CAG CONSULTANTS

Coventry City Council

Coventry Climate Change Risk and Opportunity Assessment

A COMPONENT OF THE ADAPTATION & RESILIENCE STRATEGY AND ACTION PLAN

INFORMING POSITIVE CHANGE

Coventry City Council

Coventry Climate Change Risk and Opportunity Assessment

A component of the adaptation & resilience strategy and action plan (Ref: COV 18076)

VERSION	DATE	VERSION SUMMARY	PRINCIPAL AUTHORS
V3	26 June 2024	Draft version for internal comment by Coventry Climate Change Team	Derek Morgan, Ailsa Gibson
V4	11 July 2024	Updated based on Coventry Revisions	Derek Morgan, Ailsa Gibson
V5	26 July 2024	Updated based on public consultation comments	Derek Morgan
V6	16 August 2024	Updated based on revisions to adaptation strategy and ARP4 Report	Derek Morgan

FOR DIRECT ENQUIRIES ABOUT THIS REPORT:
Name: Derek Morgan
Partner
CAG CONSULTANTS

Mob: +447593070791
Email: dm@cagconsult.co.uk

TO CONTACT CAG CONSULTANTS:
CAG CONSULTANTS
150 Minories
London EC3N 1LS

Tel: 020 8555 6126
Fax: 020 7900 1868

hq@cagconsult.co.uk
www.cagconsultants.co.uk

1 Executive Summary

Introduction

1.1 The Coventry Climate Change Risk and Opportunity Assessment is a key component of the broader Climate Change Strategy and is designed to integrate climate resilience into the city's 'One Coventry Plan' strategic objectives. This assessment aims to identify and prioritise the climate risks and opportunities for Coventry, which will help guide the development of effective strategies to address the impacts of climate change. By understanding these risks and opportunities, the city's leaders, planners and policymakers can better safeguard the community's economic stability and the well-being of its residents (particularly those most vulnerable to climate events), public service providers and businesses. This risk and opportunity assessment therefore not only helps mitigate the adverse effects of climate change but also enhances the city's capacity to adapt to new climatic realities, thereby supporting Coventry's commitment to a Just Transition, sustainable growth and resilience as part of its comprehensive city-wide strategy.

Methodology

1.2 The methodology for the Coventry Climate Change Risk and Opportunity Assessment was based on the risk assessment frameworks provided by the Intergovernmental Panel on Climate Change (IPCC) in its Sixth Assessment Report (AR6). The methodological approach that was used involved a five-step process, including hazard identification, risk identification, exposure assessment, sensitivity analysis, and adaptive capacity evaluation, all tailored to local conditions in Coventry.

Hazard Identification

- The process began by identifying potential climate hazards such as extreme heat and heavy rainfall. Climate variables were assessed under various Global Warming Level (GWL) scenarios to determine potential future conditions.

Risk

- An initial list of potential climate change risks and opportunities was developed based on the UK's Third Climate Change Risk Assessment. This list was revised for local conditions and excluded coastal or marine related risks, as well as some agricultural related risks.

Exposure Assessment

- Following risk identification, the next step assessed the exposure of the city's systems, assets, and populations to these identified risks. This involved spatial analysis, where, for example, business premises are mapped against flood risk projections to quantify the proportion of the city's economic infrastructure at risk.

Sensitivity Analysis

- Sensitivity was gauged through stakeholder engagements and quantitative assessments to understand the degree to which a system or sector could be affected by climate impacts. For instance, businesses' operations continuity during flooding events is a key sensitivity indicator.

Adaptive Capacity Assessment

- Finally, the capacity to adapt to and manage these risks was evaluated. This involved reviewing existing policies and resources, and gathering stakeholder input to ascertain how well Coventry can respond to and manage the effects of identified climate hazards.

1.3 The outcome of this methodology was a vulnerability scoring system. Vulnerability was calculated by combining the exposure and sensitivity scores and then subtracting the adaptive capacity score. The list of risks[1] the scored the highest for vulnerability provided an indication of where strategic interventions are most needed in Coventry to respond to climate change.

Vulnerability = Exposure + Sensitivity – Adaptive Capacity

Risk and opportunity analysis results

1.4 Based on the analysis, the risks listed in Table 1 were identified as those with the highest level of vulnerability for Coventry. It is recommended that these risks are prioritised in the adaptation and resilience plan for the City of Coventry going forward.

[1] Only risks and not opportunities were short-listed as a priority through this process.

Table 1: Summary of climate related risks with highest vulnerability in Coventry

Risk and Opportunity Descriptor	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
H09 - Risks to food safety and food security	2	3	1	4
I01 - Risks to infrastructure networks (water, energy, transport, ICT) from cascading failures	3	2	1	4
IO8 - Risks to public water supplies from reduced water availability	3	3	2	4
H01 - Risks to health and wellbeing from high temperatures	1	3	1	3
H03 - Risks to people, communities and buildings from flooding	2	3	2	3
H10 - Risks to water quality and household water supplies	2	3	2	3
H12 - Risks to health and social care delivery	2	2	1	3
H13 - Risks to education and care home services	2	2	1	3
H18 - Risks from climate change to role of urban ecosystems	2	3	2	3

1.5 Addressing these high-priority risks will be crucial in ensuring Coventry's sustainable future and its resilience to the impacts of climate change.

Contents

List of Figures

List of Tables

Acronyms

AR6	Sixth Assessment Report
BAP	Biodiversity Action Plan
BLPU	Basic Land and Property Unit
CCI	Climate Change Initiative
ESA	European Space Agency
GWL	Global Warming Level
HDDD	Health Deprivation and Disability Domain
IMD	Index of Multiple Deprivation
INNS	Invasive Non-native Species
IPCC	Intergovernmental Panel on Climate Change
LBAP	Local Biodiversity Action Plan
LFRMS	Local Flood Risk Management Strategy
LLPG	Local Land and Property Gazetteer
LNRs	Local Nature Reserves
LSOAs	Lower layer Super Output Areas
LST	Land Surface Temperature
NO2	Nitrogen Dioxide
PFRA	Preliminary Flood Risk Assessment
RCP	Representative Concentration Pathway
SSP	Shared Socioeconomic Pathway
SSSI	Sites of Special Scientific Interest
SuDS	Sustainable Drainage Systems
SWMP	Surface Water Management Plan
UHI	Urban Heat Islands
YCEO	Yale University Center for Earth Observation

2 Introduction

2.1 Climate change adaptation and resilience involves preparing for and responding to the impacts of climate change. This means developing strategies to cope with extreme weather events and long-term changes in climate patterns. Adapting to climate change is a future risk we need to plan for. There is an increasing incidence of extreme climatic events across the UK and more locally in and around Coventry. Relatively recent examples of extreme events include the Birmingham tornado and the Boscastle flooding incident. Extreme weather events such as these are expected to become more frequent in the future. We, as a community in Coventry must act now to prepare our residents, infrastructure, and environment from the increasing threats and opportunities posed by climate change.

Our changing climate

2.2 Human activities are changing the global climate. Since the industrial revolution, the average surface temperature has risen by over 1°C. This leads to unusual weather patterns, more extreme weather events, and rising sea levels. These changes destabilise ecosystems and increase weather-related risks globally, including the UK.

2.3 The Paris Agreement aims to limit global warming to below 2°C, ideally 1.5°C, above pre-industrial levels. However, current policies suggest a warming of 2°C to 5°C by century's end, depending on greenhouse gas emissions and the climate system's response. Higher warming increases risks to people and biodiversity.

