructure with its location at the centre of the east-west and north-south transport corridors, and the presence of the country's largest ports complex on the Humber estuary. Our industrial base of power stations, oil refineries and chemical plants means the region has one of the most carbon intensive economies in Europe.

There are around 270,000 businesses in the region employing nearly two million people, but with the proportion of small businesses being higher than the national average. Key sectors include finance, business services, manufacturing, energy, agriculture, forestry, tourism and hospitality, aggregates, ports and logistics. Economic growth opportunities centre on the low carbon industry (particularly off-shore wind), life sciences, medical technology, and digital creative industries. Just under half a million people are employed in the public sector, around 20% of the workforce, which is higher than national average.⁴

UK Climate Change Risk Assessment

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

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

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

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

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

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



Key National Messages

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

- Increases in the frequency of flooding affecting people's homes and wellbeing, especially for vulnerable groups (e.g. those affected by poverty, older people, people in poor health and those with disabilities), and the operation of businesses and critical infrastructure systems. Annual damage to properties in England and Wales, due to flooding from rivers and the sea, rises from £1.2 billion to between £2.1 billion and £12 billion by the 2080s. Without action, a range of important infrastructure such as roads and railways may be affected by a significantly increased risk of flooding based on future population growth and if no adaptive action is taken.
- Summer overheating potentially contributing to heat-related health problems. Premature deaths due to hotter summers are projected to increase (e.g. by between 580 and 5900 by the 2050s). This is likely to place different burdens on National Health Service (NHS), public health and social care services. Other health risks that may increase include problems caused by ground-level ozone and by marine and freshwater pathogens.
- Reductions in water availability, particularly during the summer, leading to more frequent water use restrictions and, in the longer term, water shortages. The gap between demand and availability will potentially widen, impacting homes, businesses, schools and hospitals. By the 2050s, between 27 million and 59 million people in the UK may be living in areas

affected by water supply-demand deficits (based on existing population levels). Adaptation action will be needed to increase water efficiency across all sectors and decrease levels of water abstraction in the summer months.

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

Detailed results from the CCRA are presented in:

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

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



Regional and local resources

- 1 - The Top Ten Interventions to Cut Regional Carbon Emissions
- 2 - Regional Housing Strategy 2005 - 2011
- 3 - NHS Yorkshire & Humber Annual Report 2010-11
- 4 - Office of National Statistics – Regional Analysis of Public Sector Employment, Sept 2009



Key Risks and Implications

Some Key Regional Climate Implications



Business

- Multiple flood impacts on business such as to premises, stock, logistics and travel by staff or customers.
- There is a disproportionate impact on small and medium enterprises (SMEs) and digital industries.
- Disruption to transport infrastructure impacting on community, customers and logistics.
- Opportunities for advanced manufacturing, research, development and tourism.



Health and Wellbeing

- Some areas at a high flood risk also suffer from a high level of deprivation.
- Exacerbation of existing health conditions, such as asthma and respiratory illnesses and increased risk of mental health issues resulting from multiple impacts of severe flooding.
- Changing nature of health needs – less winter mortality, but increased heat stress; and UV expose in summer.
- Challenges to healthcare delivery such as temperature control in buildings and ability to deliver mobile home care services.



Buildings and Infrastructure

- Multiple impacts on business premises, housing and built assets from increased internal temperatures, storm damage, and flood risk.
- Disruption to transport infrastructure from wind damage; flood related impacts and continuing snow and ice.
- Disruption to IT infrastructure, communications and energy from flooding – with knock on effects to other sectors.



Agriculture and Forestry

- Lower level of rainfall will impact on water availability for crops and livestock whilst flooding will cause challenging farming conditions.
- Higher temperatures may extend the growing season, improved yields and potential to grow new crops assuming that water and nutrient supply are not limiting factors.
- Opportunity for crops and forestry for biomass and potential to increase floodplain storage.



Natural Environment

- Shifting of seasonal events and relationship between species, food and habitats.
- High rates of coastal erosion will be exacerbated by a changing climate.
- Increased revenue from tourism may conflict with pressure on resources whilst other impacts such as floods or wildfire may reduce attractiveness.



Key Risks and Implications

Key National Risks from the UK CCRA 2012

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



Business

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



Health and Wellbeing

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



Buildings and Infrastructure

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



Agriculture and Forestry

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



Natural Environment



Business



Victoria Quarter, Leeds

Although a significant proportion of regional GDP is based in West Yorkshire, the region as a whole has a strong, mixed economy. The Humber Ports complex is the second largest in the UK and the fourth largest in Europe; it makes a significant contribution, directly and indirectly, to the regional and sub-regional economies, and employs a significant workforce.

