Climate Adaptation Report (ARP4)

Contents

Our Profile

Warwickshire County Council is dedicated to serving the residents of Warwickshire by providing a wide range of essential services. Our headquarters are located at Shire Hall in Warwick, the county town. We are committed to ensuring the well-being and quality of life for over half a million residents through services such as county roads and rights of way, social services, education, libraries, and more.

We work closely with public, private, and voluntary organisations to improve the quality of life for our residents, focusing on sustainability, community well-being, and efficient service delivery. Our council functions through a structured system of 57 councillors who meet regularly to adopt policies, approve budgets, and oversee the county's strategic functions. We collaborate with five district and borough council - North Warwickshire Borough Council, Nuneaton and Bedworth Borough Council, Rugby Borough Council, Stratford District Council, and Warwick District Council - to ensure comprehensive service delivery and address community needs. The county council handles strategic services such as education, social care, and highways, while the district and borough councils manage more localised services like housing, environmental health, and leisure centres.

Warwickshire is in the West Midlands region of England, bordered by Leicestershire, Staffordshire, Worcestershire, Northamptonshire, Oxfordshire, and Gloucestershire. The county is characterised by a mix of rural landscapes, historic towns, and vibrant communities. With a population of over 500,000 residents, Warwickshire encompasses a diverse and dynamic community.

Introduction

Warwickshire County Council is committed to reducing carbon emissions and ensuring a sustainable future for our county. In line with this commitment, we have approved a Sustainable Futures Strategy aimed at achieving net-zero carbon emissions across the council by 2030 and supporting Warwickshire to reach this target by 2050, or earlier. This strategy not only focuses on reducing emissions but also addresses the significant risks posed by climate change. These risks include damage from weather-induced events such as river flooding, extreme temperatures, high winds, and landslides, all of which have the potential to impact our infrastructure, services, and communities.

To address these risks, we are embedding climate adaptation into key areas, and have started with public health, flood risk management, transport and county highways. We are updating our processes and standards to ensure they account for climate risks and incorporate adaptation measures into day-to-day operations. Our focus is on preparing for the worst while also taking advantage of opportunities to make our systems more sustainable and efficient.

We recognise that resilience is as important as adaptation. It is not enough to prepare for climate risks; we must also ensure that our services continue to function effectively during and after extreme weather events. Through our adverse weather plans and emergency response procedures, we have been able to restore essential services following disruptions. We will continue to strengthen these emergency response capabilities while also implementing longer-term strategies to ensure that Warwickshire can withstand future climate challenges.

Warwickshire County Council is fully committed to ensuring that the county remains resilient, sustainable, and prepared for the impacts of climate change. We are focused on taking proactive steps now to safeguard our communities and infrastructure, ensuring that we are ready for whatever lies ahead.

Climate Change Context

Warwickshire, like much of the UK, is experiencing significant shifts in climate patterns, which are already having observable impacts on the local environment, infrastructure, and communities. The effects of climate change are expected to intensify over time, posing challenges to public services, businesses, and residents. Understanding the climate change context is essential for planning and implementing effective adaptation strategies, which is why Warwickshire County Council is committed to addressing these challenges proactively.

Changing Climate in Warwickshire

Recent climate data and projections for Warwickshire indicate that the county is facing a range of climate hazards, including increased temperatures, changes in precipitation patterns, and an elevated frequency of extreme weather events. These changes are aligned with broader global climate trends and are expected to become more pronounced in the coming decades.

One of the most notable trends in Warwickshire is the rise in average temperatures. In 2022, the county recorded temperatures as high as 39.0°C, surpassing previous records and signalling a shift towards more extreme heat events. As global temperatures continue to rise, it is expected that Warwickshire will experience more frequent and intense heatwaves, particularly during the summer months. This increase in temperature has a range of direct and indirect effects, from increased health risks, particularly among vulnerable populations, to greater demand on water resources, energy use, and cooling infrastructure.