2.4 Reducing greenhouse gas emissions (also referred to as mitigation) may limit warming to 1.5°C to 2°C. However, even this level of warming will alter weather patterns and raise sea levels. Therefore, adaptation is essential to manage when these changes occur. Both mitigation and adaptation are necessary to minimise risks from human-caused climate change.

Why are we doing this assessment?

2.5 This climate change risk and opportunity assessment aims to evaluate and prioritise climate change risks faced by the City of Coventry. Understanding climate change risks and opportunities is a crucial initial step in effectively responding to climate change for cities like Coventry. This understanding enables city planners and policymakers to identify and prioritise the most significant threats that climate change poses to their environments, infrastructure, and communities. By comprehensively assessing these risks, organisations in Coventry can develop targeted strategies and action plans that not only mitigate the adverse effects of climate change but also adapt urban systems and populations to new climatic realities.

The 'One Coventry' approach

2.6 This climate change risk and opportunity assessment is part of a larger strategic planning process for Coventry. The "One Coventry Plan" is the overarching strategy developed by the Coventry Council to improve the lives of its residents and the overall prosperity of the city. It outlines how the council, along with its partners and communities, will work together to deliver the best outcomes for everyone in Coventry. The One Coventry Plan focuses on three main priorities: boosting the city's economic prosperity, enhancing community outcomes and reducing inequalities, and addressing the causes and consequences of climate change. It emphasises new ways of working, core areas of focus, and the values that will guide the Council's actions.

Coventry's climate change strategy

2.7 Coventry's Climate Change Strategy was developed as a key component of the implementation of the 'One Coventry Plan'. The climate change strategy encompasses both mitigation and adaptation measures. Mitigation efforts focus on reducing the city's carbon footprint through initiatives such as developing renewable energy sources, enhancing public transportation systems to decrease reliance on fossil fuels, and promoting energy efficiency in buildings. Adaptation measures are equally critical, addressing the need to adjust infrastructural and societal frameworks to withstand climatic changes. This includes enhancing urban greenery to combat heat, improving drainage systems to prevent flooding, and ensuring that public health systems are prepared to handle new climate-related challenges.

2.8 A crucial element of the strategy's implementation is the formation of the independent Climate Change Board in November 2021. This board plays a strategic role by uniting leaders from public, private, and voluntary sectors to collaborate on sustainable initiatives and solutions. The board's formation reflects a proactive approach to governance, where city leadership facilitates a multi-stakeholder effort to address complex environmental issues effectively.

2.9 The Council's Climate Change Strategy for the city also outlines five distinct pathways, each designed to address different aspects of climate and sustainability challenges. The **Low Emissions Pathway** focuses on reducing carbon emissions across all sectors, enhancing energy efficiency, and transitioning to renewable energy sources. The **Circular Economy Pathway** promotes waste reduction, encourages recycling, and supports sustainable consumption and production patterns. The **Nature-Based Pathway** emphasises the conservation and restoration of natural habitats and biodiversity, integrating nature into urban planning to enhance ecological resilience. The **Fairer Green Futures Pathway,** with its focus on a Just Transition, aims to ensure that climate action benefits all communities equitably, particularly focusing on vulnerable groups by improving public health, reducing inequalities, and enhancing access to green spaces and sustainable resources. Finally, the **Adaptation and Resilient Pathway** prepares the city to withstand and adapt to the adverse effects of climate change, such as extreme

weather events, through robust infrastructure and preparedness planning and where appropriate a modification in the way services are delivered . Together, these pathways form a comprehensive framework for Coventry to promote sustainability and resilience in response to global climate challenges.

2.10 The Resilient Pathway in Coventry's Climate Change Strategy is specifically designed to enhance the city's capacity to withstand and recover from the adverse impacts of climate change. This pathway focuses on developing nature-based solutions, building robust infrastructure and systems that can cope with extreme weather events such as flooding, heatwaves, cold snaps, and severe storms. With the Adaptation and Resilience Pathway, several activity areas are listed for the city to better prepare for the impacts of climate change. The first activity area is to develop a "*detailed climate change adaptation and resilience plan" which will be led by the City Council with support from partner organisations. This plan will need to provide an assessment of citywide risks and to prioritise areas to address, with a clear set of actions to create a more resilient city and minimises any adverse impacts to the environment, our health and the economy*" (Coventry Climate Change Strategy).

2.11 In order to implement this activity area, the Council began the process of drafting a climate adaptation and resilience strategy and action plan. The first step in developing the adaptation plan was to conduct a climate adaptation and resilience risk assessment.

2.12 This document presents a summarised report of the climate adaptation and resilience risk assessment for Coventry. It outlines and prioritises specific risks, vulnerabilities, and opportunities stemming from climate change, along with their broader socio-economic effects. The assessment covers the entire city, highlighting key risks and opportunities for Coventry's residents, businesses, essential service providers, infrastructure, environment, and biodiversity. Additionally, it details specific risks associated with the operations, service delivery, and assets of the City Council.

3 Methodology

Methodological approach

3.1 There are different approaches and methodologies that can be used to assess climate risk and opportunities for cities. The Intergovernmental Panel on Climate Change (IPCC) in its Sixth Assessment Report (AR6) notes that the approaches and methods to analyse and assess climate risk vulnerability have evolved significantly over the past decades. The IPCC AR6 also notes that vulnerability is now recognised to differ across communities, contexts and in time. Several definitions of key concepts are provided by the IPCC AR6 to help contextualise climate risk assessment at a local level. These definitions are:

- **Hazard** is defined as the potential occurrence of a natural or human-induced physical event or trend that may cause loss of life, injury, or other health impacts, as well as

damage and loss to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources (e.g. heatwaves, heavy rain, drought and associated wildfires, and coastal flooding);

- **Risk** is defined as the potential for adverse consequences for human or ecological systems. In the context of climate change impacts, risks result from dynamic interactions between climate-related hazards with the exposure and vulnerability of the affected human or ecological system;

- **Exposure** is defined as the presence of environmental factors their severity and duration affecting people; livelihoods; species or ecosystems; environmental functions, services and resources; infrastructure; or economic, social or cultural assets in places and settings that could be adversely affected;

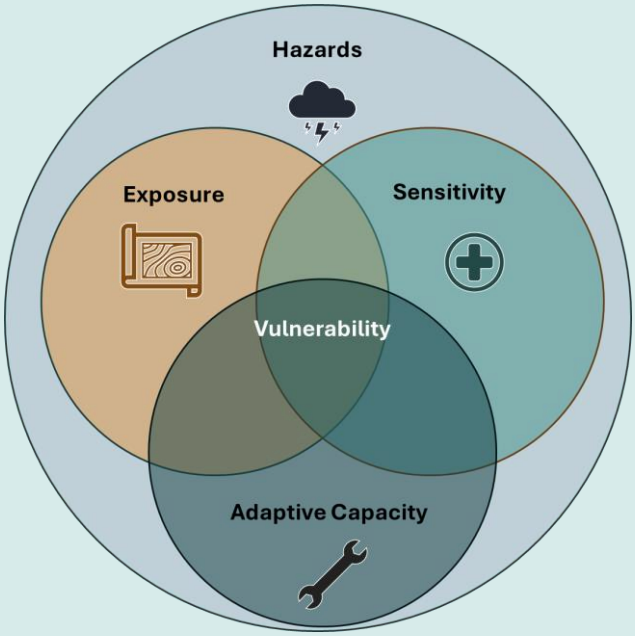
- **Vulnerability** is defined as the propensity or predisposition to be adversely affected and encompasses a variety of concepts and elements, including **sensitivity** or susceptibility to harm and **lack of capacity** to cope and adapt.

