

An introduction to climate resilience

Introduction and purpose of this paper

It is a regional and national priority to protect and grow resilience to extreme weather and climate change. Numerous flooding and dry weather events in the region over recent years have demonstrated the vulnerabilities and scale of impact on the health of individuals, communities and the economy. A range of risks and opportunities are presented from the different types of extreme weather and the general change in climate over time. Climate resilience requires specific and urgent action alongside the pathways to net zero.

Further deterioration in the climate is now inevitable for decades to come due to carbon emissions already made. The Intergovernmental Panel on Climate Change (IPCC) report to Parliament in 2019 stated: *“The climate of the UK is changing, and further change is inevitable regardless of how strongly the world reduces greenhouse gas emissions. We need to adapt and build resilience along with climate mitigation as mitigating against future risk doesn’t tackle the locked in climate change we are and will continue to experience as a result of existing temperature rise even if we keep to the Paris Agreement.”*

Evidence repeatedly shows that the most cost-effective approach is to take early action¹. There are many steps that can be taken to avoid and reduce potential impacts of extreme weather and climate change. Everyone has a role to play and action needs to be taken on every scale, from individuals and communities to landscape scale and economic system change. These changes can be developed and realised in ways that secure wider benefits such as green jobs, reducing social inequalities, and creating healthier livelihoods and improved population health. The approach needs to evolve over time in response to latest understanding and the changing climate.

The natural environment has a critical role to play within plans to help ecosystems and society adapt. Healthy forests and wetlands help reduce the risk of flooding, improve biodiversity and provide natural carbon storage. For example, it is estimated that nature-based solutions could deliver up to a third of the global cost-effective mitigation required by 2030 to meet the Paris Agreement temperature goals².

This paper provides a first introduction to the topic of climate resilience to support early discussion about the Commissions role and how it is best to approach this. Suggestions and proposals are presented, and initial direction is sought. More detail will follow in future meetings of the Commission and its working groups.

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Colleagues from these and other regional organisations have also fed into this paper.

¹ [Stern Review](#) (2006)

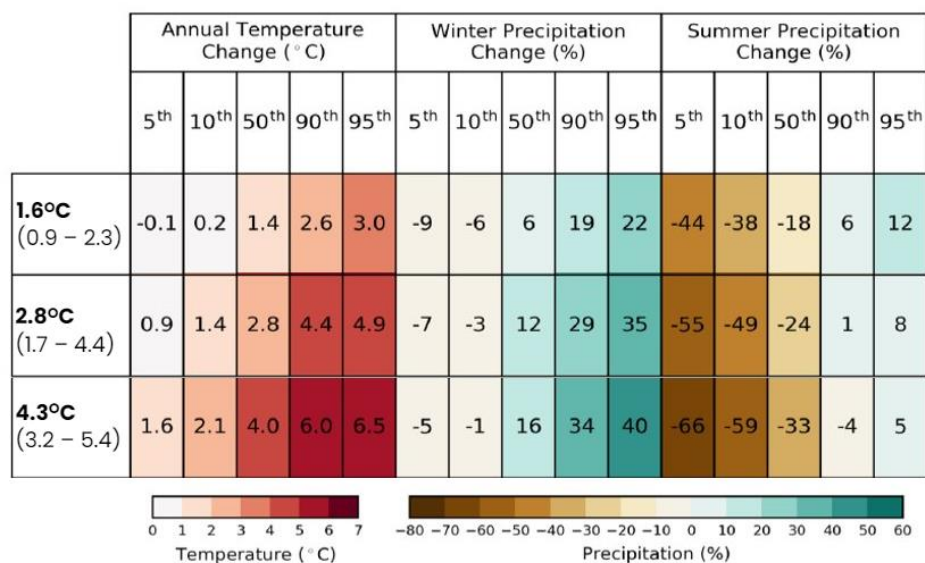
² United Kingdom Adaptation Communication to the United Nations Framework Convention on Climate Change

1. A summary of the climate projections for Yorkshire & Humber

In 2018 the Met Office and Environment Agency supported the government in developing the UK's latest national climate projections, known as UKCP18³. This provides a comprehensive database and scenarios through to the end of the century. Percentiles are used to show the likely range we should plan for. Headline statistics are provided below with further parameters, scenarios and granular data are also available in the UKCP18 resources.

