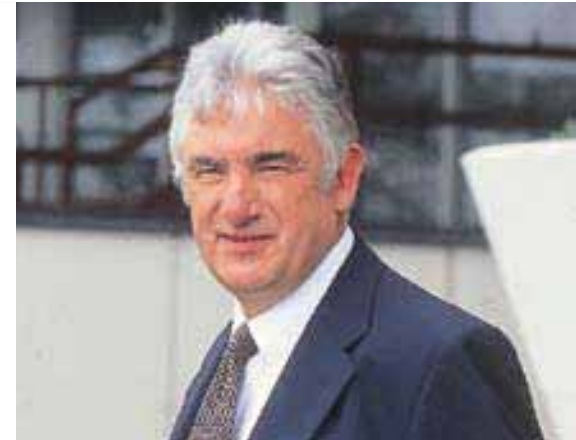


Yorkshire and Humber Regional Adaptation Study



Weathering the Storm

Foreword



Climate change is a challenge that affects us all. Its implications are profoundly important not only for the Yorkshire and Humber region, but for the country and the world in general.

These implications will become more severe over time and we all need to start adapting our systems, assets, services and management approaches to this challenge.

Recognising this, some 12 months ago, partners in Yorkshire and Humber commissioned a Regional Adaptation Study to look at what we may face and, most importantly, look at what needs to be done to tackle the predicted impacts. This Executive Summary highlights the study's key findings.

During the course of the study, more than 200 individuals, experts and organisations throughout the region provided invaluable contributions and support.

In thanking everyone who helped, I would particularly like to express my gratitude to those organisations that provided the

funding which enabled the study to be undertaken in the first place. They are Yorkshire Futures, the Yorkshire and Humber Assembly, the Environment Agency and Yorkshire Forward.

The study projected climate changes the region will face by the 2050s; the impact these changes will have on the region; and what needs to be done to adapt to these predicted impacts and make the region more resilient to a changing future.

I firmly believe the findings show us the way forward. It is now our responsibility to make the difference and ensure the region rises to the challenge.

For more detail on the study, I would urge you to log on to www.adaptyh.co.uk

Councillor Arthur Barker

Chair, Regional Adaptation Study Steering Group

The study is intended to provide a catalyst and focus for adaptation action throughout the region. It assesses future climate change in the Yorkshire and Humber region to 2050, investigates likely impacts on a range of sectors, and proposes thematic and overarching adaptation measures to help increase regional resilience.

Future climate

Modelling carried out for this study assessed current climate variability and trends in the region, and 'downscaled' climate projections for the region (UK Climate Impacts Programme 02, medium-high emissions scenario) using the Environment Agency's Rainfall and Weather Impact Generator (EARWIG). This enabled more detail than has been available to previous projects.

Key changes identified include:

- Annual average daily temperatures rising, by almost 2°C;
- Extreme hot temperatures will increase, with summer temperatures more regularly reaching 34°C;
- A reduction in annual rainfall of up to 6%, although by less in upland areas;
- Greater seasonality of rainfall, with increases in winter combined with significant reductions in summer;
- In northern and upland areas an increase in the number of extreme rainfall events;
- Dry spells (over 10 consecutive days without rain) are expected to increase in number;
- Significant reductions in the number of days of frost and snow;

- Marginal increases in winter average wind speeds, although summer and autumn speeds reduce slightly;
- Sea levels will rise by around 0.35 metres.

Study findings will also be cross-referenced with the new UK Climate Projections (UKCP09) when these are released to ensure continued relevance of our report.

There is increasing evidence that the Yorkshire and Humber region is already experiencing some of the weather patterns associated with climate change, including storms, gales and heatwaves, with effects on homes, businesses and travel. Most notable are the summer 2007 floods which led to loss of life, damage to property and infrastructure, and disruption to public and business services.

Impacts and Adaptation

The implications of these changes for the region were assessed, and measures to build resilience identified, by:

- Supplementing projected changes by considering flooding, coastal erosion, and groundwater changes;
- Assessing information on likely impacts on key sectors:
 - Business & Economy including Agriculture, Tourism, Manufacturing and Retail;
 - Public & Voluntary Services including Schools, Emergency Services and waste management;
 - Infrastructure & Utilities addressing Buildings, Transport and Utilities;
 - Biodiversity including Peatland, Moorland, Wetlands, Coastal, and other habitats; and

Impacts and Adaptation

- Health and Welfare considering Health, Hospitals, Care Homes and Vulnerable Communities.
- Drawing on the latest adaptation research, together with industry best-practice;
- Applying multi-disciplinary expertise, supplemented by local and sectoral knowledge explored through a series of workshops.

Thematic impacts and adaptations are reported in detail at regional and sub-regional levels, and are summarised for each local authority area.