3.2 These definitions were used as the basis for defining a method to assess climate risks and opportunities for Coventry. To assess climate risks, it was first necessary to understand what climate change hazards are likely to be faced by the city. This required assessing increased heat, changing rainfall patterns and other hazards. Once these hazards were identified, it was necessary to assess whether and to what degree the city or specific sectors within the city are exposed to particular climate hazards. If the city or sectors were assessed as being exposed to a climate hazard, it was then necessary to understand how vulnerable they were to these hazards. Assessing vulnerability was achieved by assessing the sensitivity to the hazards as well as the capacity to adapt to these hazards.

Text Box 1: Example of climate change risk assessment approach

We anticipated that in the future the city will flood more often (the climate hazard), and we wanted to understand the risk to businesses from this increased flooding. To achieve this, we needed to assess whether there were businesses which were in areas that could potentially flood due to climate change. The question asked is: *are there business that are **exposed** to floods resulting from climate change?* Once we understood exposure, we needed to understand how **vulnerable** businesses were to this impact. The second step therefore was to assess how **sensitive** businesses were to flooding. The question we asked included: *if a businesses flood, will they need to stop operating or could they continue with their operations?* If businesses need to stop operations, we considered them to be highly sensitive. The final step in the process was to assess **capacity** to adapt to this risk. Here we asked the question: *what systems are in place by businesses to respond to flooding, or what resources have been made available to businesses to prepare them for flooding?* If there were already systems in

place to respond to this climate impact, then this particular risk may not need to be prioritised.



Based on a combination of these factors (hazard, exposure, sensitivity and adaptive capacity) we determined how vulnerable the city was and therefore how significant a particular climate change risk was.

Methodological process

3.3 To apply the approach outlined above, several steps were necessary.

Hazard identification

3.4 Identifying potential climate hazards is a multi-step process. To begin with, there were three key climate variables that need to be considered. These were changing temperatures, changing precipitation, and sea level rise. In the context of Coventry, sea level rise has little relevance. However, within the remain two key variables, there were sub-sets of variables, such as maximum temperature variation, monthly precipitation projections, annual heating degree days, etc that need to be considered. When considering whether these variables will be relevant in the future, we needed to consider what different future scenarios will look like. For example, in a future scenario with extensive climate change, what would the impacts be on average summer temperatures?

Climate variables

3.5 For the purpose of this report, the climate change variables listed in Table 2 were selected as part of the hazard assessment.

Table 2: List of climate change variables considered

Key Variable	Associated Climate Variable
Temperature	Annual Average Temperature Change
Temperature	Summer Average Temperature Change
Temperature	Summer Maximum Temperature Change
Temperature	Winter Average Temperature Change
Temperature	Winter Minimum Temperature Change
Temperature	Annual Count of Extreme Summer Days
Temperature	Annual Count of Hot Summer Days
Temperature	Annual Count of Summer Days
Temperature	Annual Heating Degree Days
Temperature	Annual Count of Tropical Nights
Temperature	Annual Cooling Degree Days
Temperature	Annual Growing Degree Days
Temperature	Annual Count of Frost Days
Temperature	Annual Count of Icing Days
Precipitation	Summer Precipitation Change
Precipitation	Winter Precipitation Change
Temperature & Precipitation	Drought Severity Index

Climate change scenarios

3.6 There are different approaches to future climate scenario modelling. The two key approaches are Emission Scenarios based using Representative Concentration Pathways (RCPs) and Global Warming Levels (GWL's). For the purposes of this risk assessment, Global Warming Levels (GWL's) have been used to determine future climate hazards. For a full explanation of why GWL's were selected please refer to *Appendix 1: Approach to describing future climate scenarios for Coventry Council* in this report.

3.7 Global Warming Levels (GWLs) refer to the specific thresholds of average global temperature increase above pre-industrial levels. These levels are used as benchmarks to assess the progress of climate change and to guide international and local efforts in mitigating climate change impacts. These GWLs are typically grouped into 1.5°C, 2°C, 2.5°C, 3°C and 4°C above pre-industrial levels[2].

3.8 The Met Office Climate Data Portal provides global warming level (GWL) datasets for each of the climate variables listed in Table 2 in a spatial format. These datasets are

[2] For example, 2.0°C, represents a higher limit of temperature increase than that agreed by the global community under the Paris Agreement it is a level which should not be exceeded in order to avoid catastrophic environmental, economic, and health impacts worldwide.

further grouped into three categories ('upper', 'median', and 'lower'). The 'median' with the 'upper', and 'lower' values are statistical measures used to understand the range and central tendency of climate model projections.

3.9 Based on these datasets, the lower, median and higher fields were tabled for each climate change variable. By way of example, the *Annual Average Temperature Change* for Coventry for different GWL scenarios is provided in Table 3. This table shows that the median annual temperature for Coventry during the baseline period of 1981 to 2000 was 9.57°C. For the recent past (2001 to 2020), this median had increased to 10.36°C. In a scenario where the overall global temperature has increased by 1.5°C (1.5°C GWL) then the median temperature for Coventry will be 10.71°C. Similarly, for a scenario where global temperatures have increased by 2°C, the median temperature for Coventry will be 11.33°C.

Table 3: Annual Average Temperature Change for Coventry

Scenario	Upper	Median	Lower
1981-2000 Baseline	9.58	9.57	9.57
2001-2020 Recent-Past	10.57	10.36	10.28
2021 – 2040 (1.5°C GWL)	11.00	10.71	10.58
2037 – 2056 (2°C GWL)	11.54	11.33	10.95
2052 – 2071 (2.5°C GWL)	11.85	11.72	11.59
2066 – 2085 (3°C GWL)	12.46	12.17	11.99
2100 + (4°C GWL)	13.47	13.04	12.79

3.10 Maps were also generated for each variable, using the 2°C GWL scenario.

Risk identification

3.11 An initial list of potential climate change risks was provided by Coventry City Council at the outset of the risk assessment process. This initial list of risk was based on the UK's Third Climate Change Risk Assessment, and excluded all the risks related to International Dimensions, any coastal or marine related risks, and some agricultural related risks (see *Appendix 2: Coventry climate change risk* list). The risks are categorised into the following four themes

1) Business and Industry
2) Health, Communities and the Built Environment
3) Infrastructure
4) Natural Environment and Assets

Exposure assessment

3.12 Exposure was assessed for each risk identified in the previous step, by asking the question *What is the degree to which a system is exposed to a particular risk?* When possible, this exposure question was answered through geo-spatial analysis. For example, flood risk spatial data was mapped together with business premise data to assess what proportion of businesses are exposed to climate related flood risks.

3.13 Different approaches were used for scoring exposure depending on the type of data available. In the above example, the following steps were followed:

1) Polygons of all commercial business buildings were mapped using Local Land and Property Gazetteer (LLPG) data.
2) This data was overlayed with the future flooding layer (Coventry Council Flood maps).
3) Those business building polygons that touched or intersected with the future flood layer were considered exposed to flooding risk.
4) These at-risk businesses were then calculated as a percentage of all business in the city.
5) This final percentage of businesses at risk from flooding was used to score overall exposure for this particular risk.

3.14 In instances where disaggregated spatial data was not available, then secondary sources and literature were used to assess whether the city was exposed to a specific risk. For example, there was no spatial data available for *N08 Risk to forestry from pests, pathogens and invasive species*. In this instance, available documentation was used to assess whether and to what degree the city was exposed to this risk.

3.15 Exposure was scored as a percentage of an area of system affected by a risk. For example, the percentage of total households effected by flooding. These percentages were rated on a scale of zero to three using the categories listed below.