In addition to heatwaves, Warwickshire is experiencing significant shifts in rainfall patterns. While some areas have seen an increase in heavy rainfall events, others face drier conditions during the summer months. These shifts contribute to a higher risk of both flooding and drought, creating a complex set of challenges for the county. Heavy rainfall can lead to surface water flooding, particularly in urban areas, while prolonged dry spells can exacerbate water scarcity and stress on agriculture. The county's existing drainage systems, which were designed for historical climate conditions, may no longer be sufficient to manage the volume and frequency of rainfall events that are predicted.

Key Climate Hazards in Warwickshire

Warwickshire is particularly vulnerable to several climate hazards that can have significant consequences for its people, infrastructure, and economy.

Flooding: The risk of flooding is one of the most pressing climate hazards facing Warwickshire. Changes in rainfall patterns, coupled with higher river levels during periods of intense rainfall, increase the likelihood of river and surface water flooding. Areas along the River Avon and other watercourses in the county are especially at risk. The impacts of flooding are wide-ranging, from damage to homes and businesses to disruptions in transport networks and vital infrastructure.

Extreme Heat: As climate change causes temperatures to rise, extreme heat events are expected to become more frequent. These heatwaves not only pose risks to public health, especially for vulnerable groups such as the elderly, children, and those with pre-existing health conditions, but also have far-reaching effects on agriculture, water demand, and energy consumption. Increased

temperatures can also lead to the deterioration of infrastructure such as road surfaces, railways, and powerlines.

Agriculture: Agriculture is a key industry in Warwickshire, contributing significantly to the local economy and food production in the UK. Nationally, agriculture employs around 1.5% of the workforce and produces about 60% of the food consumed in the UK. In Warwickshire, the agricultural sector is vital, supporting rural communities and maintaining the landscape. However, climate change poses challenges such as crop damage and increased water demand, necessitating adaptive measures to ensure sustainable food production and economic stability.

Storms and High Winds: Increasingly severe storms, accompanied by high winds and heavy rainfall, threaten Warwickshire's infrastructure, including transport networks and power supplies. High winds can cause tree fall, leading to power outages and road blockages, and increase the risk of landslides, particularly in hilly areas. These weather events can also disrupt daily life, particularly in rural areas with limited access to services.

Biodiversity Loss: Climate change is contributing to shifts in local ecosystems, with some species struggling to adapt to changing temperatures and rainfall patterns. Warwickshire's natural habitats and biodiversity are at risk from both direct impacts, such as heat stress and habitat loss, and indirect impacts, such as the spread of invasive species that thrive under new climate conditions.

Water Scarcity: As summers become hotter and drier, Warwickshire faces an increased risk of water shortages. This can affect both public water supply and agricultural production, with potential consequences for food security and water availability for the local population. The ability to manage water resources efficiently and sustainably will be a key challenge for the county.

National and Local Climate Projections

Nationally, the UK Met Office has projected that, under a high emissions scenario, the UK could experience an increase in average temperatures of between 2°C and 4°C by the end of the century. In Warwickshire, this would mean hotter summers, milder winters, and more frequent extreme weather events, including intense rainfall and prolonged droughts.

Local climate models project that by 2050, the county could experience an increase in the frequency of heatwaves and an upsurge in annual rainfall, particularly in the winter months. This would contribute to a greater risk of both river flooding and surface water flooding, as well as increased pressure on water infrastructure. Climate projections also show that these events are likely to occur more unpredictably, leading to increased difficulty in planning and resource management.

Implications for Warwickshire County Council

These climate hazards present numerous challenges for Warwickshire County Council in its role as a provider of public services and infrastructure. The increased frequency of extreme weather events, combined with the changing patterns of temperature and rainfall, will place considerable strain on existing systems and services. The council must ensure that its infrastructure, public health services, and emergency response systems are resilient enough to withstand these climate pressures.

