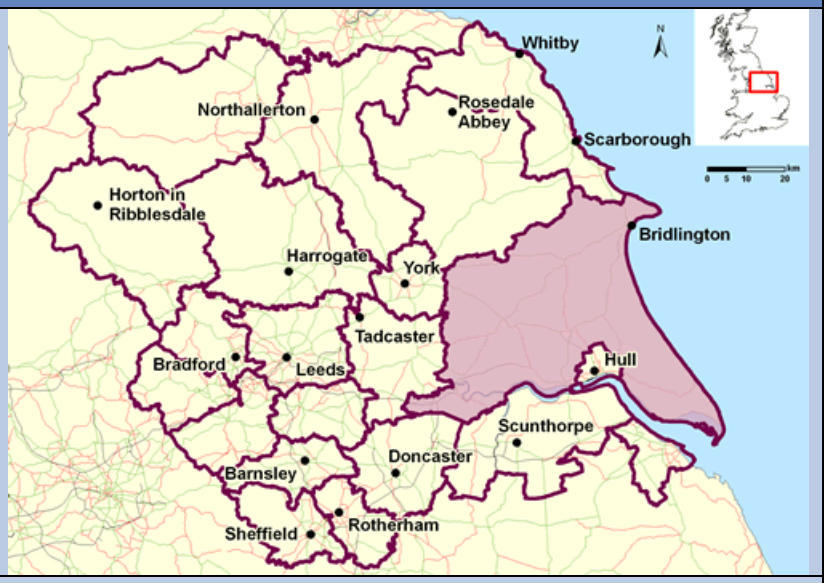
YORKSHIRE AND HUMBER CLIMATE CHANGE ADAPTATION STUDY

LOCAL AREA REPORT

EAST RIDING OF YORKSHIRE DISTRICT

Location	
Description of District	A rural district, traditionally dominated by agriculture, and including a long length of coastline and much of the north shore of the Humber Estuary.
Future Climate Projections	The results of the modelling carried out for the Yorkshire and Humber Regional Climate Change Adaptation Study suggest that the following changes are likely by 2050: • Annual average daily mean temperatures are expected to rise by 1.9˚C with summer temperatures rising more (by 2.5˚C); • Winter rainfall will, on average, increase by 16%; • Extreme cold temperatures will increase, and extreme hot temperatures will rise by 1 - 3.2˚C; and • The number of days of snowfall will reduce by 70% These figures relate to the nearest modelled cells, which were Hull, Scarborough and York.

Key Impacts and Adaptation Actions

Although principally a regional / sub-regional study, there are a range of issues that are of particular relevance to the East Riding of Yorkshire. These are set out below, using the same 'sector' headings as the main report. These points are not the only issues for consideration, however, as sub-regional and regional reports, as well as the thematic or sectoral areas of the website, do cover other issues relevant to this local authority area.

Flooding

Key Impacts

- Greater rainfall leading to increasing and more frequent flood problems for local properties, businesses and infrastructure in main towns;
- Higher groundwater recharge rates, particularly in the local chalk aquifers, producing increased baseflows and groundwater levels and further increasing winter flood risk;
- Increasing potential for tidal flood impacts with rising sea levels;
- Increased flooding to critical infrastructure and services as well as businesses and housing stock; and
- Increased erosion and more frequent breaching of historic defences.

Key Adaptations

- Protect critical infrastructure and emergency services;
- Develop flood management strategies to protect local businesses and properties;
- Concentrate improvements to tidal flood defences to maintain an appropriate standard for local populations;
- Produce multi-agency response plans to co-ordinate responses during extreme events and ensure clear access routes are kept available; and
- Use changes in local land management in rural areas to reduce rates of surface runoff.

Coastal Erosion

Key Impacts

- Increased rates of sea cliff erosion will result in loss of agricultural and amenity land and could also put pressure on existing defended areas due to outflanking. Most critically, however, it will place pressure on the existing defences fronting Bridlington and the Easington gas terminal;
- Increased lowering of foreshore platforms, leading to increased undermining of existing coastal defences and requiring increased maintenance and likely capital upgrades;
- Increased overtopping of coastal defence structures; and

- Increased rates of inter-tidal marsh-edge recession at some locations within the Humber Estuary, in many cases leading to the progressive 'squeezing' of inter-tidal habitats between a rising sea level and a fixed backstop flood defence structure or rising ground. In areas where there are European habitat designations, coastal squeeze losses will have to be replaced elsewhere within the Humber Estuary through compensatory habitat creation; and
- Increased risk of temporary loss of the access road to Spurn Point due to erosion or breaching.