Score	Rating	Area or System exposed
3	High	50-100%
2	Significant	25-50%
1	Moderate	10-25%
0	None or low	0-10%

3.16 In the example of businesses at risk from flooding, it was calculated that 24% business building polygons fall within the flood zone, resulting is an exposure score of 1 (Moderate exposure). The methods for calculating each risk exposure is provided in the Chapter *5 Risk and Opportunity Assessment*.

Sensitivity assessment

3.17 As noted above, sensitivity is a measure of susceptibility to harm. For sensitivity, the line of enquiry built on the exposure question, by asking: *If a system or area is exposed to a particular risk, what degree will the system or areas be affected by that risk*? For example, in assessing the risk to businesses from flooding, it was necessary to understand to what degree businesses will be affected by flooding. An important element of sensitivity is the consideration of synergistic effects. For example, the line of enquiry is not limited to the direct consequences of increasing temperatures, but also the relationship between temperature and pollutants such as ground level ozone.

3.18 Assessing sensitivity is relatively subjective and therefore required an understanding of the local context. Several stakeholder engagement processes took place to help assess sensitivity to different risks. These included an in-person stakeholder workshop on the 8th May 2024, number of semi-structured interviews with key sector specialists and an online survey made available to all relevant stakeholders. Through these engagements, stakeholders were encouraged to explain how they are currently being impacted by climate change and whether they track the impact of climate change on their organisations and services. As part of this line of enquiry, the following questions were asked of stakeholders

- Can you tell us in broad terms how extreme weather events have impacted your organisation/service over the past few years?
- Do you quantitatively measure the impact extreme weather events have on your organisation/service?

3.19 The template for the stakeholder interviews is provided in Appendix 3: Stakeholder Interview Template and the online survey is provided in Appendix 4: Online Survey Template.

3.20 Based on these responses, sensitivity to each risk were scored on a scale of zero to three using the categories listed below.

Score	Rating
3	High sensitivity
2	Significant sensitivity
1	Moderate sensitivity
0	None or low sensitivity

3.21 By way of example, the sensitivity to business from flooding scored as 3 (High sensitivity) because it was noted by stakeholders that when businesses flood, they need to stop their operations.

Adaptive capacity assessment

3.22 Adaptive capacity was assessed using two lines of enquiry. These are summarised by the questions:

1) What policies and plans are in place to respond to a particular risk?
2) What skills and resources are in place to respond to a particular risk?

3.23 A literature review of existing policies and plans was conducted to determine whether there were already policies and plans in place to address specific climate change risks. In many instances, there were high level plans in place, but these did not always address the specific risks identified as part of this assessment.

3.24 The stakeholder engagements listed above (stakeholder workshop, semi-structured interviews and online survey) were used to answer the adaptive capacity question related to skills and resources. In these engagements, stakeholders were asked a range of questions related to how organisations are currently adapting to climate change impacts (see *Appendix 3: Stakeholder Interview Template*).

3.25 Based on the findings of the literature review and feedback from the stakeholders, adaptive capacity was also scored on a scale of zero to three, where zero indicated low adaptive capacity and three high adaptive capacity.

Score	Rating
0	Low or No Adaptive Capacity
1	Moderate Adaptive Capacity
2	Significant Adaptive Capacity
3	High Adaptive Capacity

3.26 In our previous example of business at risk from flooding, adaptive capacity was scored as 2 (Moderate Capacity) because there is detailed policy and planning in place to address flood risk. There is also dedicated flood risk management team in place in the Council. However, stakeholders noted that businesses have limited skills or funding to respond to flooding.

Vulnerability scoring and risk prioritisation

3.27 The overall vulnerability to each risk was scored using the results from the assessment steps above. The vulnerability score was achieved by adding the exposure score to the sensitivity score and then subtracting the adaptive capacity score. The scoring of adaptive capacity was subtracted because higher adaptive capacity reduces vulnerability. The formula below is a summary of the vulnerability calculation.

Vulnerability = Exposure + Sensitivity – Adaptive Capacity

3.28 In our previous example of business at risk from future flooding, the overall vulnerability was scored at 3 (see Table 4).

Table 4: Vulnerability score for business at risk to flooding in Coventry.

Exposure	Sensitivity	Adaptive Capacity	Vulnerability
1	3	1	**3**

3.29 Once each risk score was complete, it was possible to prioritise risks with high vulnerability. Each risk scored on a scale of 0 – 6 and those risks that scored above 4 were considered a priority.

Limitations

3.30 While the methodology described above provides a comprehensive framework for assessing climate change risks in Coventry, there are a number of limitations to consider.

Data availability and uncertainty

3.31 The climate models and data used to predict future scenarios, such as temperature changes and precipitation patterns, inherently contain uncertainties. These uncertainties stem from the assumptions made in the modelling process and the variability in climate behaviour. As a result, while the scenarios provide useful guides, they should not be viewed as precise forecasts.

3.32 In areas where high-resolution spatial data is unavailable (e.g. ground water flooding and urban heat island data) or no spatial data was available, assessments were based on broader resolution data or secondary sources. This can lead to less precise exposure assessments, potentially overlooking localised variations in risk.

Subjectivity in sensitivity and adaptive capacity assessments

3.33 The assessment of sensitivity and adaptive capacity relies significantly on stakeholder input and literature reviews. Different stakeholders may have subjective perspectives based on their experiences and interests, which can introduce bias into the assessments. Additionally, the input received is dependent on who was available and chose to participate in the workshops and interviews. This selective participation might not fully represent all community perspectives or sectors, potentially skewing the assessment towards the views and concerns of those who participated.

3.34 Understanding these limitations is crucial for interpreting the results of the climate risk assessment realistically and for planning subsequent updates or revisions to the methodology.

4 Climate Hazards

Introduction

4.1 Describing potential climate hazards is a key initial step when assessing climate change risks. Hazards are defined as the potential occurrence of a natural or human-induced physical event or trend that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources. Hazards are typically described in terms of changes to temperature, precipitation and sea level rise.

4.2 A detailed climate change projections report was developed as part of the background research (see *Appendix 5: Coventry Climate Change Projections Report*). This detailed climate change projections report included summary projections of the 17 sub-sets of variables (listed in *Table 2: List of climate change variables considered*) for Coventry. For the purpose of this risk assessment report, only select variables are presented.

Methodology summary

4.3 As noted above (See: Section *0 Hazard identification*), the data for the projections was sourced directly from The UK Met Office climate data portal based on global warming levels (GWLs). When considering timeframes for different GWLs, the Shared Socioeconomic Pathway SSP3-7.0 (See IPCC Table 1) was used as the principal scenario when presenting possible climate futures for the Coventry Council. The approximate timeframes for each GWL based on SSP3-7 are as follows:

- Baseline (1981-2000)
- Recent Past (2001-2020)
- 1.5°C change (2021 – 2040)
- 2°C change (2037 – 2056)
- 3°C change (2066 – 2085)
- 2.5°C change (2052 – 2071)
- 4°C change (2100 and beyond)

4.4 The projections are summarised for 'median', 'upper', and 'lower' values. Data is calculated by averaging the four 12km^2 grids the cover the city. The maps presented below use the 2°C change (2037 – 2056) GWL data.

City wide climate data

Annual Average Temperature Change

4.5 This dataset shows the change in annual temperature for a range of global warming levels, including the recent past (2001-2020), compared to the 1981-2000 baseline

period. Note, as the values in this dataset are averaged over a year, they do not represent possible extreme conditions.