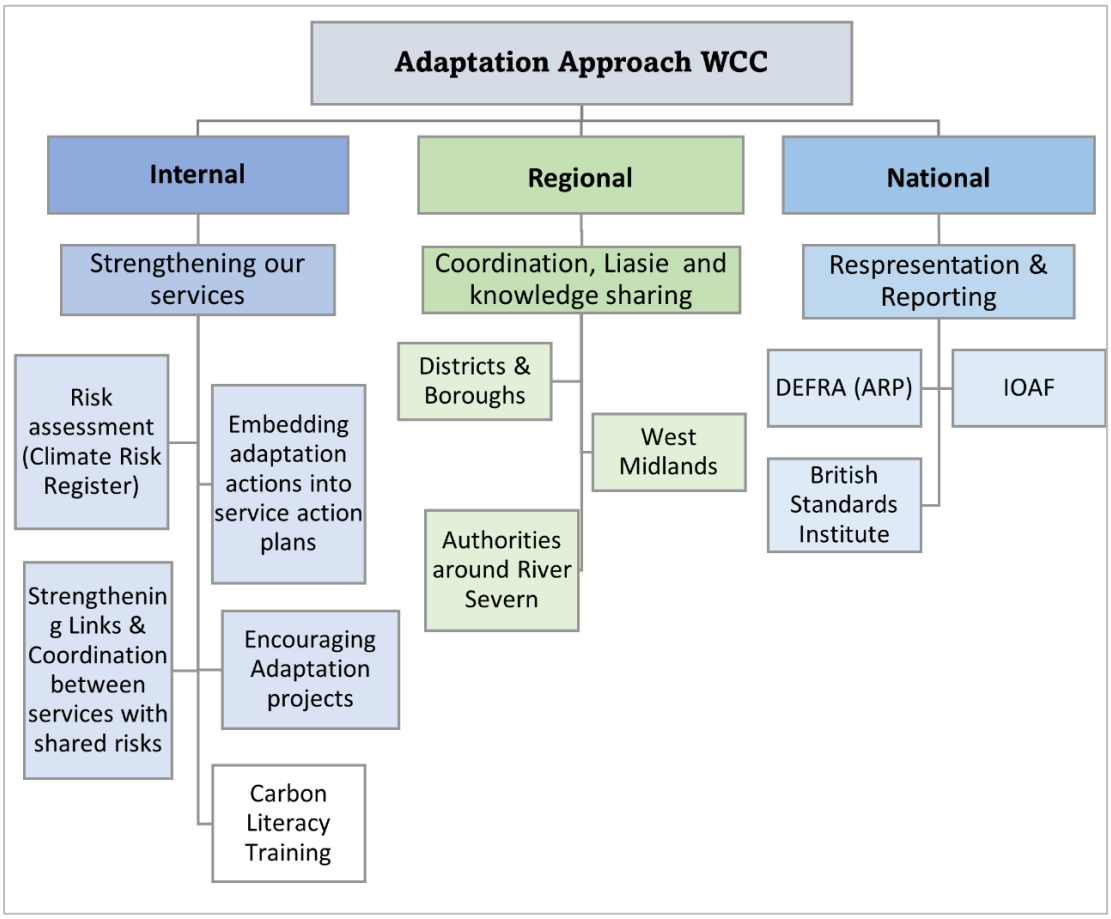
Additionally, Warwickshire's agriculture, economy, and transport systems will require robust adaptation measures to ensure they continue to function effectively in a changing climate. The county council's ability to manage these risks and implement adaptation measures will play a critical role in ensuring that Warwickshire remains a safe and thriving place to live, work, and visit.

Considering these challenges, Warwickshire County Council is committed to implementing a comprehensive climate adaptation strategy to protect its residents, services, and infrastructure from the impacts of climate change. This includes identifying the most vulnerable sectors, investing in resilience measures, and continuously evaluating and refining adaptation actions to ensure that the county can effectively respond to future climate risks.

Climate Adaptation Approach

Warwickshire County Council recognises the critical need to ensure the continued efficient delivery of services, even in the face of the challenges posed by climate change. To achieve this, our adaptation approach prioritises strengthening our services and focusing on building resilience across all areas of council operations to ensure uninterrupted service delivery. We are also concentrating on strengthening our partnerships with external stakeholders to ensure a joined effort towards shared climate risks. Our methodology is centred around a continuous cycle of risk assessment, the development of actionable plans, implementation, and regular evaluation. This ensures that our response to climate change remains proactive, comprehensive, and responsive to emerging risks.