Financial services are particularly prevalent in Leeds. Tourism, manufacturing, distribution, hotels and restaurants, construction, aggregate extraction and the public sector are also all major contributors to the regional economy.

Agriculture and forestry are key sectors especially in North Yorkshire and the East Riding. Fishing fleets operate from Whitby, Scarborough, Bridlington, Hull and Grimsby. Economic growth opportunities centre on the low carbon industry, life sciences, medical technology, and digital creative industries.

The region has a higher than average proportion of small and medium enterprises (SMEs) and they are likely to be more severely impacted by a changing climate than larger companies because they often operate from only one site and are least likely to have business continuity plans.

Threats

- Industrial processes requiring large amounts of water abstraction, for energy generation and cleaning or cooling, may be affected by a lower level of rainfall. Limitations on use may reduce output or efficiency and increase costs.
- In the food processing industry the potential for increased contamination, particularly of shellfish, will affect treatment and handling procedures. Little is currently known about the effects of climate change on the spread of food-borne disease. ¹
- Urban development such as retail parks, warehouse and distribution parks - often large areas of impermeable surfaces containing buildings with flat roofs - will be susceptible to urban flooding.
- Greater pressure on tourism centres could increase conflict between recreational and other demands, stressing infrastructure but increasing revenue for services. Negative effects on the natural environment (for example landscapes suffering drought or erosion) could affect the region's attractiveness.
- Although not unique to business, premises may suffer from increased temperatures, reducing comfort, productivity and ultimately the health of workers. Lost production days per year per employee for days exceeding 26°C is projected on average to increase three-fold by the 2050s. ²
- There is already disruption to transport infrastructure due to extreme weather such as flooding or high winds that will impact on commuting for staff and customers and logistics for supply chains.
- Grounds and venue operation and maintenance could become increasingly difficult. Irrigation water may be limited in drier summers. Outdoor events may be increasingly vulnerable to disruption or cancellation, with crowd welfare a particular concern.

Opportunities

- There are opportunities for advanced manufacturing as the region is well placed to respond to the need for technical solutions to climate adaptation and mitigation.
- Increased opportunity for the tourism sector as the region is likely to become more attractive to tourists over an extended season.



River Ouse, York

1 - Yorkshire and Humber Regional Adaptation Study.

2 - UK CCRA 2012



Health and Well-being



Swaledale

Standards of health and welfare vary markedly across Yorkshire & Humber. Health inequalities remain a significant issue in the region, with people in most areas experiencing poorer health and having a greater likelihood of premature death than the average for England.¹ A larger proportion of people are deemed to be suffering from 'fuel poverty' when compared to England overall.

There are lower than average levels of physical activity in children, healthy eating and housing deemed suitable for habitation. There is a higher than average number of premature deaths and long-term preventable illness and an aging population that is migrating away from urban centres towards more rural areas.

As the largest employer in the region the NHS includes a 15 Primary Care Trusts (PCTs), 22 NHS Trusts, 32 general hospitals and 33 community hospitals. One of the Trusts is the Yorkshire Ambulance Service NHS Trust which serves the whole region except North Lincolnshire and North East Lincolnshire which is served by the East Midlands Ambulance Service NHS Trust.

The potential impact on health and wellbeing from climate change will be exacerbated by many of the issues listed above and particularly impact on disadvantaged communities that already suffer from health and environmental inequalities. The UK Climate Change Risk Assessment highlights the region has a significant proportion of deprived areas that are also affected by flooding. Tackling some of the root causes listed above will pay dividends when adapting to climate change.