Table 5: Annual Average Temperature Change for Coventry

Range	Upper	Median	Lower
1981-2000 Baseline	9.58	9.57	9.57
2001-2020 Recent-Past	10.57	10.36	10.28
2021 – 2040 (1.5°C GWL)	11.00	10.71	10.58
2037 – 2056 (2°C GWL)	11.54	11.33	10.95
2052 – 2071 (2.5°C GWL)	11.85	11.72	11.59
2066 – 2085 (3°C GWL)	12.46	12.17	11.99
2100 + (4°C GWL)	13.47	13.04	12.79

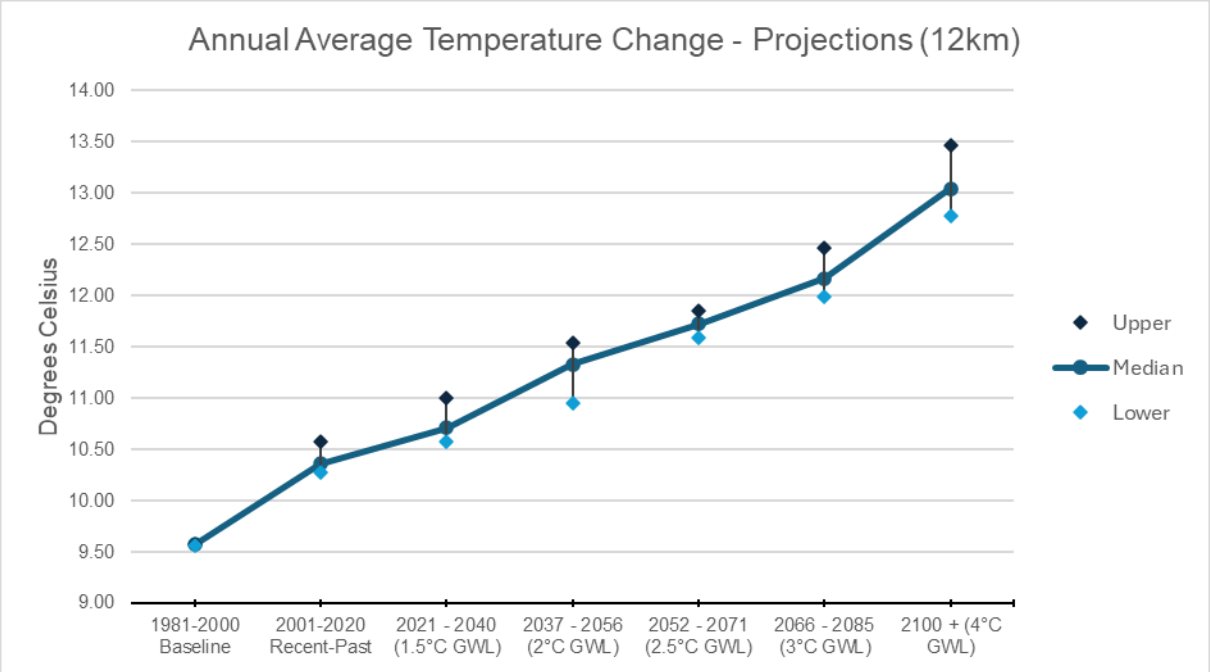


Figure 1: Annual Average Temperature Change for Coventry

4.6 Figure 1 and Table 5 indicate that the average annual temperature change for Coventry is expected to be slightly lower than global (GWL) average temperature changes. It is expected that the annual average temperature will increase from a baseline of 9.57°C by approximately 3.5°C degrees to 13.04°C by the turn of the century (4°C GWL).

4.7 Figure 2 shows anticipated annual temperature changes (from the 1981-2000 baseline) for Coventry compared to the rest of the UK for the 2°C GWL scenario. This map

illustrates that Coventry is in the region of the UK that is anticipated to experience higher overall average annual temperature increases.

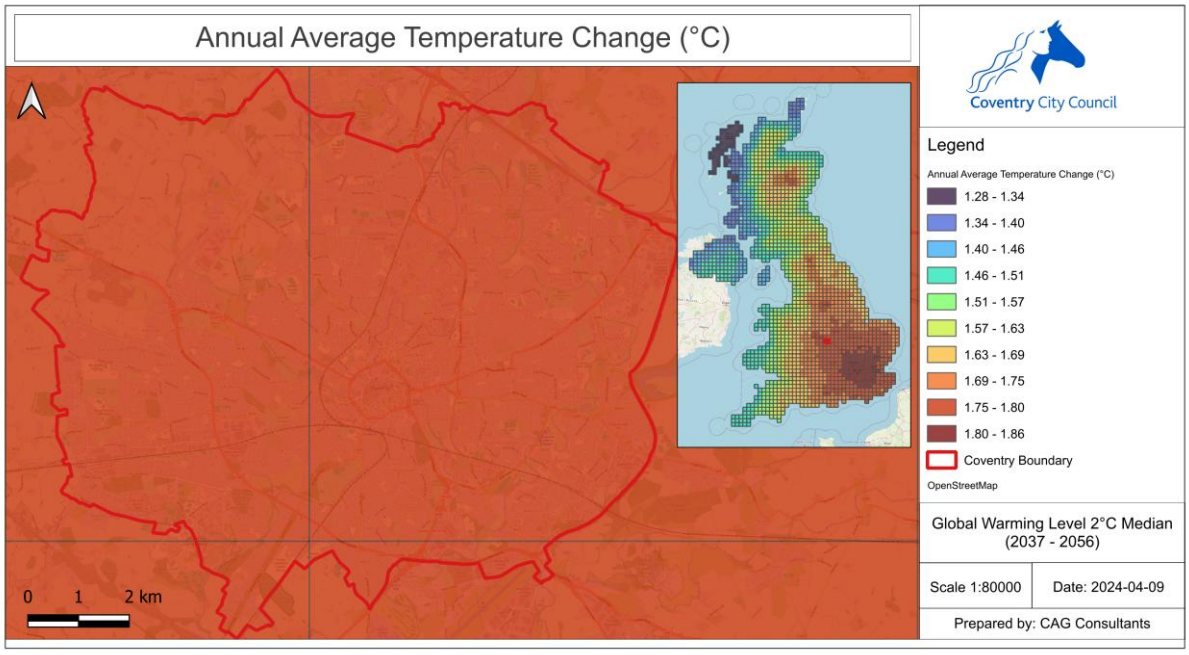


Figure 2: Annual Average Temperature Change for Coventry from 1981-2000 Baseline for GWL 2°C

Summer Average Temperature Change

4.8 This dataset shows the change in summer average temperature for a range of global warming levels, including the recent past (2001-2020), compared to the 1981-2000 baseline period. Here, summer is defined as June-July-August.

Table 6: Summer Average Temperature Change for Coventry

Range	Upper	Median	Lower
1981-2000 Baseline	15.67	15.65	15.64
2001-2020 Recent-Past	17.17	16.78	16.51
2021 – 2040 (1.5°C GWL)	17.91	17.07	16.78
2037 – 2056 (2°C GWL)	18.58	17.85	17.53
2052 – 2071 (2.5°C GWL)	18.97	18.27	18.03
2066 – 2085 (3°C GWL)	19.59	18.72	18.64
2100 + (4°C GWL)	21.00	20.09	19.56