We also emphasise the integration of climate adaptation into every aspect of our work. By embedding these considerations in both existing and new projects, we aim to build a future-proof Warwickshire. In line with this, we actively seek funding opportunities to support adaptation projects, allowing us to implement practical solutions that protect our communities, economy, and environment.



Risk Assessment

The impacts of climate change are inevitable, but their intensity and magnitude will vary depending on several factors, including the exposure to climate hazards and the vulnerability of those affected. We acknowledge the complexity of these risks and take a holistic approach to understanding them. We consider not only direct climate hazards but also the compound, cascading, and interdependent risks that arise when one hazard triggers others, or when different systems or sectors are linked in unforeseen ways.

Given that climate risks are multi-sectoral, effective adaptation requires collaboration within all council services too. Each service area is assigned a specific time for reassessment of their risks and identification of the services with shared risks. The Climate & Sustainability team plays a key role in supporting these services throughout the risk assessment process, ensuring that all practices comply with established British Standards and are aligned with best practices in climate adaptation and creating necessary links between services with shared risks. This coordinated approach helps ensure that we are prepared to manage both immediate and long-term risks, with a focus on minimising disruption to services and enhancing resilience.

Adaptation Strategy

Climate adaptation is fundamental to our operations and future planning. We are aiming for climate adaptation to be part of our planning processes, decision-making, and day-to-day business.

Our adaptation strategy starts with a risk assessment process that helps identify the key vulnerabilities. We then prioritise actions based on the impact they could have and how urgent they are. This considers physical infrastructure and the broader social, economic, and environmental factors that influence our vulnerability. We divide our adaptation efforts into immediate actions and long-term interventions.

Immediate actions are things we can tackle immediately because they fall within our current adaptive capacity. These actions are either easy wins, require minimal resources, or can be implemented quickly.

Long-term interventions are actions that are necessary but go beyond what we can currently handle. For these, we will need to build up our capacity—requiring resources, skills, or infrastructure—so we can take the necessary steps in the future.

In essence, our strategy is a combination of addressing immediate needs while also planning and preparing for future challenges.

We have established strong coordination and collaboration links with local districts and boroughs, as well as other regional organisations. This ensures that our climate adaptation efforts are aligned, and that best practices and knowledge is shared across the county. We also support these partners in developing their own adaptation measures, providing guidance and resources for a cohesive approach across all levels of local governance.

We also actively engage with national policymakers and participate in forums and networks dedicated to climate adaptation. By keeping up to date with the latest national strategies and climate adaptation policies, we can ensure that Warwickshire's interests are well-represented, and that our local strategies align with national climate goals and standards.

Implementation Plan

Our adaptation implementation plan involves a structured approach to categorising and monitoring the vulnerabilities of council services. Each service is assessed for its exposure to climate risks, and these risks are categorised using a color-coding system—red for high vulnerability, amber for moderate, and green for low. This visual representation allows for a clear overview of the adaptation needs across services.

Once a service has been through its assessment, the Head of Service is responsible for maintaining climate risk registers, in which identified risks are logged and periodically reviewed. The Climate & Sustainability team works with service managers to quality assure these registers. Once approved, specific adaptation actions are developed to address the identified risks, with measures categorised into short-term, medium-term, and long-term actions. Responsibility of implementation of the adaptation actions rests with the services and so is the prioritisation of actions. There are several factors that are counted in prioritisation including, likelihood of risk, its impact, vulnerability and above all current adaptive capacity. Based on these factors the action timeline is also determined. The climate risks are recorded in present real-time scenario and therefore in our adaptation action register the action timelines are current (immediate), current and on-going (continuous action) and planned (by 2030)

These actions will be embedded into service action plans, and we expect the process of reassessment and adaptation to continue a regular basis, ensuring ongoing improvements and timely responses to emerging climate challenges.

