


# YORKSHIRE AND HUMBER CLIMATE CHANGE ADAPTATION STUDY

## LOCAL AREA REPORT CITY OF SHEFFIELD

<p><b>Location</b></p>	
<p><b>Description of District</b></p>	<p>The City of Sheffield is an urban area. It was dominated by the steel industry until recently and is now regenerating. Part of the district reaches into the Peak District National Park.</p>
<p><b>Future Climate Projections</b></p>	<p>The results of the modelling carried out for the Yorkshire and Humber Climate Change Adaptation Study suggest that the following changes are likely by 2050:</p> <ul style="list-style-type: none"> <li>• Annual average daily mean temperature is predicted to rise by 1.9°C;</li> <li>• Extreme winter cold temperatures will rise from -6.9°C to -4.4°C;</li> <li>• Summer extreme temperatures are set to rise by 3.2°C (summer average temperature increase by 2.5°C), the largest increase across the study area;</li> <li>• Winter rainfall is to increase by 14%, and rainfall intensity is expected to increase, although annual average rainfall to is expected to decrease marginally;</li> <li>• There are projected to be at least 25 fewer frost days annually; and</li> <li>• Winter average wind speeds are predicted to increase by 1%.</li> </ul> <p>These figures relate to the nearest modelled cell, which was Sheffield.</p>

## 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 City of Sheffield. 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*

- Flood risk (fluvial, sewer/drainage, and from direct surface runoff) to local businesses and properties due to flows from the moorlands is likely to increase with the increasing seasonality of rainfall and higher intensity, flashy flows, particularly in the summer;
- Increased watercourse blockages and siltation reducing channel capacity and requiring greater maintenance works. Culvert entrances becoming blocked by tree debris and vegetation during storms; and
- Increased surface water flooding in heavily urbanised areas during higher intensity, more extreme storms, and also affecting low sections of roads and railways.

#### *Key Adaptations*

- Continue river flow monitoring for fluvial flood events to provide advanced flood warning to critical risk areas;
- Improve current drainage design and maintenance standards to incorporate future climate changes, and strategically plan and implement system improvements across the drainage network. Consider a wide range of flood reduction techniques across urban areas; and
- Concentrate flood management on protecting critical infrastructure assets and services. Develop flood management strategies to protect local businesses and properties or encourage flood-resilience of buildings where this is not viable.

### Groundwater and Minewater

#### *Key Impacts*

- Low risk of increased incidence of outbreak from abandoned coal mines on Coal Measures outcrop across central parts of the district (e.g. Sheephouse Wood – where there has been a recent major outbreak).

### *Key Adaptations*

- Continued Coal Authority monitoring and planned remedial schemes (e.g. at Sheephouse Wood) at most polluting sites will limit the potential for and impact of outbreak. Current and expanded Coal Authority pumping operations will limit outbreak of rebounding mine waters to the east of the district and in the adjacent Rotherham district.

## **Business and Economy**

### *Key Impacts*

- Industrial processes, and in particular those requiring large amounts of water, may be impacted by future water shortages. Heavy users may find limitations imposed in order to balance industrial and other needs, which could reduce process efficiency and output and increase costs;
- 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;
- There will be significant opportunities for the Advanced Manufacturing sector and the region's advanced technology industries in developing solutions to the challenges presented by climate change;
- Increases in pest and disease spread, together with the potential for more 'exotic' species, may demand changes to the management of upland extensive livestock; and
- Management of sports venues and heritage and amenity sites will be affected by changing temperatures and rainfall/storm patterns. This will affect grounds management, building fabric and health and wellbeing.

### *Key Adaptations*

- Build climate adaptation into regular 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 from the outset;
- Increasing links with the regional and sub-regional universities will enable greater research and development. Combined with support from local and regional business organisations this will help make the most of the opportunities which will be presented;
- Initiate, develop and review pest management strategies to ensure the early identification and treatment of any species or conditions;

- Climate adaptation should also be built into all new developments, particularly bearing in mind the high levels of regeneration in the district, to ensure working and other conditions are maintained into the future. This could include increased use of shade trees in urban areas, retail parks and malls to ameliorate the heat island effect; and
- Long-term changes in visitor patterns should be built into management strategies as well as into infrastructure and other regional plans, and longer-term maintenance regimes.

## 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;

### *Key Adaptations*

- A set-aside maintenance and repair budget for school buildings and public service offices, developed through adapting current budgetary mechanisms, would ease the costs of any damage that is incurred as a result of climate impacts. The maintenance and repair budget should give due consideration to appropriate guttering and sustainable drainage systems, green roofs, water butts, grey water systems, passive ventilation and shading, and renewable sources of energy; and
- Local authorities and regional bodies should ensure full participation in regional resilience forums and regional flood groups and undertake precautionary as well as adaptive measures.

## Infrastructure and Utilities

### *Key Impacts*

- Occasional deficits in volumes in individual surface water reservoirs;
- Increased number of traffic delays on major highways caused by increased winter rainfall and winter average wind speeds;
- Increased frequency of flooding from urban drainage and sewer systems in Sheffield, especially in winter;
- Increased tourist and recreational use of Peak District National Park, including increased pressure on rural road networks;
- Increased blockage of drains, culverts and gullies;
- Loss of efficiency on overhead power transmission lines due to sagging in warmer temperatures; and
- Mechanical operations within the water distribution grid could be affected by climate-related disruption to power supplies.

### *Key Adaptations*

- Balance water supply from other local sources or from the Yorkshire Grid at times of individual reservoir deficits;
- Weather and travel warnings issued to users of principal road networks during forecast storm events and anticipate increased resource requirements for emergency responses;
- Capital programs should consider improved sewer and drainage design capacity;
- Plan for increased visitation and provide additional public transport;
- Re-evaluate resources and approaches for inspection and clearance of drain, culvert and gully blockages;
- Use of balancing weights or alternative materials to counteract sagging or better resist thermal expansion; and
- Increased awareness of inter-dependencies between critical infrastructures, leading to improved resilience planning.

## **Biodiversity**

### *Key Impacts*

- High risk of total loss of habitats which have already become very isolated and confined such as heathland, moorland, grassland and woodland and therefore a loss of species, many of which are at immediate risk; and
- Loss of tree species due to water stress, direct and indirect impacts of temperature, wind-throw, waterlogging and enhanced acidification of soils and water. Change of understorey species with possible opening up of stands.

### *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. Design new habitats to introduce southern species to current wooded areas, and transplant existing species to new areas in order to provide links. The overall connectivity of existing and newly created habitats needs to be enhanced to enable species to migrate and disperse as easily as possible; 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; and

## Health and Welfare

### *Key Impacts*

- Impacts upon mental and physical health due to increasing temperatures, particularly in areas of deprivation;
- Growing number of cases of respiratory illnesses due to increasing number and intensity of air pollution episodes; and
- Growing burden upon people providing care to vulnerable individuals.

### *Key Adaptations*

- Urban design to minimise heat island effect as much as possible;
- Improve sustainable transport infrastructure to reduce isolation; and
- Raising awareness, educating and building community resilience to climate change and its likely impacts, and continue tackling social and economic inequalities throughout the city.