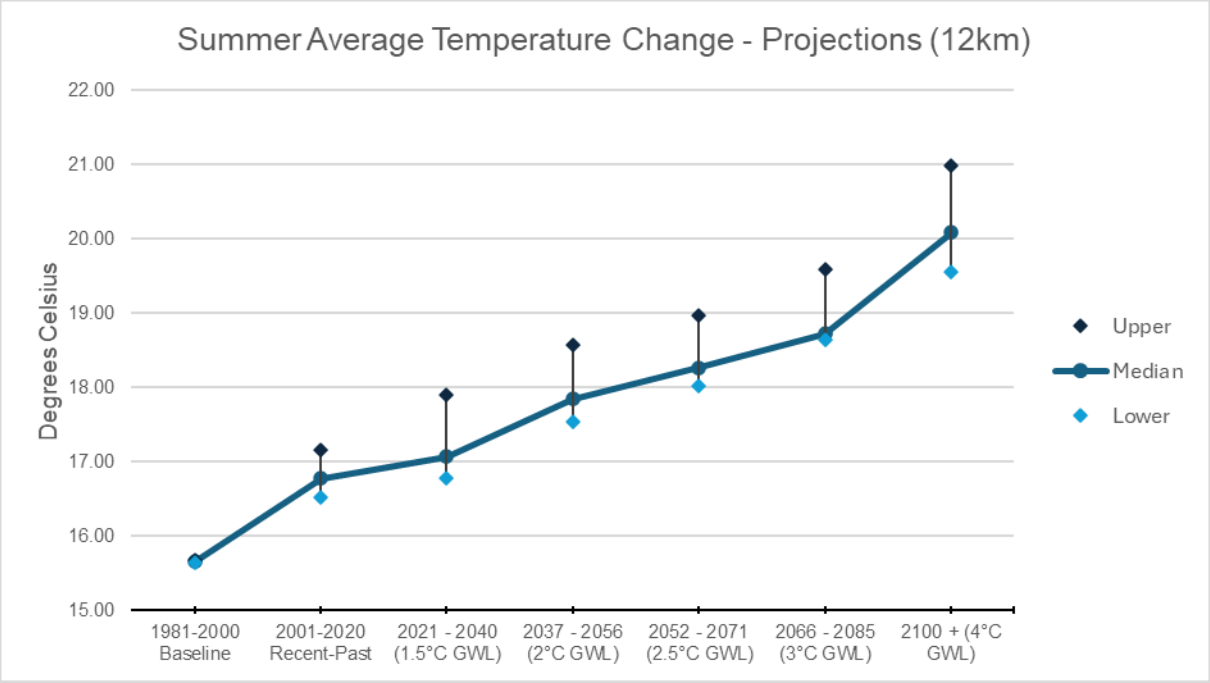


Figure 3: Summer Average Temperature Change for Coventry

4.9 Table 6, Figure 3 and Figure 4 show a similar pattern for project summer temperature increases. However, the summer projections are slightly higher than the global average with an anticipated change from a baseline of 15.65°C, increasing by approximately 4.4°C to 20.09°C by 2100.

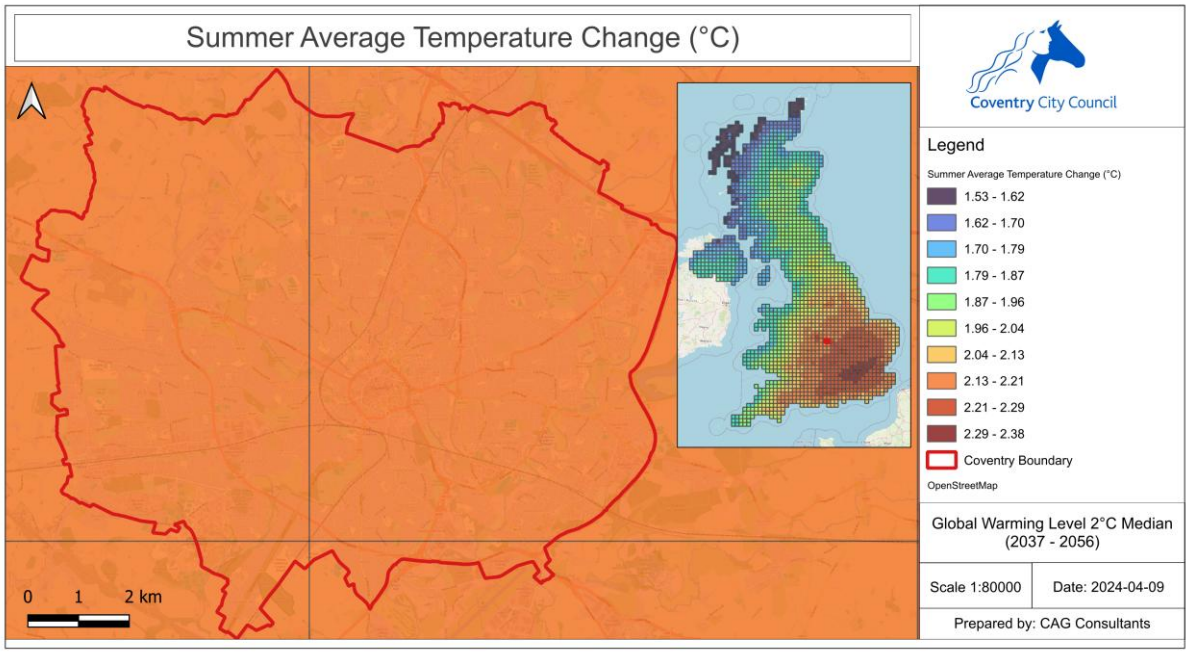


Figure 4: Summar Average Temperature Change for Coventry from 1981-2000 Baseline for GWL 2°C

Annual Count of Hot Summer Days

4.10 The Annual Count of Hot Summer Days is the number of days per year where the maximum daily temperature is above 30°C. It measures how many times the threshold is exceeded (not by how much) in a year. The Annual Count of Hot Summer Days provides an indication of extreme heat events which are often masked by average annual temperature changes. Annual Count of Hot Summer Days is also a good indicator of stress on health systems and infrastructure.

Table 7: Annual Count of Hot Summer Days for Coventry

Range	Upper	Median	Lower
1981-2000 Baseline	1.30	1.09	1.04
2001-2020 Recent-Past	4.76	3.55	3.23
2021 – 2040 (1.5°C GWL)	7.55	4.24	3.48
2037 – 2056 (2°C GWL)	8.71	6.86	4.95
2052 – 2071 (2.5°C GWL)	11.01	8.22	6.45
2066 – 2085 (3°C GWL)	17.55	12.07	9.50
2100 + (4°C GWL)	30.37	20.52	16.73