Monitoring and Evaluation

We expect effective monitoring and evaluation to be integral to our process, planning regular assessments to evaluate the progress of our adaptation actions and ensure that the strategies we implement are having the desired effect. Our monitoring and evaluation of these actions are systematic, with key components including regular reporting, periodic reviews, and adaptive management to ensure our adaptation actions are not only effectively monitored and evaluated but also continuously improved and adapted to remain relevant and effective.

- **Regular Reporting:** Services will report annually on the progress of action implementation.
- **Periodic Reviews:** Climate and Sustainability Team along with the service would conduct regular reviews to incorporate new scientific data, technological advancements, and lessons learned from past actions, aiding in continuous plan improvement. Review meetings with service heads will provide opportunities to assess progress, address challenges, and adjust actions where necessary.
- **Adaptive Management:** Maintain a flexible approach to allow for adjustments based on monitoring and evaluation outcomes, ensuring actions remain relevant and effective.

Funding and Resources

The initial risk assessment phase is conducted using internal resources, which helps establish a baseline without requiring additional funding. Where possible adaptation actions will be carried out within existing service budgets. However, for actions that require additional resources, we will continue to look for funding opportunities to support the prioritisation of these actions.

Capacity Building

Recognising that effective adaptation requires the engagement of all council staff, stakeholders, and the community, we prioritise capacity building through training and educational programs. These initiatives aim to enhance the understanding of climate risks and adaptation strategies, empowering individuals, and teams to take informed action. Regular workshops, meetings, and online training

courses are organised to ensure that council officials particularly from key services remains up to date with the latest climate adaptation developments and best practices.

By continuously building the capacity of our teams and partners, we aim to create a culture of climate resilience throughout the county, equipping all involved to respond effectively to the challenges ahead.

Climate Risks and Vulnerabilities

Risk assessment scope

Our climate risk assessment scope is designed to ensure the continuous and efficient delivery of services (see Profile above) amidst the challenges posed by climate change. The assessment began with a focus on critical services that have a high impact on the community, including Fire & Rescue, Public Health, Flood Risk Management, Transport, and County Highways. Recognising the importance of cultural and heritage assets (including County Records), the scope has been expanded to include these areas as well.

The Council's approach involves a thorough examination of current climate risks through detailed data analysis, stakeholder consultations, and historical climate data reviews. Additionally, the assessment incorporates predictive modelling to forecast future scenarios based on high emissions projections towards the end of the century. This forward-looking perspective helps in identifying potential vulnerabilities and developing robust adaptation strategies.

As part of its commitment to comprehensive risk management, Warwickshire County Council plans to gradually extend the scope of its climate risk assessment to cover the majority council services. This phased approach ensures that each service area is systematically evaluated and equipped with the necessary measures to enhance resilience against climate impacts. Through this proactive and inclusive strategy, the Council aims to safeguard public welfare, infrastructure, and heritage while promoting sustainable development across the county.