Key Adaptations

- In undefended areas along the open coast, the adaptation response is likely to be one of 'no active intervention', allowing the natural development of the coast to continue. This will continue to release sediment to the coastal system, some of which will feed the Humber Estuary and help the inter-tidal areas to accrete vertically and reduce the impact of sea level rise in the estuary. Elsewhere local works may be required to prevent outflanking of defended sections. Critically, however, some difficult decisions will need to be made along this frontage, in particular with respect to future maintenance of coastal defence structures. This will be most critical at the Easington gas terminal. The ongoing Flamborough Head to Gibraltar Point Shoreline Management Plan 2 will address these issues through 2009; and
- Adaptation to inter-tidal salt marsh-edge erosion within the Humber Estuary is inextricably linked with flood risk management decisions. This in part will involve maintenance or improvements to existing flood defence structures, leading to continued coastal squeeze. In part it may also involve the managed realignment of existing defences, enabling marsh creation across the newly inundated areas. The Humber Flood Risk Management Strategy outlines the different areas where defence improvements may be hard to justify but it may be many years before final decisions are taken on individual lengths.

Groundwater and Minewater

Key Impacts

- Risk to Chalk groundwater resource due to declining groundwater levels and increased drought;
- Impact on river flows, particularly the River Hull, due to reduction in spring flow from Chalk;
- Risk of groundwater derived flooding from Chalk aquifer due to increased winter rainfall; and
- Risk of saline intrusion which is already evident in several places, e.g. around Flamborough Head, Meaux Abbey, Atwick and in a broad area towards Spurn Head.

Key Adaptations

- Continued monitoring and careful exploitation of the Chalk aquifer; and
- Assessment of saline intrusion and possible constraint of groundwater abstractions during periods of drought.

Business and Economy

Key Impacts

- Increases in pest and disease spread, together with the potential for more 'exotic' species, are likely to have significant effects on the district's agriculture;
- As fish species currently targetted by local boats become unavailable or uneconomic they are likely to be replaced by other warmer-water species, the attractiveness of which will depend upon the market;
- Higher summer temperatures are expected to increase demand for leisure and tourism, and especially outdoor amenity and coastal destinations. However this may also place significant strain on existing attractions and infrastructure;
- Industrial processes, and in particular those requiring large amounts of water, may be impacted by water shortages resulting from lower rainfall and warmer temperatures. Heavy users may find greater controls placed on abstraction, potentially reducing process efficiency and output, and increasing costs; and
- The distribution and logistics sector is susceptible to flooding and heat impacts at warehouse and distribution park sites. It is also heavily dependent on the activities of the ports and the wider transport network.

Key Adaptations

- Initiate, develop and review pest management strategies, in particular in those rural areas frequented by visitors, to ensure the early identification and treatment of any species or conditions which may negatively affect the district's habitats or economy;
- Promote and circulate research into the likely effects of climate change on local fisheries species, and ensure long-term investment decisions account for a potentially changing catch. Drive and share research on changing markets to ensure and enable early adaptation. Require that development and support programmes, especially where publicly or industry-supported, are climate adapted;
- Long-term changes in the tourism industry should be built into visitor management strategies, and the expected future needs and demands of tourists should be built into infrastructure and other regional plans, and longer-term maintenance regimes; and

- Build climate adaptation into regular industrial process reviews, and programme any necessary adaptations (for instance to improve water efficiency) into maintenance and upgrade cycles.
- Flooding impacts on distribution and retail parks should be addressed as a priority before development, with surface water management plans and sustainable drainage systems, designed to cope with future water flows, integrated into the developments from the outset. Greater resilience in supply networks, through greater appropriate storage, could further limit impacts.