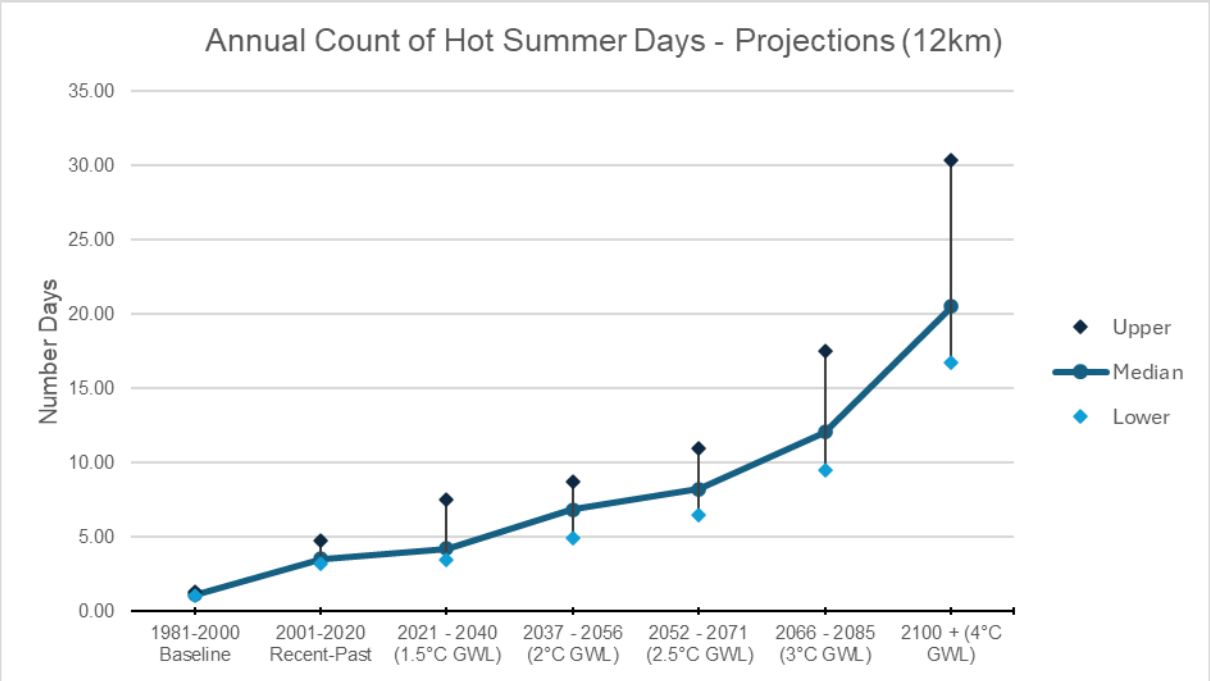


Figure 5: Annual Count of Hot Summer Days for Coventry

4.11 Table 7 and Figure 5 show that these is projected to be a significant increase in hot summer days, to as many at 20 by the turn of the century. These hot summer days have potential impacts on residents, businesses and the environment (as discussed in Chapter *5: Risk and Opportunity Assessment*). Figure 6 also illustrates that in the GWL

2°C scenario, Coventry will be experiencing significantly more hot summer days than most of the north and west regions of the UK.

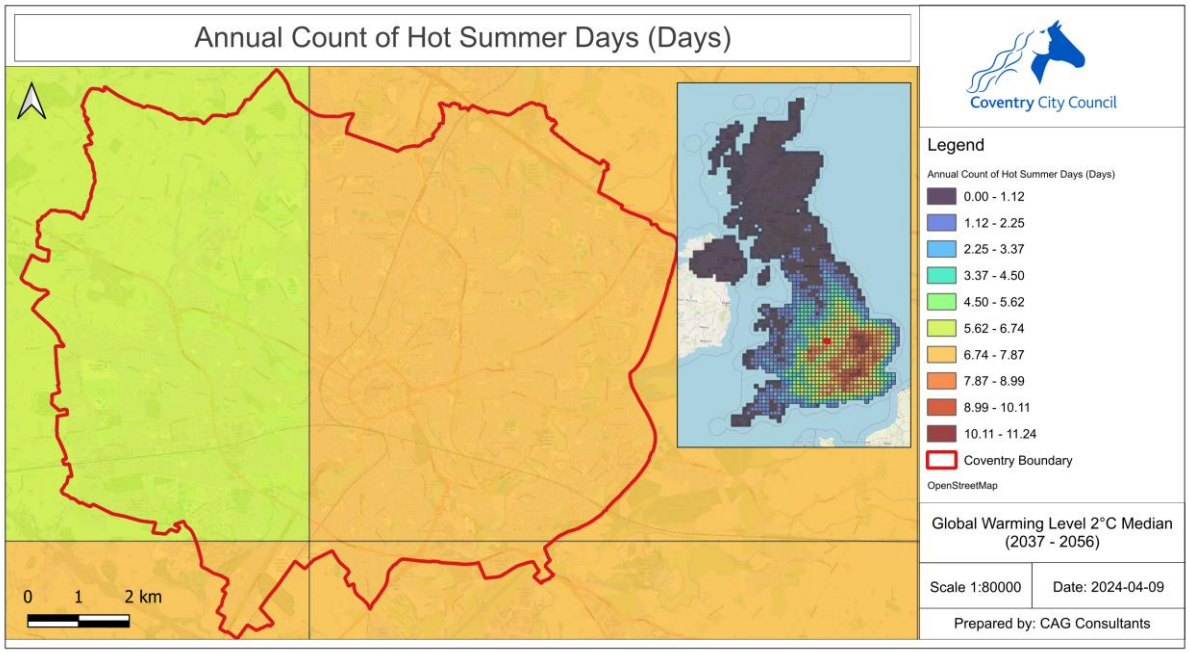


Figure 6: Annual Count of Hot Summer Days for GWL 2°C for Coventry

Annual Count of Frost Days

4.12 The Annual Count of Frost Days is the number of days per year where the minimum daily temperature is below 0°C. It measures how many times the threshold is exceeded (not by how much) in a year.

Table 8: Annual Count of Frost Days for Coventry

Range	Upper	Median	Lower
1981-2000 Baseline	53.04	52.35	51.90
2001-2020 Recent-Past	48.05	41.60	37.09
2021 – 2040 (1.5°C GWL)	44.71	36.48	32.17
2037 – 2056 (2°C GWL)	42.30	31.88	26.33
2052 – 2071 (2.5°C GWL)	36.11	27.30	23.05
2066 – 2085 (3°C GWL)	31.24	21.43	18.71
2100 + (4°C GWL)	24.14	13.99	12.70

4.13 Table 8 and Figure 7 show an anticipated reduction in frost days with increasing GWLs. A reduction in frost days has an obvious impact on agriculture and horticulture by potentially increasing the growing season. Reduced frost may also impact on infrastructure and road maintenance and reduce overall heating demand in the city.

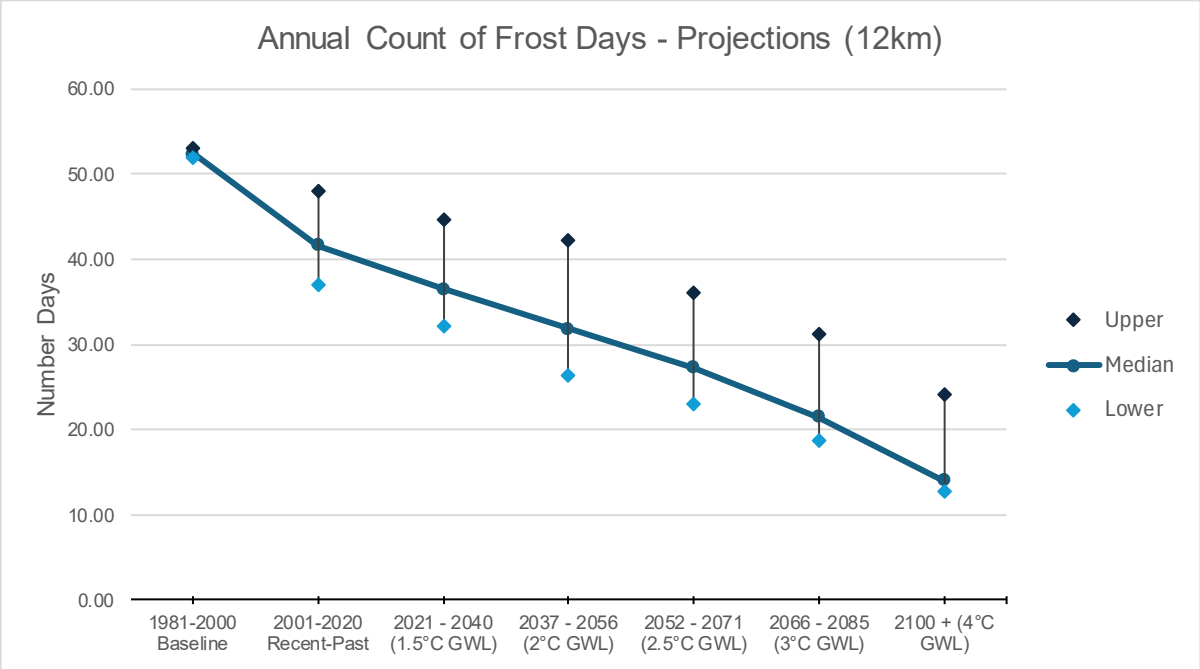


Figure 7: Annual Count of Frost Days for Coventry

Summer Precipitation Change

4.14 This dataset shows the change in summer precipitation rate (%) for a range of GWLs compared to the 1981-2000 baseline period. The data includes baseline and recent past (2001-2020) rainfall in mm/day and percentage change from the baseline for GWLs. For this data, summer is defined as June-July-August. The data is presented as a % change in Table 9 and as total mm for the summer months (92 days) in Table 10.

