Report of the Climate Change Adaptation Task and Finish Group

Making Warwickshire Sustainable for Future Generations

Warwickshire County Council

Recommendations

That Cabinet:

1 Adopts the Met Office's UK Climate Projections as the basis of Warwickshire County Council's expectation of the climate in 2050 and plans to this effect.

2 Provides clear direction through the Council Plan 2020-2025 detailing actions that will be taken to prepare Warwickshire for the change in climate to come.

3 Includes the impact of projected climate change in the assessment criteria for prioritising options and schemes that come forward for capital investment, which will prepare Warwickshire for the 2050 projected climate.

4 Produces an updated Climate Impact Assessment for Warwickshire assessing the economic and social impact of the expected changes in climate on key areas of the Council's responsibility and quantifying the costs of investment against the costs of inaction.

5 Establishes a standing group comprised of members from all political groups and officers, chaired by the Portfolio Holder for Environment and Heritage & Culture to advance work on climate change adaptation.

i) That the standing group uses the themes identified in this report to develop an action plan within six months setting out the activity to be undertaken by the County Council in the short, medium and long term.

ii) That consideration be given to the establishment of a dedicated resource to coordinate climate change adaptation and mitigation efforts.

Executive Summary

The Climate Change Adaptation Task and Finish Group (The Group) began its work in July 2019 and was tasked with investigating how a changing climate in Warwickshire will impact on Warwickshire County Council's (WCC) ability to deliver services, and to identify steps to make services more robust.

The Group first carried out a desktop study to gain a picture of how the climate in Warwickshire is likely to change over the next 30-80 years. **Evidence showed that, on average, by 2050 summers would be warmer and drier with a 50% chance of a summer being as hot as 2018.** While summers may be drier, when it does rain this rainfall will be more intense. The average winter temperature is also likely to increase along with increased rainfall.

The level of change in the climate over the next 100 years will depend upon global emission levels, but due to inertia in the climate system conditions will change over the next 30 years regardless of any carbon reduction work. This means that **WCC will need to implement adaptation policies alongside its carbon reduction work** and the two must be seen as equally important.

The Group gathered evidence from 14 officers from across the Council at a workshop held in September 2019. Attendees were asked to identify risks and possible ways to overcome them as well as highlight adaptation work already being done.

Officers were given two weather scenarios; hotter, drier summers (with summer storms) and warmer, wetter winters. Across two group discussions 150 post-it notes were filled with risks and opportunities. Tree planting, water management and infrastructure investment were identified as key strands for effective adaptation to predicted summer and winter climates.

The Group has produced five recommendations that ask Cabinet to take a strategic approach to adaptation, drawing together the risks and opportunities identified across the organisation and to set adaptation at the centre of WCC's planning to help make Warwickshire sustainable for future generations.

Climate Adaptation and the Warwickshire Climate

The Met Office's UK Climate Projections (UKCP) (2018) give an indication of how we can expect Warwickshire's climate to change over the next 30 - 80 years. The Met Office uses different emission levels to predict the changes in climate but even with drastically reduced emissions the climate will still change. This means that regardless of actions taken to reduce carbon emissions, Warwickshire will need to adapt to climate change.

Adaptation, Mitigation and Climate Inertia

There are two main policy responses to climate change: **mitigation** and **adaptation**. Mitigation addresses the root causes, for example by reducing greenhouse gas emission while adaptation seeks to lower the risks posed by the consequences of climate change.

Climate Inertia refers to the latent effect of greenhouse gases already released into the atmosphere. This means that mitigation strategies may not show an immediate impact due to the complex nature of interrelated climate systems.

CO2 has a lifecycle of around 100 years, which means that even if we entirely cut global carbon emissions tomorrow, there would still be a century-long legacy of climate change.

Guidance from the Town and Country Planning Association and Royal Town Planning Institute recommends that "climate adaptation must be understood as the main priority for long-term planning to secure climate resilience, and must be accepted as equally as important as meeting housing need."[1]

The Climate Change Adaptation Task and Finish Group has based its work on the Met Office's projections for the Midlands, particularly focusing on the low emissions or best case scenarios.