Principal impacts of climate change

Increased flooding from rivers, the sea, and drainage

will mean that properties currently at risk will be at an increasing risk, and the number of properties at risk will rise. There is also likely to be additional strain on already critical sewerage networks. Drainage problems will be worse in areas where outfalls become tide-locked.

Impacts on coastal and estuarine shores such as increased erosion will lead to further losses, including natural habitats, and to altered coastal processes.



Impacts on business premises and other built assets

are not sector dependent. Many different sizes and types of organisation will be impacted in similar ways, including: increased internal temperatures; increased water penetration; and increased storm damage and disruption.

Impacts on employees', customers' and students' comfort, safety and performance. Disruptions to transport infrastructure will also affect commuting and customer access.

Changing yields and crops in agriculture and forestry as growing seasons extend. The potential for growing new and specialist crops increases, but over the longer term adaptation to climate adapted cultivars or species may be required.



Water shortages affecting agricultural practices as hotter drier summers, and more erratic rainfall patterns, are expected to increase competition for water with domestic and industrial requirements, and wider habitat needs.

Changing pests and diseases affecting agriculture, forestry, parkland and gardens, and biodiversity as the range and virulence of species increases. New 'exotic' pests may also find the region more habitable in the future.

Increases in uncontrolled fires as drought conditions, combined with increased outdoor leisure, are projected to increase the occurrence of parkland, moorland and forest fires, with implications for Fire and Rescue Services.

Increased opportunity for the tourism sector as the region is likely to become more attractive to tourists over an

extended season. This could be amplified by legislation to mitigate climate change.

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 (eg landscapes suffering drought or erosion) could affect the region's attractiveness, however.

Grounds and venue operation and maintenance could become increasingly difficult. Irrigation water may be limited in drier summers, but conversely waterlogging during winter will require adapted management. Outdoor events may be increasingly vulnerable to disruption or cancellation, with crowd welfare a particular concern.

Principal impacts of climate change

Opportunities for advanced manufacturing as the region is well placed to respond to the need for technical solutions to climate mitigation and adaptation.

Altered pressures on emergency services as reductions in ice and snow could lead to fewer road accidents (although this impact is unclear). Rising summer and extreme temperatures are likely to increase the need to respond to the effects of drought and heat stress. Increased storminess could also increase calls for rescue.

Disruptions to transport infrastructure as increased temperatures affect road surfaces, rail tracks and overhead cables. More extreme rainfall could exacerbate scour around bridges. Transport infrastructure is also critically vulnerable to flooding, and has significant knock-on effects on all other areas covered by this study.

Rainfall and temperature will affect water supply and wastewater treatment as although the region is well-supplied with water smaller reservoirs will be vulnerable to drought and tighter abstraction controls. Higher temperatures will accelerate some treatment processes but changing river flows could have implications for treatment standards.

Disruption to electricity and telecommunications networks as projected wind speeds make towers and cables more susceptible to failure. This infrastructure is also extremely vulnerable to flooding, with knock-on effects on other sectors.

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Positive and negative effects on biodiversity which will depend largely on complex interactions between different species, and between species and their habitats. However it is clear that species which can colonise different areas easily will have an advantage.

Significant changes to wetlands as although increased winter rainfall may be beneficial, intense rainfall events are likely to increase runoff and could enhance erosion. Conversely lowland wet meadow is likely to deteriorate due to drought, and increased fragmentation could be likely as generalist species encroach.

Exacerbation of existing chronic conditions particularly in urban areas. As well as respiratory illnesses such as asthma, the increased flood risk is likely to increase mental health issues such as stress and depression. Areas identified as deprived or vulnerable are likely to be most severely affected.



Changing medical needs and delivery as cold-related conditions decline but summer temperatures exacerbate problems for the elderly and vulnerable. Food poisoning and diseases could be exacerbated and hospitals, care homes and mobile services may find it increasingly difficult to provide core services, particularly in rural areas.

Common adaptation themes

The impacts of climate change on each sector can be addressed through a wide range of specific mechanisms, but a number of common themes emerge, including:

Monitor, assess and respond. Many actions will rely initially on identifying vulnerability through monitoring. Early

identification of weaknesses means that necessary action can be built into routine upgrades and maintenance rather than relying on more expensive reactive actions.

Guidance and dissemination. Information relating to the nature of climate change, impacts on different areas, and adaptation activities available, is being released regularly. Actions need to be based on the best available appropriate information but mechanisms for ensuring the wide circulation and awareness of this information, within sectors to ensure it is of most relevance, are crucial.

Innovation. Many sectors can build resilience and adapt to climate change by moving away from traditional techniques, markets and crops or products. While early movement has the

Common adaptation themes

potential to gain market advantage, it is perceived as carrying an element of risk.