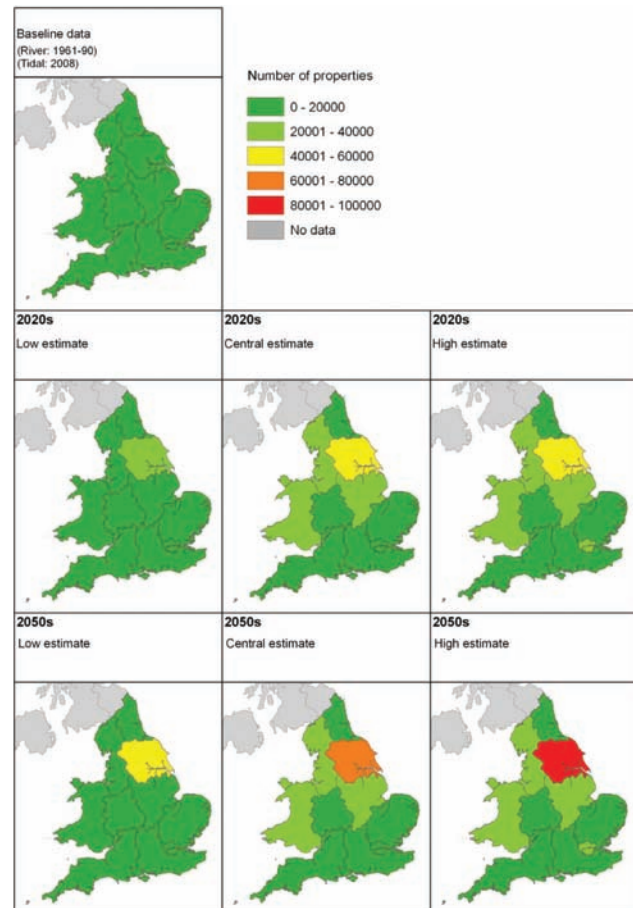


Threats

- Some areas at a high flood risk also suffer from a high level of deprivation.²
- Increasing incidence of respiratory illnesses such as asthma due to air pollution episodes from elevated levels of atmospheric ozone and other air quality pollutants, exacerbated by hotter drier summers. These will be most pronounced in urban areas and during summer months.
- Heat related stress, heat stroke, dehydration and exhaustion especially for vulnerable people such as those with breathing difficulties, the elderly and the very young.
- Changes to temperature and flooding frequency and severity could impact on human health such as through contamination of flood waters and an increase of vermin and disease.
- Mental health issues arising from residents' properties being flooded. Loss of property and possessions, prolonged periods of living in temporary accommodation, slow or incomplete insurance payments and fear of future events can lead to stress, anxiety and depression.
- Severe weather may impact on mobile care services such as home help, meals on wheels and community transport schemes. Restriction of such services, even over short times scales, even hours, could have serious impacts upon those requiring care.

Opportunities

- A reduction in cold-related mortality in winter as average temperatures rise.² Similarly, milder winter temperatures may lead to fewer frost days and potentially a reduction in the number of people hospitalised.



Number of properties in England and Wales in the highest 20% of deprived areas at significant risk of river (baseline 1961-90) and tidal (baseline 2008) flooding. (UK CCRA 2012)

1 - Health Profile 2010, Yorkshire and the Humber, Public Health Observatory.

2 - UK CCRA 2012



Buildings and Infrastructure



Sea defences, Scarborough

Yorkshire and Humber is at the centre of the country's north-south and east-west transport corridors including the East Coast Mainline, trans-Pennine rail route and the M1, A1/M, M62 and M18 motorways. The Humber is also home to the second largest ports complex in the UK where almost one quarter of the UK's seaborne trade lands.

There are over two million households across the region with around 385,000¹ being at risk of flooding. The regional historic environment boasts two World Heritage Sites at Saltaire and Fountains Abbey and Studley Royal as well as over 30,000 listed buildings and monuments.²

There are several large power plants in the region, notably Drax, which supplies 7 per cent of the nation's electricity.³ Yorkshire Water deals with both water supply

and waste water treatment for most of the region, with small areas being covered by various other utility companies. Maintaining levels of service to a growing customer base in the face of changing rainfall patterns and increased temperatures is a key part of Yorkshire Water's adaptation strategy.

The networked nature of most of the region's infrastructure means it is particularly vulnerable to impacts such as flooding and any disruption to critical infrastructure can have wide-ranging and long lasting impacts, as was seen during the summer 2007 floods.³ However, regular maintenance, upgrades and preventative seasonal work helps to mitigate against these risks.



Threats

- The UK Climate Change Risk Assessment highlights the increased risk for the region for the number of properties projected to be at significant likelihood of flooding in the near-term (2020s) and medium-term (2050s)⁴.
- The Yorkshire and Humber Regional Adaptation Study highlighted that the following critical infrastructure is estimated to be at risk of future flooding from rivers or the sea across the Yorkshire and Humber region:
 - 22 ambulance stations, 90 police stations and 51 fire stations.
 - 509 schools, 161 nurseries, and 63 college/ university buildings
 - 33 hospitals
 - 79 railway stations and 11 bus stations.
 - 385,500 residential properties ¹
- Yorkshire and the Humber has 351km of coast, with 203km (56%) eroding, but only 156km (43%) with defences or artificial beaches⁵.
- The UK Climate Change Risk Assessment highlights a potential future supply-demand deficit by the 2020s due to climate change (Figure 5.3, Water Sector report).
- Disruption to IT infrastructure will affect heavily-reliant industries. The large data storage centres associated with digital media and the creative industries (both of which are priority economic growth sectors for the region) are susceptible both to hot temperatures and particularly to flooding.³ The common location of servers and data storage in ground floor and basement locations creates a significant vulnerability.³
- Assets with long life spans such as bridges and tunnels will require ongoing monitoring in case remedial engineering works are required – for example in providing scour protection around bridges to cope with increased flows.
- Although not expected to increase when using the climate projections UKCP09, parts of the road and rail network are presently vulnerable to wind-related impacts. This includes trees, posts and poles being blown over and falling onto rail tracks or road carriageways causing damage and blockages, or onto overhead power cables leading to loss of power to trains and trams, traffic management systems or transport communication signs.