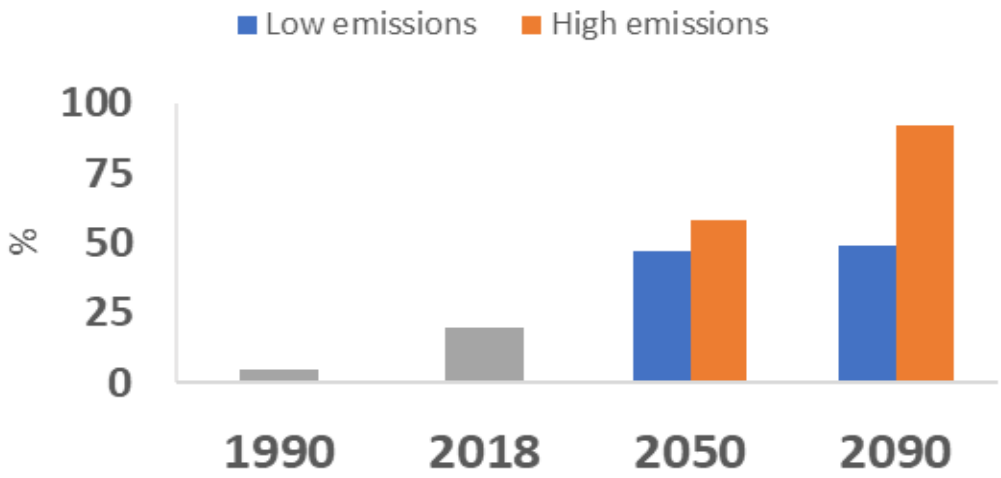
All areas of the UK are expected to experience warming according to the UKCP. Warming is anticipated to be greater in the summer than the winter. It is anticipated that the UK will see an increase in the average annual temperature of up to 2.3°C by 2100[2].

[1] Planning for Climate Change: A Guide for Local Authorities – TCPA/RTPI, May 2018

[2] BBC News Article, 26 November 2018 https://www.bbc.co.uk/news/science-environment-46343103 and UK Climate Projections: Headline Findings, 9 September 2019 https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp-headline-findings-v2.pdf

Hot summers are expected to become more common; in the recent past (1981-2000) the chance of seeing a summer as hot as 2018 was lower than 10%. The likelihood has already increased due to climate change and is now between 10-25%. With future warming, hot summers by mid-century could become even more common, near to 50% (UKCP 2018).

Diagram 1: **Chance of exceeding summer 2018 temperature**



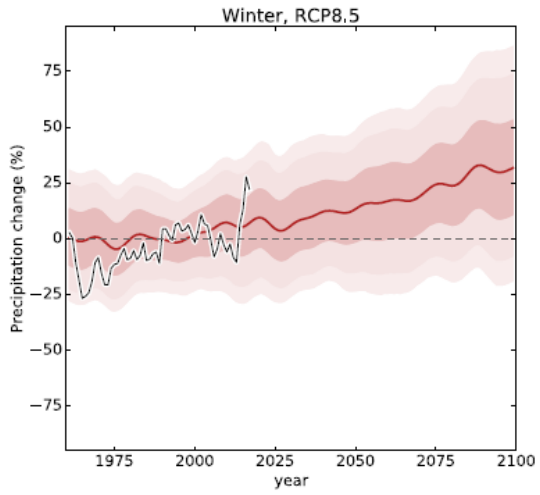
These projected warmer summers are likely to be much drier, with average summer rainfall anticipated to drop by 47% by 2070. Climate change is projected to reduce the amount of water in the environment that can be sustainably withdrawn whilst increasing the demand for irrigation during the driest months.

While average precipitation in the summers is expected to reduce, at the same time rainfall during the winter is predicted to rise (UKCP 2018). Global warming is expected to lead to more extreme rainfall, with the UK anticipated to receive around 10% more rainfall on average per year by 2100 compared to the levels recorded between 1986 – 2005, according to the Intergovernmental Panel on Climate Change (IPCC). Significant areas of Warwickshire are subject to flood risk, with around one in seven commercial properties and one in ten residential properties being at risk of flooding from rivers or surface water.[3]

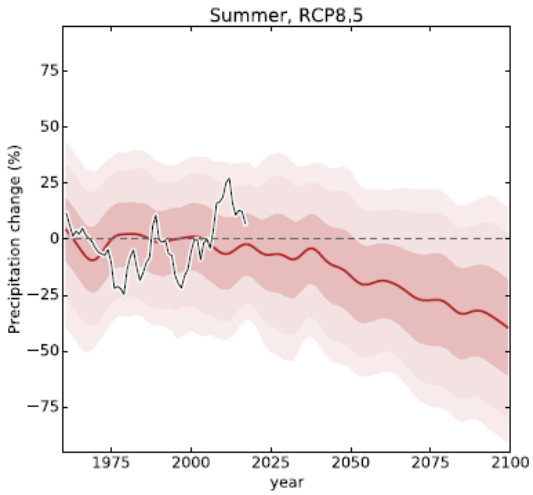
[3] WCC Local Flood Risk Management Strategy: https://www.warwickshire.gov.uk/swmp

Diagram 2:

Future UK Winter Precipitation



Future UK Summer Precipitation



An increase in the frequency of heavy rain, flash flooding and unseasonably strong winds is also anticipated during the summer months. Summer storms have the potential to cause more serious impacts as a greater number of people are likely to be outdoors, especially by the coast.[4]

Summary of the workshop findings

The Group held a workshop with officers in September 2019 to consider the impact of climate change on Warwickshire; focusing on the risks posed to Warwickshire County Council's ability to deliver services. The attendees were drawn from across the council, representing; Highways Engineering, Transport Planning, Tree Inspections, Planning, Public Health, CSW Resilience, Ecology, Infrastructure and Regeneration, Flood Risk Management, Fire and Rescue, Construction Services, and Energy.