Temperature and rainfall projections for Yorkshire & Humber in the year 2100

The scenario for an average global temperature increase of 1.6°C can be considered best-case; this assumes the global community will achieve the Paris Agreement by delivering significant additional emissions reduction policies over and above those already announced. Current carbon commitments are on track for an average global temperature increase of between the 2.8°C and 4.3°C scenarios⁴.



Sea level rise projections for the Yorkshire & Humber coast

In Yorkshire we can expect 0.30 - 0.35m of sea level rise in a 2°C climate, or 0.65 - 0.68m in a 4°C climate, by 2100. Given current trajectories it is likely we will see 0.3m rise by around 2050.

With 0.35m of sea level rise we will see a decline in the level of protection offered by sea defences. For example, between Flamborough and Gibraltar Point, defences that were designed to protect against a storm we might expect once in 100 years on average will be reduced to protecting in a storm now expected once in 35 years⁵.

The scale of flooding we currently consider infrequent and extreme, such as that seen on the Humber in December 2013, will occur more regularly and with growing consequences.

2. The climate risks and opportunities for Yorkshire

The climate projections outlined in the previous section present a wide range of risks to inform short and long term planning consideration for the region. The table over the page summarises the region's headline position against the six priority themes of the national Climate Change Risk Assessment⁶

³ www.metoffice.gov.uk/research/approach/collaboration/ukcp/index

⁴ <https://unfccc.int/resource/docs/2015/cop21/eng/07.pdf>

⁵ <https://www.ukclimaterisk.org/wp-content/uploads/2020/07/Future-Flooding-Main-Report-Sayers-1.pdf>

⁶ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/584281/uk-climate-change-risk-assess-2017.pdf

(CCRA) which is maintained for the national government and was last published in 2017, and which will be updated in 2022.

In simplest terms, Yorkshire needs to prepare all aspects of its infrastructure (social, green and grey) for increasing risk and severity from the following physical risks:

- hot and dry periods causing water stress, drought and wildfires
- increased volumes of winter rainfall and more intense short, sharp rainfall events, causing surface water flooding
- sea levels rising along our coast, reducing the level of protection offered by current defences
- storm surges causing floods for coastal communities
- coastal erosion causing loss of land, property and infrastructure
- high winds, lightning and cold snaps causing damage and disruption
- changes to the growing season and to the habitats and species able to live in our new climate, impacting nature, farming and bringing invasive species, pests and diseases.

It is important to consider the social aspects associated with these risks – significant disruption and stress can quickly escalate to unrest and distrust. Furthermore, the above physical conditions will also occur outside Yorkshire and could disrupt supply chains that results in knock-on impacts on activities within Yorkshire.

Whilst the negative impact of the climate change risks is stark, there are also considerable opportunities that must also be seized. Our region has centres of excellence in advanced manufacturing, renewable technology, and flood resilience amongst others. Positioning Yorkshire and Humber as a well adapted and resilient region will be more attractive to investors and businesses. Adapting to climate change brings many co-benefits including better air quality, reduced flood risk and improved green spaces. These opportunities provide a powerful and engaging narrative that will help many move to a resilient and sustainable way of living, recognising that it is not only those directly impacted that will need to change and adapt. It is imperative that we understand the scale of the risks we face and harness the power of positive visioning to help realise the required societal changes.

Informing the approach of the Commission

This information presents several aspects to shape our direction and approach, which is discussed further in the next section.