Public and Voluntary Services

Key Impacts

- Indoor air temperatures are likely to rise in the summer in schools and public buildings, particularly in urban areas, with impacts on indoor air quality also;
- With the expected increase in winter rainfall and extreme rainfall, localised flooding events will become increasingly frequent and intense, impacting buildings as well as social housing residents, housing association, public services and emergency service ability to operate; and
- The drying out of soils followed by heavy rainfall could lead to increased risk of subsidence and slope instability, together with inundation and/or erosion of low lying coastal facilities.

Adaptation measures

- Building refurbishment should encompass a full range of climate adapted measures, including drainage, guttering and insulation, as well as opportunities to integrate low carbon and renewable energy to offset future costs;
- To limit impact to vulnerable communities, contingency planners should use the index of multiple deprivation to prioritise areas for action. A number of approaches to adaptation can then be progressed, including personalised adaptation planning, increased education/awareness, or household / community NI 188 assessments; and
- Subsidence, slope instability and inundation , should be fully considered through the planning process when considering applications for new, particularly strategic, facilities.

Infrastructure and Utilities

Key Impacts

- Surface melt of rural road surfaces and associated knock-on effects;
- Increased number of traffic accidents delays on major highways;
- Increased frequency of flooding from urban drainage and sewer systems in Beverley and Bridlington, especially in winter;

- Increased demand on water resources, particularly from agriculture;
- Increased tourist and recreational use of the coast, including increased pressure on rural road networks;
- Increased blockage of drains, culverts and gullies;
- Mechanical operations within the water distribution grid could be affected by climate-related disruption to power supplies;
- Increased frequency of flooding to sections of the rail line to/from Hull and coastal erosion of sections at Bridlington;
- Increased overtopping of sea defences at Easington Gas terminal and accelerated erosion of undefended coast to either side; and
- Increased scour of river bed around bridge pier foundations.

Key Adaptations

- Allow additional resources for use of alternative road surfacing materials in carriageway maintenance programmes to ensure higher melt thresholds;
- Weather and travel warnings issued to users of principal road networks;
- Capital programs should consider improved sewer and drainage design capacity;
- Farm-holdings to consider local winter water storage reservoirs;
- Plan for increased visitor numbers to coastal facilities and provide additional public transport;
- Re-evaluate resources and approaches for inspection and clearance of drain, culvert and gulley blockages;
- Increased awareness of inter-dependencies between critical infrastructures, leading to improved resilience planning;
- Consider flood defence to rail line and/or relocation of sections of line in the longer-term;
- Critical re-evaluation of decommissioning timescales for Easington Gas Terminal, linked to existing defence standard, erosion rates and national energy policy; and
- Monitoring and scour protection around bridge pier foundations.

Biodiversity

Key Impacts

- There is likely to be a loss of salt and freshwater wetland due to coastal squeeze;
- Increasing saline influence due to sea level rise and coastal flooding may increase the presence of specialised species;
- There is likely to be a change in some locations from wet to dry types of habitat; and

- Climate change is expected to put pressure on future food production. A re-intensification of agricultural production will enhance cumulative pressure on overall biodiversity, which has suffered a loss as a result of previous agricultural activity.

Key Adaptations

- Wherever possible allow natural processes to continue, and therefore adaptation to change to occur naturally;
- An overall expansion in habitat types currently suffering from isolation or fragmentation, to improve habitat permeability. The overall connectivity of existing and newly created habitats needs to be enhanced to enable species to migrate and disperse as easily as possible;
- Integrate biodiversity concerns fully with future coastal and agricultural planning; and
- Maximise the potential for different habitats and species to help sustain each other. New habitats may take on functional roles such as buffering natural hazards such as wind, flooding and drought.

Health and Welfare

Key Impacts

- Impacts upon mental and physical health due to increasing temperatures, particularly in areas of deprivation; and
- Coastal and fluvial flooding attributable to sea level rise and increased seasonality and intensity of rainfall.

Key Adaptations

- Raising awareness, educating and building community resilience to climate change and its likely impacts. Target vulnerable groups as reducing social and economic inequalities will allow people to more easily adapt to the impacts of climate change; and
- Rainwater capture and harvesting and associated flood preparedness work with vulnerable communities will help build resilience and avoid potentially devastating impacts.