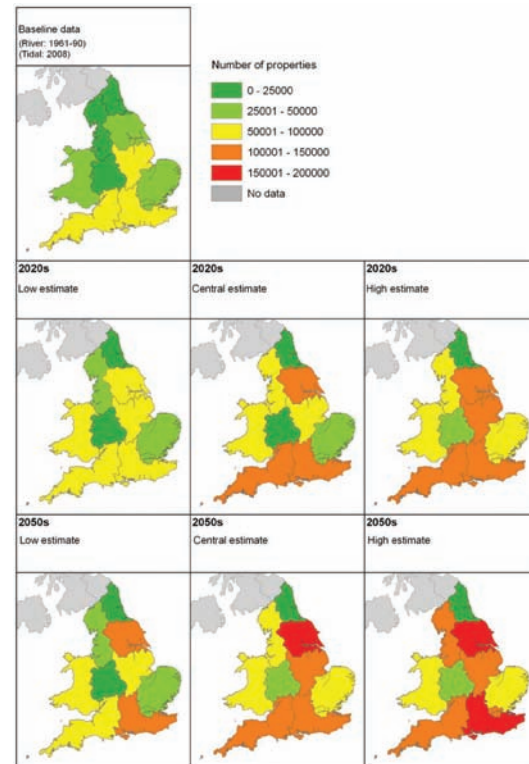


Diagram shows the number of properties projected to be at significant likelihood of flooding in the near-term (2020s) and medium-term (2050s). (UK CCRA 2012)

Opportunities

- With a strong historic base and future focus on manufacturing Yorkshire and Humber is well placed to respond to increased business opportunities to develop other technical solutions to climate mitigation and adaptation, potentially linked with the innovation and advanced technology sector.
- In urban areas an increased number of trees can limit local climatic variations, especially through reducing local temperatures and providing shelter from wind.

1 - State of the Environment - Yorkshire & Humber 2009, Environment Agency

2 - English Heritage - about Yorkshire & Humber, www.english-heritage.org.uk

3 - Yorkshire & Humber Regional Adaptation Study

4 - UK CCRA 2012

5 - Living with coastal erosion in Europe: Sediment and Space for Sustainability, PARTII - Maps and statistics, 2004.



Agriculture and Forestry



Harvest, Yorkshire farm

Agriculture and forestry are key sectors particularly in North Yorkshire and the East Riding - over 76% of Yorkshire and Humber is agricultural land. This is also important culturally and for its tourist attraction, but remains critical to rural livelihoods and its contribution to the wider economy (for example the position of agriculture in many supply chains).

There is both livestock and arable farming, and cultivation is split almost equally between arable and grassland, with an additional 12% of the land being rough grazing. The prevalence of pig farms is distinctive; the region accounts for nearly 30% of the UK's pig herd, with a large proportion in the East Riding and North Yorkshire.

The region has major tracts of semi-natural, ancient, managed and plantation woodland, which covered over 90,000 hectares in 2002. Almost two-thirds are in North Yorkshire where notable plantations include Dalby Forest. South Yorkshire and West Yorkshire have over 35% of their woodland designated as ancient, much of which extends into the urban areas, whilst the Humber is the least forested sub-region.

Threats

- Increased summer temperatures, reduced summer rainfall, and more erratic rainfall patterns are expected to reduce the amount of water available for crop irrigation and for livestock.
- Changing weather patterns will potentially limit access to land and increase disruption around key farming periods such as sowing and harvesting, with consequences for yields.¹
- Lower levels of rainfall alternating with more intense rainfall are likely to exacerbate problems with soil management and increase the occurrence of challenging farming conditions, such as waterlogged land.¹ Animals may also require supplementary feeding or housing to prevent them trampling fields.
- Increased flooding, inundation of coastal agricultural areas and storm surge heights, can reduce land quality and spread contamination with implications for both animal and human health.