Officers were given two scenarios (appendix B) to consider, drawn from the Met Office's predictions for the 2050 climate. The first scenario covered warmer, drier summers with periods of intense rainfall and the second looked at milder winters with significantly increased precipitation. Over two hours attendees identified risks, highlighted the good work already being undertaken across the Council and considered how WCC could build resilience. The ideas put forward are summarised in figures 1 and 2.

It was clear from feedback that teams across the Council are already working to adapt to climate change and that in its officers, WCC has the expertise, inventiveness and enthusiasm necessary to successfully build a sustainable county. In order to make best use of these assets the County will need to take a more strategic approach to adaptation as severe weather events will have cross cutting

[4] BBC News Article, 9 August 2019: https://www.bbc.co.uk/news/uk-wales-49265965

impacts that need to be addressed through a whole system approach. It was felt that increased resources would be necessary to adopt a more proactive approach and it was suggested that WCC should try to bring in more outside funding and that appointment of a Grants Officer may be the best way to facilitate this.

A recurring theme of the workshop was **water management**; Warwickshire will need to have the capacity to both deal with increased rainfall in the winter and intense storms in the summer while also capturing more water to manage demand with water shortages during hotter drier summers. These competing demands mean that the Council will have to be more ambitious when looking at drainage solutions and SuDS will play a key role in this.

SuDS – Sustainable (Urban) Drainage Systems

SuDS seek to align with the natural water cycle to re-use and store surface water, control the flow of water downstream and remove pollutants by using a series of drainage features working in conjunction for example; green roofs reduce the volume of rainwater, then a bioswale (ditch) helps to remove pollutants before water is captured in a retention pond or soaks into the ground through soakaways.

The use of SuDS to capture and re-use rainwater will help to maintain plant life through the drier summers without increasing water usage. Increased rainfall in the winter will overwhelm our traditional drainage infrastructure and controlling the rate at which water enters the drainage system using SuDS will help make Warwickshire more resilient to floods. WCC has the opportunity to be a lead the county and region in implementing SuDS when it brings forward developments. The Council can demonstrate best practice and influence development, moving thinking forward and having a real impact on developments.

SuDS will also be fundamental to successful **tree planting** in the county which was highlighted as another key adaptation policy. Urban trees can provide shade to cool buildings in the summer and insultation in the winter without the need for increased energy usage. The water captured and stored by SuDS will keep trees healthy through the summer. Urban trees carry risks such as damage to buildings caused by roots. Providing a water source close by will limit root growth and minimise the risk to surrounding buildings and the highway.

Hotter, Drier, Summers

Risks
Actions WCC are already taking
Opportunities for future action

Transport

Damage to Transport Infrastructure
Road surfaces will melt in sustained high temperatures and will be harder to repair as tarmac will take longer to harden keeping roads closed for longer. Train tracks will warp in heatwaves.

Investing in Buildings and Infrastructure
WCC could take a strategic, proactive approach to upgrading heating/ cooling systems in buildings rather than replacing broken equipment on an ad hoc basis.

Proactive investment in road surface materials that will withstand higher temperatures would reduce future maintenance costs and road closures.

Infrastructure Maintenance
WCC has an existing highways and bridge maintenance budget and has invested in improved materials.

Buildings

Building Standards
WCC is developing an improved design guide and is exceeding minimum standards in its own developments.

Need to keep buildings cool
Council buildings will need to be kept habitable during heatwaves.

Subsidence
As clay soil dries it contracts leading to subsidence. Tree roots will spread further looking for water in drier weather risking growth under buildings causing subsidence.

CSW Resilience
The CSW Resilience Team produce a Heatwave Plan.

Water Use
Water reuse promoted in the planning hierarchy to encourage the use of water-cooling systems.
Drainage system to water capture rather than dispersal to help combat droughts.
Fire and Rescue drawing water from Kingsbury Lakes year-round.

Planting Trees
Existing budgets do allow for some tree planting. This is supplemented by planting associated with planning applications.

Planting trees to provide shade and cool buildings.

Green Infrastructure
WCC has a green infrastructure strategy.

Green Infrastructure

Increased Risk of Wild Fires
Dry vegetation poses a fire risk. Wild fires are likely to start in areas that are less accessible.

Working in PPE becomes more difficult in hotter weather (which will impact fire officers and highways maintenance crews).