Opportunity. Regardless of the levels of innovation required, climate change brings opportunities as well as potential challenges. Early identification of these opportunities, and positioning to maximise them, will bring advantages to the region and allow it to align future growth in a climate-adapted way.

Staged adaptation. Not all impacts require an immediate response, and a single big change is not always the safest or most cost-effective means of adapting to the gradual changes in climate. A more staged approach enables regular review, of markets and assets, but also of developing knowledge and best practices. Introducing changes incrementally also builds in flexibility. As such even long-term decisions do not lock the region into an unadapted future.

Cross-sectoral delivery

A number of strategically-delivered activities have been identified as having the potential to bring wide-ranging benefits across a number of sectors. These were discussed in a workshop held as part of the study, and include:

- Better manage all land to address drainage, water storage and flooding;

- Facilitate greater uptake of green infrastructure;
- Develop and encourage new crops and land management methods;
- Stimulate private sector involvement;
- Ensure climate change and regional priorities are aligned;
- Improve coordination within the region, within and between sectors, to raise awareness of resilience and develop proactive and reactive approaches to climate adaptation;
- Optimise use of existing building stock, including encouraging retrofitting for climate adaptation.

Blocking delivery

Alongside these, a number of factors have been identified through the study as potentially blocking effective delivery of climate change adaptation. These include issues such as:

Political and private sector understanding and will.

Although tackling climate change is attractive, some necessary actions can be less so. Drive at the highest levels to implement these can vary. There is also a strong perception of low private sector engagement with climate change within the region, despite business vulnerabilities and a potentially key role in delivering adaptation. Linked with this there is also felt to be a general resistance to innovation which, although playing a role in adaptation, can be high-risk. There are also concerns about inconsistent application of regulations, including in the planning system, standing in the way of climate adaptation.

Lack of coordination, responsibility and communication at a specific level. The nature of climate change means that it will affect almost everyone, and will affect most sectors of society. Due to the number of stakeholders, the cross sectoral nature of many of the issues, and potentially competing objectives between stakeholders, there is a strong role for coordination at the regional and sub-regional or sectoral/thematic level.

Lack of communications, integration and engagement. Linked with coordination and understanding are perceived poor levels of communication about climate change challenges to many sectors within Yorkshire and the Humber. Low levels of information sharing between different sectors and networks are of concern, and are associated with insufficient advocacy at the appropriate level (regional, sub-regional and sectoral) to raise

awareness, to make the case for action, and to drive adaptive action.

A lack of incentive has also been identified as affecting delivery. Due to the lower levels of understanding of benefits and risks associated with climate change, incentivisation may be required to encourage action that might be perceived as a risk.

Enabling change

Addressing these, and to enable delivery of climate change adaptation in a coherent and efficient way, we suggest that five overarching enabling factors are addressed.

1. Centralised coordination of climate change adaptation activity in the region. Operating at the regional level this

Enabling change

should drive the consolidation of climate change work in Yorkshire and Humber, and delivery of actions against a prioritised and resourced climate change adaptation plan. This regularly reviewed plan should encompass the areas of work described below.

2. Wider education and engagement of stakeholders and the public is needed to ensure adaptive capacity is built into organisations and wider political structures. Stronger engagement could be facilitated through sectoral groups, established along the lines of this study or within existing structures. These will help ensure climate change impacts and adaptation measures are made relevant to all sectors. They can also ensure appropriate communication and information sharing, and coordinate delivery within and between sectors where appropriate, contributing to progressing the regional adaptation plan.
3. Collation and dissemination of an improved evidence base is needed to support and enable greater engagement by businesses and organisations in particular. This evidence base should be made widely available and be used to support greater advocacy for change, coordinated through sectoral groups, and aimed at building political and board level will. As well as drawing together existing and emerging guidance and information at the national and sectoral levels this evidence base should be augmented by targeted

research including regional vulnerability/opportunity mapping. This can then enable adequate risk assessment, and allow a risk-based approach to prioritisation within the regional adaptation plan.

4. Identify, and fund where necessary, pilot schemes within the region but linked with national, European and international initiatives to trial innovative approaches to climate change adaptation. This would further contribute to the evidence base and such schemes can be used to overcome perceptions of risk associated with innovation, facilitating further change. They could also help in positioning the region as a leader in climate change adaptation in a range of sectors.
5. Delivery of climate change resilience through long-term planning, including infrastructure and spatial planning, will require greater integration of climate change awareness and understanding into planning structures and planners' toolkits. Although linked with wider education, this reflects the importance with which delivering tangible climate change adaptation immediately is seen by regional stakeholders. The ongoing Regional Spatial Strategy review and renaissance activity both offer means for delivery. However, as with the key themes presented above, flexibility is critical so that approaches can be amended in the light of emerging information in what remains a developing field.

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