Opportunities

- Climate change may extend the growing season and, combined with increased fertilisation from elevated carbon dioxide levels, crop and tree yields can be expected to increase. There is also potential for growing new and more specialist crops including garlic and rocket.²
- Using sugar beet as a reference crop, projections suggest yields might increase by over 50% by the 2080s (assuming other constraints don't have a negative impact - e.g. water availability)².
- Potential diversification of farmland and woodland management to provide woody biomass for energy production, timber for use in more sustainable timber-framed buildings, and UK-based carbon sequestration (offset) schemes.¹
- There are opportunities for woodland expansion and extension across the region. Strategically positioned woodland can significantly increase floodplain storage and reduce downstream flood flows.¹



Timber for construction and biomass

1 - Yorkshire and Humber Regional Adaptation Study

2 - UK CCRA 2012



Natural Environment



Yorkshire limestone pavement

The Yorkshire and Humber region contains some of the most diverse and important habitats and species in Britain. The Pennine Upland and North Yorkshire Moors contain the largest extent of upland heathland of any region in England, along with extensive areas of blanket bog. The lowlands of the region support substantial areas of lowland heathland and local, but regionally important, areas of wetland habitat.

Lowland areas are characterised by extensive areas of arable farming, hedgerows and parkland, with nationally important concentrations of Ancient Woodlands. The region also contains chalk wolds and the limestone habitats of the Yorkshire Dales, with the upland areas also supporting over half of the UK's limestone pavement resource.

The region contains one of the most extensive areas of low lying floodplain in Britain, associated with the Humber Estuary. This is internationally designated for its important wetland habitats, rare species of birds, mammals and fish and significant wintering and migratory bird populations. The region has an extensive and highly energetic coastline ranging from chalk cliffs to subtidal rock habitats and associated species.

There is complexity in the interactions between different species, and between species and the wider habitats they occupy. Although the subject of considerable ongoing research, it is clear that those species which can disperse and colonise different areas easily will have the advantage over those which cannot. The natural environment can contribute to enhancing the resilience of urban areas to climate impacts through the use of green infrastructure.

Threats

- The Yorkshire and Humber Regional Adaptation Study highlights that in general the direct key impacts of climate change to biodiversity are likely to be:
 - Changes in the timings of seasonal events (phenology), potentially leading to a loss of synchrony between species and the availability of food, and other resources upon which they depend;
 - Shifts in suitable climate conditions for individual species (their climatic niche or 'space') leading to changes in both abundance and range; for example increased water temperatures threatening salmon and the spread of invasive non-native species.²
 - Changes to habitats and ecosystems such as altered water regimes, increased rates of decomposition in bogs and higher growth rates in forests and changes in plant and animal communities.
- Parts of the coast currently experience very high rates of erosion and this will likely accelerate under future climate conditions. Sea level rise and storm surges will mean that coastal defences have a greater chance of being overtopped - damaging structures such as piers, as well as resulting in loss of or damage to intertidal habitat.³
- More intense rainfall may increase water-logging, increase runoff and enhance erosion – particularly when combined with dry periods and other pressures such as increased tourism.³
- Projected increase in conditions such as periods of drying and increased tourism that can lead to the occurrence of parkland, moorland and forest fires, with implications for Fire and Rescue Services.³



Coastal erosion at Barmston, East Riding of Yorkshire

- 1 - Forest Research, Benefits of green infrastructure, 2010.
- 2 - Shore Thing, Natural England.
- 3 - Yorkshire and Humber Regional Adaptation Study, 2009.

Opportunities

- Well designed green infrastructure can provide shade, cooling and wind interception and an insulation role in the winter. It can also potentially mitigate risks from climate change-induced reductions in air and water quality; and it can provide a buffer for habitats and species, whilst contributing to sustainable urban drainage and controlling upstream water flows to reduce flood risk.¹

Jon Clubb

Climate Change Coordinator

Tel: 07970 120 827

Email: jon.clubb@lgyh.gov.uk

Website: www.yourclimate.org

Your Climate – the Climate Change Partnership for Yorkshire & Humber

c/o Local Government Yorkshire & Humber

19 King Street

Wakefield

WF1 2SQ



Your Climate brings together the key stakeholders across Yorkshire and the Humber to drive forward our work to tackle the cause and effect of climate change. We will build from a local level on the extensive work already undertaken to map and understand the risks, possible impacts and adaptive measures required - and engage positively with the design of national tools and guidance. The development of a National Adaptation Plan will be a key opportunity to influence decision makers at all levels to ensure that stakeholders' aspirations for sustainable and low carbon economic growth are realised within the context of a changing climate.

Further local resources are available for stakeholders including the range of sub-regional and local adaptation risk assessments and adaptation action plans developed with support from YoHr Space. Visit the partnership's website (above) to view the resources.

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