Tree Planting and Maintenance
Planting trees in urban areas provides shade to keep building cool. WCC needs to take a strategic approach to ensure that this is effective and to minimise negative side effects (damage caused by roots) this could include i.e. using SuDS to capture rainfall to maintain plants through dry periods and planting species that can survive in a warmer climate.

Working with the community to maintain trees; water trees to help them establish themselves and then clearing leaves from gullies/drains if there is the threat of heavy rain.

Loss of Native Species

- Native species (and traditional crops) will struggle to adapt at the rate at which the climate is expected to change.
- New species will be able to thrive in the warmer, drier climate providing new competition for native species.
- New diseases will also impact plant and animal life as well as posing a public health risk.
- Loss of keystone species could lead to whole ecosystem collapse.
- Reduced yield from traditional crops will impact on the food supply as well as the economic viability of local farms.

Pressure on Social Care System
The very young and the elderly are most vulnerable to high temperatures.

Infectious Diseases
An increase in biting insects could lead to the spread of diseases that are not currently seen in Warwickshire such as Malaria or Dengue Fever.

This can already be seen in the increase in cases of Lyme disease, spread by ticks.

Public Health Risks
WCC can work with CCGs and local NHS trusts to ensure that new diseases can be quickly and effectively diagnosed and treated.

Disease

Public Health Risks
WCC advises public to risk of ticks in country parks.

WCC provides information and warnings about expected heatwaves to health partners.

Diversifying the Species in Warwickshire
WCC can diversify the species that it plants to increase the resilience of wildlife in the County.

WCC can issue advice on planting to small holders and work with farmers and the NFU to influence the types of crops being grown. As well as securing the food supply this could also bring opportunities to expand into new markets.

- Intense rain after periods of dry weather mean that flash floods will be more likely.
- Increase in traffic accidents resulting from hazardous driving conditions.
- Trees are more vulnerable to high winds when they are in leaf.

Drainage systems can be used to capture water during storms and then keep plants healthy during heat waves.

Planting additional trees will intercept rainfall and help to prevent flooding.

Summer Storms

- Stormwater attenuation: introduction of sections of large diameter drainage pipe
- Review criteria for dropped kerb vehicle access applications
- WCC could bid for CIF funding to improve the condition of bridges.

- Bridge Scour: Removal of sediment such as sand and gravel from around bridge abutments caused by swiftly moving water, compromising the integrity of a structure.
- WCC could be required to replace existing river bridges with more substantial structures through the Construction Law Court. WCC is anticipating defending a case in the court in 2019.
- Risk of motorists being stranded in flood water and disruption to rail services.
- Dropped kerb vehicle access reducing drainage capacity on the side of the highway

Flood Risk Team

WCC has a team that looks at flood risk and consults on planning applications.

Risks
Actions WCC are already taking
Opportunities for future action

Transport Infrastructure

Depth gauges have been installed on areas of highway prone to flooding to alert motorists

Forestry vehicles used to enable health care visits during floods and extreme weather

Flood Prevention

The Minerals and Waste Strategy includes flood alleviation works over the long-term.

Schemes already being implemented to alleviate flooding such as on Stratford Road.

Assessing the speed and different characteristics of floodwaters.

Flood Prevention

WCC is beginning to map gullies/ drains and track when they were cleared. This will create a full inventory and allow for maintenance to be better planned.

Increased Winter Rainfall

Planning

- WCC to take a leading role when bringing forward developments, specifically in the implementation of SuDS and landscaping plans. WCC can implement best practice SuDS which it can then use to influence private developments.
- Flood Risk Team to be consulted on planning applications for developments of fewer than ten houses, as well as major developments.
- New developments to have good balancing ponds and closer liaison with Severn Trent.
- Develop a sustainable construction policy that takes future climate changes into account.

Asset Management

- Develop a Strategic Asset Management Policy that takes account of climate change.
- WCC to use existing land, and purchase land, for natural attenuation, sustainable crops, solar power, water storage, tree planting and carbon capture
- Tree planting to intercept rainfall and prevent erosion.

Planning

Building Standards

Legislation only allows the council to require a 'lack of detriment' to surface water drainage from developments rather than asking for an improvement. This is failing to create the necessary resilience to deal with increased rainfall.

Water Management

- Repurposing of quarries to hold flood water once extraction work has been completed.
- Water Harvesting: Consideration to be given to methods to store water for use during periods of drought.
- Maintain a record of who is responsible for drainage infrastructure.

Drainage Infrastructure

- Existing infrastructure unable to cope with the increased amount of water.
- "Sewer Spills" risk of contaminated water entering ponds and watercourses

Flooding

- Psychological impact of flooding – loss of possessions, damage to property.
- Expectation that WCC will collect flood damaged furniture and carpets. Risk of fly-tipping.
- Risk to vulnerable people isolated by flooding; likelihood that carers and social workers will not be able to reach clients.
- Pressure on Emergency Services from increased demand resulting from flood rescues.
- Disruption to supply chains and damage to business will harm productivity.