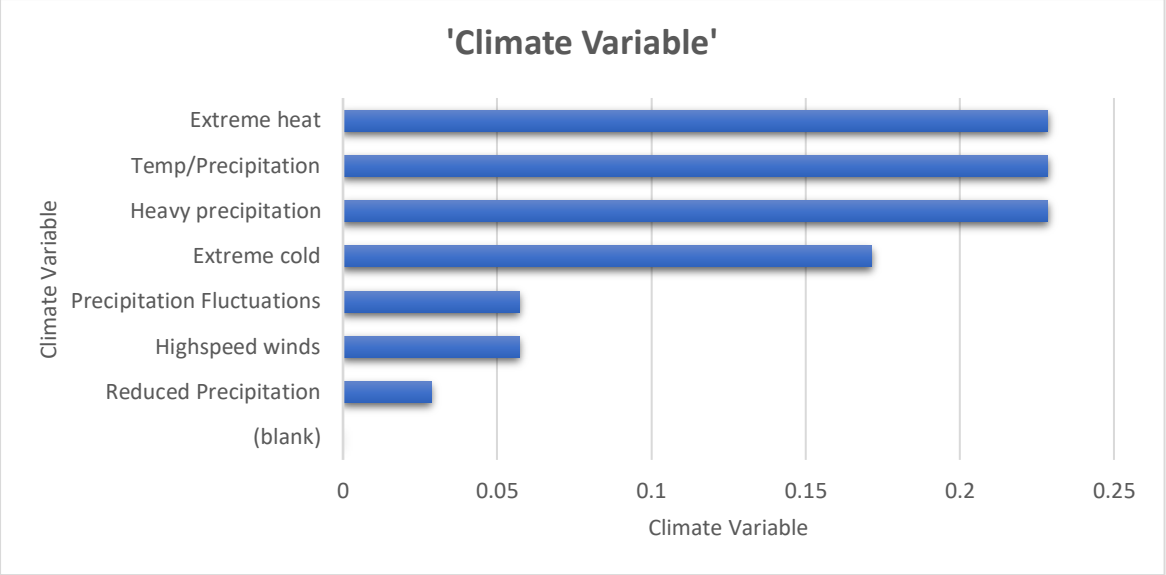
Risk assessment scenarios

We examined present-day climate conditions to address immediate risks, using a scenario of a 4°C rise by the end of the century to plan for severe long-term impacts. For high-risk activities, we consider longer timescales and higher warming levels to ensure resilience. National climate data provides a consistent baseline for assessing regional trends and impacts, helping us implement effective adaptation measures across all services.

Risk analysis and evaluation

We used a comprehensive risk analysis framework to ensure the resilience and continuity of services. This framework uses a 5-point matrix to determine the level of impact associated with each risk and a 3-point matrix to assess vulnerability. The impact consequences, including cascading effects and interdependencies, are recorded, along with the areas of risk (service delivery or asset). Only risks with significant impacts are documented.