The risks and opportunities show priorities that require further consideration to guide and align how the region and local areas best prepare now and over time. It is proposed that an early action of the Commission is to review and update the regional climate risk assessment published in 2009⁷ and to consider priority measures to adapt to climate change risks in a regional action plan.

Careful consideration is needed of the potential synergies and conflicts between climate resilience, carbon reduction, health and wellbeing and the imperative for a just transition for all. For example, some resilience measures may add pressure to carbon emissions through increased need for energy and built infrastructure, while others could help reduce and store carbon through nature-based approaches. Equally, high quality green and blue infrastructure is proven to have significant health and wellbeing benefits. There are substantial savings to be made, and increased productivity to be realised, by creating resilient people and places. It is therefore important for the Commission to maintain an integrated approach on these matters to ensure optimal outcomes.

⁷ https://yourclimate.github.io/system/files/documents/Weathering_the_Storm%20-%20Regional%20Adaptation%20Study%20full%20report.pdf

The six national CCRA priorities	Yorkshire projection for 2050*	Yorkshire risk headlines and examples	Yorkshire opportunity headlines and examples
Flooding and coastal change risks to communities, businesses and infrastructure	10% increase in short duration, intense rainfall events. Around 30cm sea level rise.	Examples in recent years show widespread risk of surface water flooding that will be exacerbated by climate change. Low lying areas on the East coast face the highest national flood risks outside London. Where defences were designed to protect against a storm we might expect once in 100 years on average, in 2050 this will be reduced to 1 in 35 years ⁸ . Increases in the number of people exposed to flooding and the frequency of exposure will have significant and long-term implications for communities' physical and mental health. This will further exacerbate existing health inequalities and increase pressures on the health and social care system.	Lead in the skills and techniques needed in shifting to societal approaches that live with water and improve water resilience. For example, by making natural and designed spaces that slow and store storm water out of harm's way, with benefits for public health (eg green social prescribing) jobs, nature, amenity, recreation, carbon storage and water resources.
Risks to health, wellbeing, and productivity from high temperatures	Every other year is a summer like the hot and dry one experienced in 2018.	Recent hot, dry spells show the widespread and varied impacts on increased morbidity and disruptions to infrastructure and operational processes such as roads melting and people falling ill due to heat. These will be exacerbated by climate change. The severity of the impact will be further compounded by the ageing population, given both age and chronic illness are increased risk factors for heat-related illness and morbidity.	Lead in the skills and techniques needed to improve the quality and climate resilience of public spaces, housing, businesses and operational processes. For example. By insulating homes from cold and heat, and making them more energy and water efficient we can reduce running costs, fuel poverty, illness and morbidity.
Risk of shortages in the public water supply, and for agriculture, energy generation and industry	10-16% less rain in summer.	Depression, anxiety and PTSD can affect up to a third of people who have been flooded. The mental health impacts can last for two years or more after flooding has happened. The resulting costs to the NHS up to £4,136 per adult, depending on the depth of the floodwater in their home. After the 2019/20 floods, the estimated mental health costs nationally were £20m, and £590m in mental costs were avoided thanks to our defences. Increasing water stress and competition for public supplies, agricultural and business needs, and for wildlife.	Place-making can help mitigate these risks while delivering wider benefits. For example, following a Sustainable Drainage Systems (SuDS) scheme in Sheffield, people are choosing to get off the bus three stops earlier so they can walk through the new green space. Opportunities to further improve the region's water efficiency and resilience, including the ability to move water to where it's needed. Support the ambition of Water Resources North by taking an integrated catchment approach to water management, recognising the importance of water quality and flood risk, as well as the need to protect water resources.
Risks to natural capital, including terrestrial, coastal,		Yorkshire holds internationally significant areas of special habitats legally designated for their high value. We already see the pressures facing these habitats and associated wildlife. For	Warmer, drier summers are an opportunity for the tourism industry, with alignment to increased investment in our natural resources as a star attraction. Complimentary