Community Resilience

Community Resilience

WCC could build up community resilience maps and recruit volunteer first responders.

Conclusions and Recommendations

Recommendation 1
That Cabinet adopts the Met Office's UK Climate Projections as the basis of Warwickshire County Council's expectation of the climate in 2050 and plans to this effect.

The evidence shows that there is a need to review the ways in which the Council works and the projects it invests in to ensure that we can continue to effectively provide services into the future. Warwickshire County Council adopting a shared view of the likely climate and an agreed canon of scientific evidence means that everyone across the organisation will start from the same place when considering what measures need to be in place to ensure that a project is fit for the future.

Recommendation 2
That Cabinet sets a clear objective in the Council Plan 2020-2025 to prepare Warwickshire for the changing climate.

Given the inertia in the climate system, the temperature and weather conditions in Warwickshire will change irrespective of what happens to global emission levels. Climate adaptation must thus be considered as an equal priority to carbon reduction and the Council Plan 2020-2050 needs to reflect this.

Recommendation 3
That Cabinet Provides clear direction through the Council Plan 2020-2025 detailing actions that will be taken to prepare Warwickshire for the change in climate to come.

The task of adapting to climate change is not a short-term project and will require long-term planning and investments. The implications of the expected future climate will need to form part of a framework that, as well as highlighting future benefits, allows for investments to be weighed against the cost of inaction. For example, cheaper traditional road surfacing materials may not constitute good value for money over the longer-term when more extreme climate events are taken into account whereas a more expensive option may prove more resilient and actually reflect a saving.

Recommendation 4
That Cabinet produces an updated Climate Impact Assessment for Warwickshire assessing the economic and social impact of the expected changes in climate on key areas of the Council's responsibility and quantifying the costs of investment against the costs of inaction.

The desktop research carried out by the Task and Finish Group and the evidence provided by officers has given a strong foundation to build upon in terms of understanding the impact of climate change on the county and Council services. This needs to be taken forward and expanded to estimate the economic and social costs of inaction. This analysis can then help to identify priority areas when considering investments. The production of the Assessment would require the short-term commitment of some officer resource.

Recommendation 5
That Cabinet establishes a standing group comprised of members from all political groups and officers, chaired by the Portfolio Holder for Environment and Heritage & Culture to advance work on climate change adaptation. i) That the standing group uses the themes identified in this report to develop an action plan within six months setting out the activity to be undertaken by the County Council in the short, medium and long term. ii) That consideration be given to the establishment of a dedicated resource to coordinate climate change adaptation and mitigation efforts.

If the challenges of climate change adaptation are to be met, the Council will need to take a strategic and cohesive approach that is driven by senior officers and Councillors from all parties. The workshop gave a clear steer as to which risks need to be tackled, and suggested potential solutions, but these need to be investigated and developed into an action plan.

Workshop attendees identified a huge breadth of risks and possible solutions in two 40- minute sessions and it is unlikely that their feedback constitutes a complete list of everything that the Council will need to consider. In order to build the capacity to face the issue of climate change the Council may benefit from establishing a specific resource tasked with supporting the implementation of climate adaptation (as well as carbon reduction) policies.

Appendix A

Examples of Climate Adaptation Work from Other Local Authorities

Cambridge City Council has produced a comprehensive and far-reaching Climate Change Adaptation Plan recommending the use of SuDS for new developments, high standards of water efficiency, and design standards for new housing which limits the potential of overheating:
https://www.cambridge.gov.uk/media/5996/climate-change-adaptation-plan.pdf
https://www.cambridge.gov.uk/adapt-to-climate-change

The Northamptonshire Climate Change Strategy 2017 – 2020 offers a detailed assessment of the impacts of climate change and identifies measures to adapt to changing conditions. These include SuDS, tree planting and a "Green Leaders" project to recruit young adults to raise awareness within their communities:
https://www3.northamptonshire.gov.uk/councilservices/environment-and-planning/climate-change/Pages/climate-change-strategy.aspx

The Lancashire Climate Change Partnership has presented an in-depth Strategy Report providing a scientific basis, detailed regional emissions stats, local climate impacts, carbon reduction targets and objectives for adaptation:
https://www.lancashire.gov.uk/media/190306/Lancashire_Climate_Change_Strategy_2009_2020.pdf

West Lothian Council has provided an accessible on-line resource of information including council-led initiatives to mitigate and adapt to the effects of climate change:
https://www.westlothian.gov.uk/climate-change