From this risk assessment, 38 key risks were identified, with 25 risks (66% of total) directly attributed to high temperatures and heavy precipitation, making heatwaves and flooding the most critical risks. Flooding is highlighted as having the highest impact. Most risks fall into the moderate vulnerability category, indicating that the Council is either partially prepared or actively working towards mitigating these risks.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Temp/Precipitation
Heavy precipitation
Extreme cold
Precipitation Fluctuations
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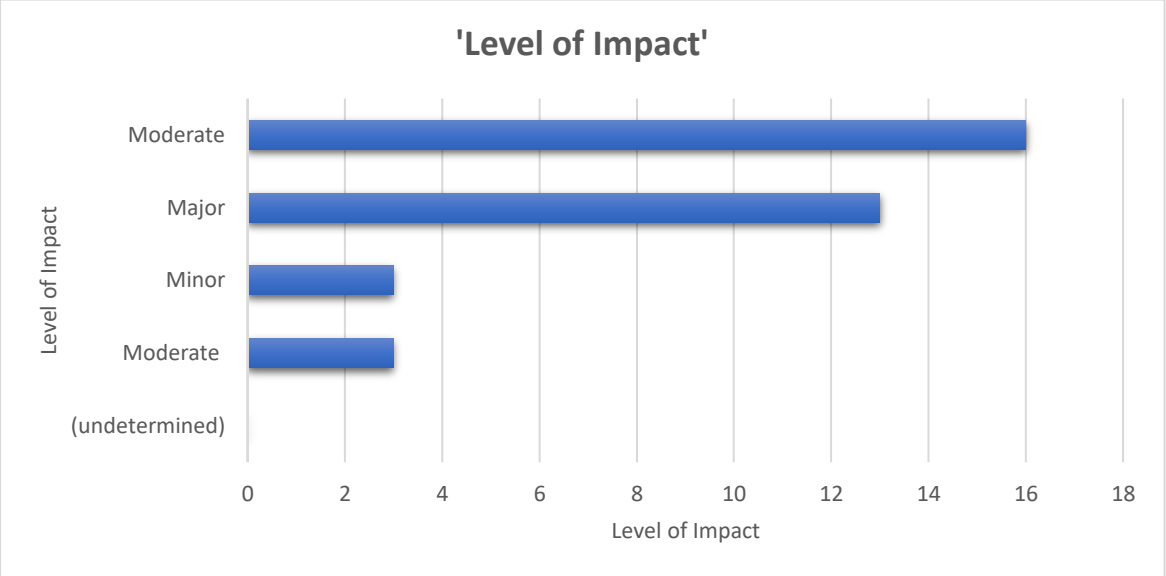
Climate Variable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Level of Impact
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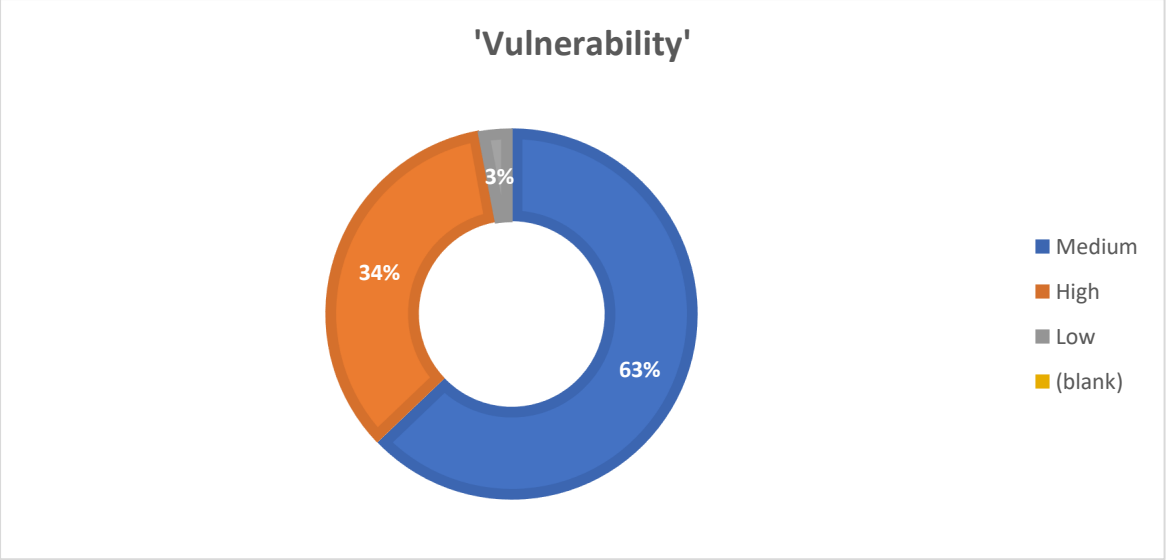
4
6
8
10
12
14
16
18
Level of Impact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34%
63%
Medium
High
Low
(blank)

Highlighted Risks with High Impact and Vulnerability

- Risks of Land Management Practices Exacerbating Flood Risk: Ineffective land management can increase flood risks, impacting both urban and rural areas.
- Risks to Agriculture and Wildlife from Water Scarcity and Flooding: Extreme weather conditions threaten agricultural productivity and biodiversity.
- Risks of Sewer Flooding Due to Heavy Rainfall: Increased rainfall can overwhelm sewer systems, leading to flooding and sanitation issues.
- Risks of Cascading Infrastructure Failures Across Interdependent Networks: Failures in one infrastructure network can trigger failures in others, amplifying the overall impact.
- Risks to Health and Social Care Delivery from Extreme Weather: Extreme weather events can disrupt health and social care services, affecting vulnerable populations.
- Risk to Species and Habitats Due to Inability to Respond to Changing Climatic Conditions: Climate change poses significant threats to local species and habitats, which may not adapt quickly enough.

Adaptation Actions

The adaptation register provides a comprehensive overview of the council's efforts to address climate risks. This register outlines activities agreed upon with County Highways, Warwickshire Fire & Rescue, Public Health, and Transport (Strategy & Policy) teams, including actions already underway and those yet to be implemented. The register records 86 specific adaptation actions aimed at mitigating climate risks. Each action is linked to a particular climate risk (risk code), with some risks having multiple corresponding actions. The adaptation actions are categorised as planned, current, ongoing, and completed. Out of the 86 recorded actions, 22 are planned, 16 are currently being implemented, 39 are ongoing, and 9 have been completed, prompting a reassessment of risks.