⁸ <https://www.ukclimaterisk.org/wp-content/uploads/2020/07/Future-Flooding-Main-Report-Sayers-1.pdf>

<p>marine and freshwater ecosystems, soils and biodiversity</p>		<p>example, Yorkshire holds areas of carbon rich peatland important for water quality and storage, but which are prone to drying and fire in hotter conditions. Scenarios suggest they may be unviable by the end of the Century.</p> <p>Parts of the East coast are prone to high levels of coastal erosion, displacing communities and requiring interventions to infrastructure.</p>	<p>responses with the need for nature-based approaches in response to other risks. Growth in tourism could be utilised to ensure that development is environmentally friendly, low carbon and with integrated transport, flooding and wildlife considerations.</p> <p>Yorkshire is well placed to attract funding by piloting and leading the evolving development of the new national agri-environment incentive schemes and innovative environmental and social finance mechanisms such as green and social bonds.</p> <p>Significant opportunity to green our urban areas with multiple benefits. Eg tree lined streets, wildlife corridors, parks.</p>
<p>Risks to domestic and international food production and trade</p>		<p>Climate change will alter the suitability of crop and livestock choices and management approaches, as well as increasing the risk from pests and diseases. We will need enhanced resilience to the risk of storms, droughts and floods on farmland and food manufacturing sites.</p> <p>Humber side is an important coastal trade route for the country. The Humber estuary is the busiest trade route in the UK and Immingham is the largest UK Port by tonnage. Need to consider and ensure is resilience to rising sea levels and risk of storms.</p>	<p>Consider alternative crop and livestock choices and potential to increase production and value in the warmer, drier summers. Help reduce reliance on food imports. Potential to align with innovative ways to engage communities and consumers in the benefits of moving to healthier, low carbon food choices.</p> <p>Approaches like those in Sustainable Futures and Beyond Nature programmes are working with Yorkshire farmers and companies throughout the food supply chain to demonstrate sustainable farming practices. For example, planting cover crops to increase soil health and water and carbon storage.</p>
<p>New and emerging pests and diseases, and invasive non-native species, affecting people, plants and animals</p>		<p>Various pests and diseases are already causing issues across Yorkshires land and water systems, eg Ash tree die back disease, bluetongue in sheep and cattle. Climate change will make conditions more suitable for current pests to grow and new ones to arrive in Yorkshire. We will often see these starting in the South and spreading north with worsening climate change.</p>	<p>Lead in the skills and techniques needed to manage pests and diseases. Healthier habitats are most resilient to change and therefore complimentary approaches with those listed above. This can be an opportunity to increase biodiversity across the region which both increases natural habitat diversity but also increases the attractiveness of the region as a tourist destination.</p>

*The data is a central estimate from all emission pathways, with important variability around the average. These are considered the minimum levels of changes we must adapt to. The 2019 Commission on Climate Change report to Parliament suggests that in most sectors this minimum level of planning is not yet happening. www.theccc.org.uk/2020/04/21/how-much-more-climate-change-is-inevitable-for-the-uk/

3. Initial priorities and suggested approach for the Commission

Below we make suggestions and recommendations to inform discussion about the Commission's approach to climate resilience and its early priorities for attention and action. These are initial ideas for comment and further development by the Commission.

Governance:

- i. Climate resilience is managed as a priority cross-cutting theme for active consideration throughout the Commission's work, including a standing agenda item at the main meetings and within working groups.
- ii. The potential synergies and conflicts with carbon reduction and the just transition will need regular consideration if we are to secure the best overall analysis and recommendations.
- iii. Align with existing groups operating on climate resilience topics, such as the Regional Flood and Coastal Committee, and the Yorkshire Land Network (and many more). We should avoid duplication and offer support and constructive challenge to these groups, and fill important gaps where they exist.
- iv. Follow and build on existing local, national and international best practice, learning from communities who already live with our projected climate, as far as relevant and useful for the Yorkshire perspective. For example, the national CCRA provides a detailed and structured assessment and structure on which we can consider a Yorkshire-specific approach, and frame other local initiatives, such as the recent work in Leeds (and other localities) on standards for new builds.
- v. Recognise, support and utilise existing local projects for fresh analysis, solutions and funding opportunities. For example, Yorkshire's integrated catchment solution programme (iCASP) and Hull's Living with Water partnership and programmes and Humber 2100+.
- vi. Building more resilient communities who are prepared and able to respond to diverse civil emergencies (environmental, health, disasters) who are mentally and physically healthy and have a level of economic resilience. We need to empower communities to better understand risk and enable them to engage in community planning and response to climate resilience.