The summary document for the Nottinghamshire Local Climate Impacts Profile is well-designed and succinct, offering a balanced view of key findings as well as the regional implications of climate change:
https://www.nottinghamshire.gov.uk/media/109734/local-climate-impacts-profile.pdf

CAG Consultants has produced an overview of local authorities' responses to climate change and the methodologies adopted to ensure improved resilience:
https://climate-adapt.eea.europa.eu/metadata/publications/adapting-to-climate-change-local-areas-action/11238630

Useful Resources

Met Office, UKCP18 National Climate Projections (2018): https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18-overview-slidepack.ff.pdf

Met Office, UK Climate Projections: Headline Findings (September 2019, version 2): https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp-headline-findings-v2.pdf

The Committee on Climate Change, Preparing for Climate Change: https://www.theccc.org.uk/tackling-climate-change/preparing-for-climate-change/

Town and County Planning Association, Planning for Climate Change (December 2018): https://www.tcpa.org.uk/planning-for-climate-change

DEFRA, Climate change: second national adaptation programme (2018 to 2023): https://www.gov.uk/government/publications/climate-change-second-national-adaptation-programme-2018-to-2023

Sustainable Development Unit (Environment Agency), Under the Weather - Adapting to a changing climate (2015): https://www.sduhealth.org.uk/areas-of-focus/community-resilience/community-resilience-copy.aspx

Warwickshire County Council, Local Flood Risk Management Strategy and Surface Water Management Plan: https://www.warwickshire.gov.uk/swmp

CLASP, Adaptation Risk Assessment Resource Pack: http://www.claspinfo.org/adaptation-risk-assessment-pack

Climate Just, Socially vulnerable groups sensitive to climate impacts: https://www.climatejust.org.uk/socially-vulnerable-groups-sensitive-climate-impacts

Forest Research, The influence of climate change on forest insect pests in Britain (2016): https://www.forestresearch.gov.uk/research/the-influence-of-climate-change-on-forest-insect-pests-in-britain/

HM Government, UK Climate Change Risk Assessment (2017): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/584281/uk-climate-change-risk-assess-2017.pdf
http://randd.defra.gov.uk/Document.aspx?Document=CCRASummaryAgriculture.pdf

The Environment Agency, Climate change impacts and adaptation (2018): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/758983/Climate_change_impacts_and_adaptation.pdf

Appendix B

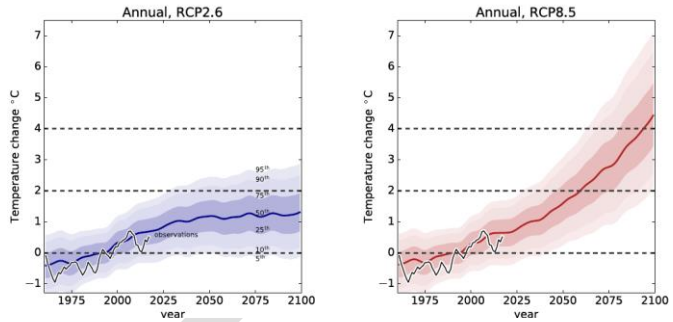
Heatwave Scenarios

All areas of the UK are projected to experience warming according to the **Met Office UK Climate Projections (UKCP) of 2018**. Warming is anticipated to be greater in the summer than the winter. Future rise depends on international levels of greenhouse gas emission.

Future UK temperatures

RCP2.6 (left) represents a best case scenario in which a concerted international response to climate change has been put in motion. RCP8.5 (right) represents a worst case scenario in which emissions have continued to rise contributing to increased atmospheric concentrations of CO2 and accelerated global heating.

For a central location in England, the Met Office forecasts that in a high emissions future, temperatures could rise by as much as 5.8°C. Under a low emissions scenario, it is anticipated that the UK will see an increase in the average annual temperature of up to 2.3°C by 2100.



Representative Concentration Pathways (RCPs) are scenarios that describe alternative trajectories for greenhouse gas emissions and the resulting atmospheric concentration from 2000 leading up to 2100.

Hot summers are expected to become more common; in the recent past (1981- 2000) the chance of seeing a summer as hot as 2018 was lower than 10%. The likelihood has already increased due to climate change and is now between 10-25%. With future warming, hot summers by mid-century could become even more common, near to 50%.

CO2 has a life-cycle of around 100 years, which means that even if we entirely cut global carbon emissions tomorrow, there would still be century-long legacy of climate change.

With the likelihood of a heatwave comparable with the summer of 2018 occurring as regularly as every other year; a unified strategy to address and adapt to the implications of climate change will be essential.

These projected warmer summers are likely to be much drier, with average summer rainfall anticipated to drop by 47% by 2070.

However, an increase in the frequency of heavy rain, flash flooding and unseasonably strong winds is also anticipated during the summer months. Summer storms have the potential to cause more serious impacts as more people are likely to be outdoors, especially by the coast. Additionally, with trees in full leaf they are more vulnerable to being brought down by strong winds.