Highlights of the Adaptation Actions:

- **Flood Risk Management**: Enhancing flood defences and improving drainage systems to better protect against increased rainfall and flooding.
- **Infrastructure Resilience**: Upgrading infrastructure to withstand extreme weather conditions, such as heatwaves and storms, ensuring that essential services remain operational. More frequent inspection of vulnerable infrastructure.
- **Water Management**: Implementing sustainable water management practices to secure a reliable water supply during periods of drought.
- **Biodiversity Protection**: Promoting conservation efforts to safeguard local wildlife and natural habitats, ensuring that biodiversity thrives despite changing climate conditions.
- **Education and Awareness**: Enhancing our services education, awareness, and training on climate adaptation. By equipping our team with the knowledge and skills needed to address climate-related challenges, we not only aim to foster a culture of resilience but also empower our employees to contribute to sustainable solutions.

- **Interdependencies and Engagement**: Actively involving stakeholders, partners, and local communities in climate resilience efforts through education and participation programs, fostering a collective response to climate challenges. Interdependencies remain a crucial part of risk assessment and adaptation actions and therefore, collaboration and working with partners is one of the key actions for all services.

Benefits and Challenges

Adaptation actions for roads, footways, drainage systems, and public infrastructure provide numerous benefits and pose several challenges. Benefits include prolonged asset life, reduced instances of early failure, and a decrease in highway insurance claims. These adaptations also lead to less disruption for the travelling public and protect the authority's reputation. Efficient maintenance and inspection processes become feasible with the identification of prone sites and the reduction of street furniture, which minimizes inspection needs. Better intelligence on the impact of extreme weather helps in anticipating risks effectively.

On the environmental and safety front, the introduction of Sustainable Drainage Systems (SuDS) features reduces surface water runoff and the need for frequent gritting, which benefits the environment. However, these actions face challenges, especially with material performance since materials that perform well in extreme heat may not perform well in extreme cold, leading to higher costs. Budget constraints often focus on short-term maintenance rather than long-term benefits, making it uneconomical to retrofit the entire network with better-performing materials.

Predicting high-risk locations is another challenge, exacerbated by heavy vehicle movements, braking forces, and historic road construction. Managing infrastructure and resource allocation, such as hardening verges and handling surface water runoff, requires significant financial and human resources. Proactive responses to vulnerable drainage systems and tree management during extreme heat events also necessitate additional resourcing. Finally, climate-specific adaptations like future-proofing charge point designs for higher temperatures and rainfall events demand careful contract management and performance indicators that reflect these adaptations.

Future Plans

We plan to enhance our climate adaptation approach by extending coverage to other services. We will continue to prioritise services based on their risk impact and vulnerability. We aim to embed climate resilience in every aspect of council’s operation to make it business as usual. We will also work towards our quantitative risk assessment and adaptation actions specifically focusing on our infrastructure resilience, such as buildings, roads, and bridges. Our long-term strategy aims to integrate adaptation into our operational and capital investment decisions, ensuring sustainable practices. Collaboration with regional authorities will continue to be important, fostering a partnership response to climate change challenges.

Conclusion

This report has highlighted the significant climate hazards facing our infrastructure, including extreme temperatures, heavy rainfall, and increased frequency of severe weather events. Our comprehensive adaptation approach is designed to mitigate these impacts through robust risk assessment, identifying key risks such as asset deterioration, public disruption, and increased maintenance costs. The outlined adaptation actions, including the use of advanced materials, proactive maintenance strategies, and the implementation of Sustainable Drainage Systems (SuDS), are critical to enhancing the resilience of our infrastructure. The implementation plan details the

necessary steps, resource allocation, and timelines required to effectively execute these measures. By adopting this proactive and strategic approach, we aim to safeguard our infrastructure, minimise risks to public safety, and ensure long-term sustainability and operational efficiency.