Immediate priorities:

- a. The UK hosting COP26 presents a unique opportunity to raise the profile of Yorkshire's climate leadership and priorities, and to harness the momentum to increase engagement and debate within Yorkshire itself. It is proposed that we host a regional summit in the run up to COP26 and consider alignment and collaboration with other regions and organisations in having a visible presence in the COP26 programme of events.
- b. A first task is to develop a clear, documented climate risk assessment and action plan for Yorkshire, ideally in time for the above summit. This would build on existing work and set out a regionally-agreed need and ambition for climate resilience in the region.
- c. The above could inform an agreed goal or target for Yorkshire & Humber's climate resilience – for instance "Yorkshire & Humber will be adapted to 2°C of climate change by 2050, and be planning for 4°C by the end of the century"
- d. Using the above, and the priority risks and opportunities outlined in section 2, to define and agree our priorities for integrating climate resilience in the forward programme and working group structure of the Commission.
- e. Ensure that the work of the Commission reflects the needs and experiences of all residents of Yorkshire, irrespective of socio-economic background, qualification, age, gender, sexuality, faith and culture.

Quick wins

In practical terms, commonplace integration of the following good practices into policies, standards and planning considerations by businesses, government agencies and other organisations would go a long way towards supporting the region's climate resilience while also delivering wider benefits:

- ✓ Energy, water and other resource efficiencies – using less where we can.
- ✓ Renewable energy – generating more of our own energy and from low carbon sources, being mindful of the costs currently associated with being eco-friendly and that climate change itself has the potential to increase social inequality considerably.
- ✓ Flood resilience – maintaining and developing our collective forecasting capabilities, using natural processes to slow water and hold it out of harm's way, and taking preventative steps to keep flood water out of buildings, infrastructure and important areas.
- ✓ Greening our environment – Protecting, enhancing and growing all forms of more natural landscape in both urban and rural areas. This is particularly important in urban areas where many people have little or no access to nature. Urban blue spaces offer the potential to overcome inequalities in accessing nature, which in turn helps to address health inequalities.
- ✓ Inclusivity – Involving all parts of our communities in understanding and addressing the climate resilience challenges, including how to overcome socio-economic barriers, and enabling them to connect with the local blue/green spaces for better health.
- ✓ Project connections, developing new and broad ranging collaborations across sectors to maximise the benefits of environmental and bio-diversity net gain initiatives, and provision of stimulating natural play space for children, social interaction and 'ownership'/stewardship of local spaces by the communities that live and work in them. There is scope for real innovation.

4. Conclusion and recommendation

Climate resilience is a priority topic for the region and should be considered a cross-cutting theme throughout the work and approach of the new Commission. As well as consideration in each activity of the Commission, it is suggested that an initial focus is on the development of the regional climate change risk assessment and action plan. This will enable the Commission to grow alignment and momentum around a bold and positive vision for a climate resilient Yorkshire. Such a vision requires consensus on what we are collectively aiming for and what good looks like, so another early task of the Commission could be to build suggest and build consensus around a suitable climate resilience goal.

In addition to this introductory paper, early funding is enabling a more detailed piece of work to support the Commission in its goals. This will further inform the Commissions discussions and will be shared with the Commission in the months ahead to support further exploration and progress towards a shared vision.