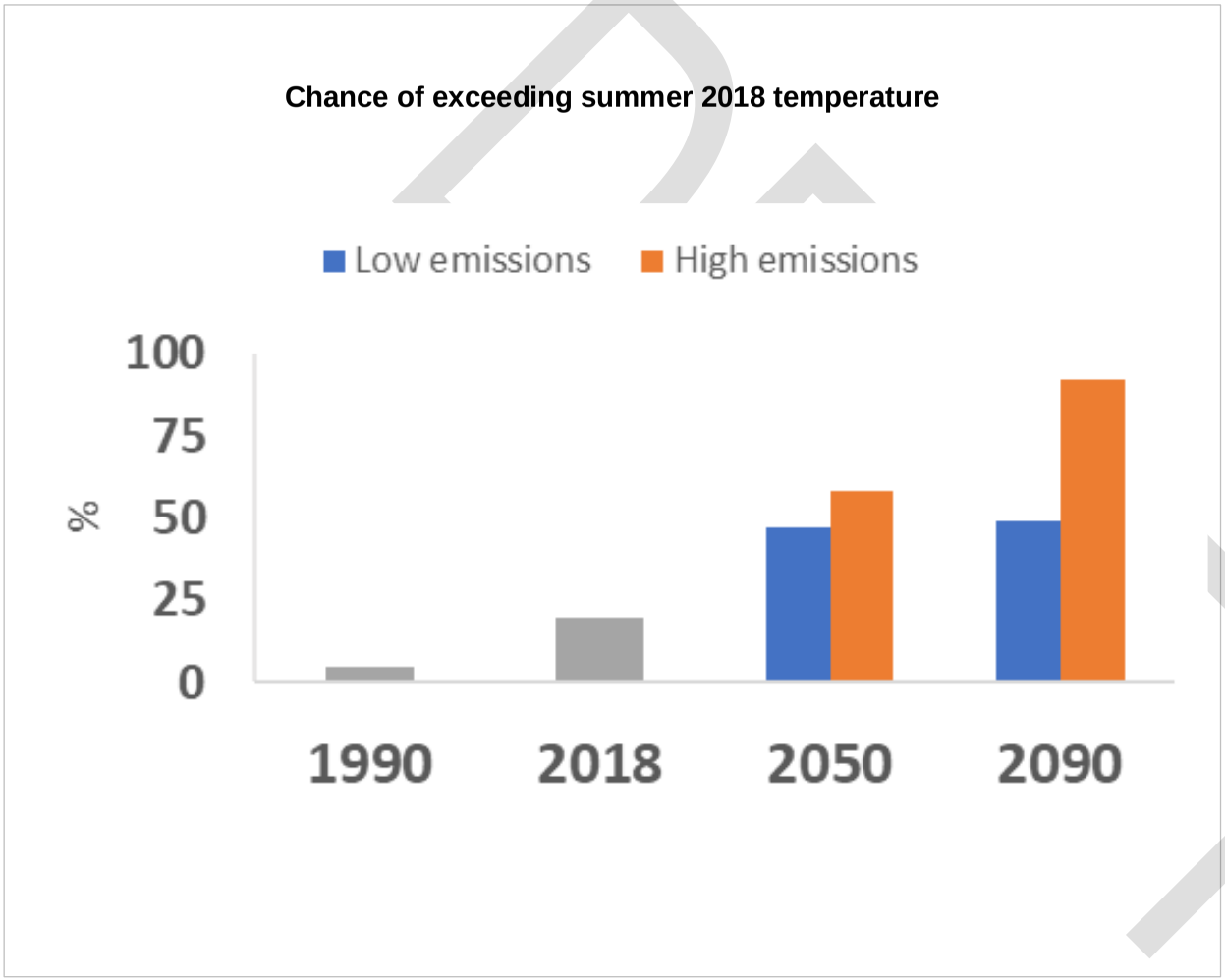
Climate change is projected to reduce the amount of water in the environment that can be sustainably withdrawn whilst increasing the demand for irrigation during the driest months. At the same time the growing population will create additional demands on already stretched resources in some parts of the country. Even low population growth and modest climate change scenarios suggest severe water supply deficits, and with high population growth and more severe climate change these deficits are predicted to deepen and, by the 2050s, extend across the UK.

The growing, ageing population of the UK means that the number of vulnerable people at risk is increasing. The number of premature heat related deaths is expected to more than triple by the 2050s. Many newly built homes are not resilient to predicted climate conditions; concerns have also been identified in respect of the effect of future temperatures on hospitals, care facilities, schools and prisons.

Extreme heat can have a range of impacts. Hot spells can lead to impacts on human health, especially in urban areas where buildings retain heat, resulting in higher night time temperatures. Impacts on transport can include buckling of rail tracks and melting of tarmac road surfaces. Prolonged heat can create favourable conditions for wildfire.

https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18-overview-slidepack.ff.pdf

https://www.theccc.org.uk/tackling-climate-change/preparing-for-climate-change/



2018 was the joint hottest summer on record for the UK as a whole, and the hottest ever for England according to the Met Office.

Hot summers are expected to become more common; in the recent past (1981- 2000) the chance of seeing a summer as hot as 2018 was lower than 10%. The likelihood has already increased due to climate change and is now between 10-25%. With future warming, hot summers by mid-century could become even more common, near to 50%.

CO2 has a lifecycle of around 100 years, which means that even if we entirely cut global carbon emissions tomorrow, there would still be a century-long legacy of climate change.

Flooding Scenarios

Significant areas in Warwickshire are subject to flood risk, with around one in seven commercial properties and one in ten residential properties being at risk of flooding from rivers or surface water.

Scientists expect global warming to lead to more extreme rainfall with the **UK receiving around 10% more rainfall** on average per year by 2100 compared to 1986 – 2005, according to the Intergovernmental Panel on Climate Change (IPCC).

Under a best case scenario, the Committee on Climate Change (CCC) has calculated that the number of **residential properties in the UK at risk of flooding** is likely to increase by 40% within the next 65 years, from 860,000 today to 1.2 million. Under a worst case scenario this figure rises to 1.7 million, constituting a 93% increase. These estimates assume no population growth and adaptation continuing at current levels.

The data also suggests significant **risks to infrastructure** assets, with the number of sites in the UK exposed to the highest chance of flooding increasing by 30% in a best case scenario, and by 200% in a worst case scenario by the 2080s.

The study suggests that the **length of railway line** located in areas exposed to the highest chance of flooding is subject to a 53% rise in the best case, and 160% increase in the worst, high emission, future scenario.

The **lengths of major highway** in the UK exposed to flooding rises by 41% in the best case, and by 120% in the worst case.

The proportion of **railway stations** prone to flooding by 2080 rises by 10% in an optimistic forecast, to 28% in a high emission forecast.

The IPCC has reported that climate change **could increase the annual cost of flooding in the UK almost 15-fold by the 2080s** under high emission scenarios.

Ambitious approaches to adaptation could offset increases in expected annual flood damage if global warming is limited to 2°C. However, local impacts will vary considerably; some communities will be significantly at risk. This will affect property values, business revenues, and in extreme cases the viability of communities. Risks to communities and local economies are closely linked to the resilience of local infrastructure, in particular energy, transportation and communications systems.

The threatened collapse of Whaley Dam in Derbyshire illustrates the urgent nature of the UK's preparedness for climate change. The CCC has recommended to Parliament that ageing infrastructure be treated as a priority. Should climate change impacts, such as dam collapses, become more commonplace there could be serious implications for emergency response agencies.

In February, the Environment Agency warned that if global temperatures continue to rise in line with current trends, the UK will need to spend £1 billion a year to adequately protect homes from flooding. Currently the UK government spends just under two-thirds of that amount – £600 million. Meanwhile, the risk of flooding appears to be an upward concern.

While the risk of heavy flooding is becoming more frequent – the Met Office logged 17 record-breaking rainfall months since 1910, with nine of them since 2000 – the UK remains reliant on flood defence systems to limit its impact. The Environment Agency has recommended that "we need to develop consistent standards for flood and coastal resilience in England that help communities better understand their risk and give them more control about how to adapt and respond."

Guidance from the Town and Country Planning Association and Royal Town Planning Institute recommends that "climate adaptation must be understood as the main priority for long-term planning to secure climate resilience, and must be accepted as equally as important as meeting housing need."

By ensuring that adaptation strategies are embedded within planning processes and decision making, local authorities will be able to access essential benefits to health and wellbeing, provision of green infrastructure and flood resilience.

According to the Met Office's most recent climate projections:

- **Winter precipitation** in the UK is expected to increase significantly;
- **Summer rainfall** is expected to decrease significantly;
- But when it rains in summer there may be more **intense storms;**
- Also consistent with the global projections, variability in rainfall is increasing: wet winters will get wetter, but we can still expect to see dry winters. This means that we will need to be resilient to a wider range of conditions.

More information can be found at:

https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/research/ukcp/ukcp18-overview-slidepack.ff.pdf

https://www.theccc.org.uk/tackling-climate-change/preparing-for-climate-change/

https://www.carbonbrief.org/how-much-flooding-is-in-the-uks-future-a-look-at-the-ipcc-report

https://www.bbc.co.uk/news/science-environment-48206325

https://www.tcpa.org.uk/planning-for-climate-change