Table 9: Summer Precipitation Change in % for Coventry

Range	Description	Upper	Median	Lower
1981-2000 Baseline	Average value for the period (mm/day)	1.80	1.80	1.79
2001-2020 Recent-Past	Average value for the period (mm/day)	1.91	1.78	1.66
2021 – 2040 (1.5°C GWL)	Percentage change (%) relative to 1981-2000	1.72	-3.18	-11.98
2037 – 2056 (2°C GWL)	Percentage change (%) relative to 1981-2000	-1.32	-14.41	-20.58
2052 – 2071 (2.5°C GWL)	Percentage change (%) relative to 1981-2000	-6.33	-15.81	-28.26
2066 – 2085 (3°C GWL)	Percentage change (%) relative to 1981-2000	-3.84	-24.34	-34.19

2100 + (4°C GWL)	Percentage change (%) relative to 1981-2000	-22.79	-29.87	-44.49

Table 10: Summer Precipitation Change in mm for summer months (92 days) for Coventry

Range	Description	Upper	Median	Lower
1981-2000 Baseline	Average value for the period (mm for 3 summer months)	165.6	165.6	164.68
2001-2020 Recent-Past	Average value for the period (mm for 3 summer months)	175.72	163.76	152.72
2021 – 2040 (1.5°C GWL)	Average value for the period (mm for 3 summer months)	168.4	160.3	144.8
2037 – 2056 (2°C GWL)	Average value for the period (mm for 3 summer months)	163.4	141.7	130.6
2052 – 2071 (2.5°C GWL)	Average value for the period (mm for 3 summer months)	155.1	139.4	117.9
2066 – 2085 (3°C GWL)	Average value for the period (mm for 3 summer months)	159.2	125.3	108.1
2100 + (4°C GWL)	Average value for the period (mm for 3 summer months)	127.9	116.1	91.0

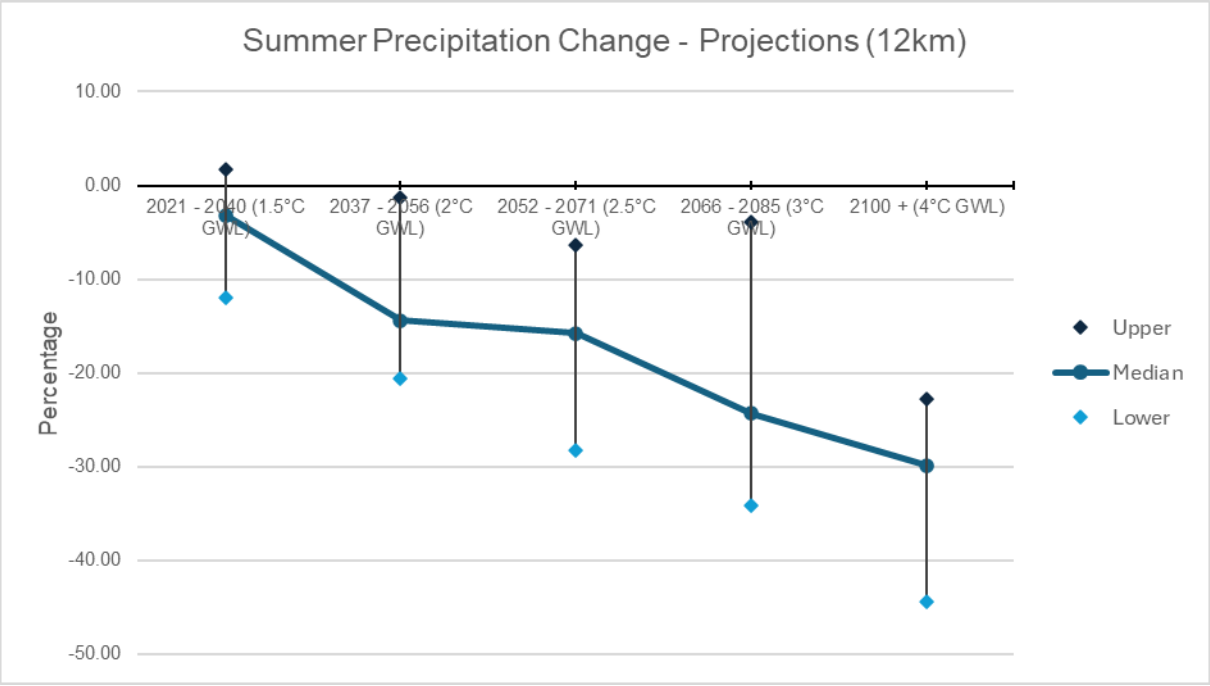


Figure 8: Summer Precipitation Change for Coventry

4.15 Table 9, Table 10 and Figure 8 clearly show a marked decrease in summer precipitation as global temperatures rise. Summer precipitation may be as much as 30% lower by the

turn of the century. There is however significant variation in the data across different models, with upper and lower bands significantly different from the median.

4.16 It is, however, important to note that these average changes do not include the intensity of rainfall for specific events. The Met Office notes that "*rain that does fall in summer will likely be more intense than what we currently experience. For example, rainfall from an event that typically occurs once every 2 years in summer is expected to increase by around 25%. This will impact on the frequency and severity of surface water flooding, particularly in urban areas*".

4.17 Reduced summer rainfall can lead to a series of interconnected challenges that impact public health, water resources, and urban infrastructure. For example, drier conditions can stress urban vegetation, such as parks, gardens, and street trees, requiring increased irrigation or leading to the deterioration of green spaces. This stress on green spaces can, in turn, heighten the risk of urban heat islands, potentially increasing temperatures in city environments and worsening air quality. However, increased intensity of rainfall events call also lead to surface water flooding and damage to infrastructure.

Winter Precipitation Change

4.18 This dataset shows the change in winter precipitation rate (%) for a range of GWLs compared to the 1981-2000 baseline period. The data includes baseline and recent past (2001-2020) rainfall in mm/day and percentage change from the baseline for GWLs. For this dataset, winter is defined as December-January-February. The data is presented as a % change in Table 11 and as total mm for the winter months (90 days) in Table 12.

Table 11: Winter Precipitation Change for Coventry

Range	Description	Upper	Median	Lower
1981-2000 Baseline	Average value for the period (mm/day)	1.85	1.85	1.84
2001-2020 Recent-Past	Average value for the period (mm/day)	2.15	1.94	1.80
2021 – 2040 (1.5°C GWL)	Percentage change (%) relative to 1981-2000	17.68	4.79	-6.05
2037 – 2056 (2°C GWL)	Percentage change (%) relative to 1981-2000	19.17	7.06	-0.96
2052 – 2071 (2.5°C GWL)	Percentage change (%) relative to 1981-2000	17.16	5.80	2.63
2066 – 2085 (3°C GWL)	Percentage change (%) relative to 1981-2000	24.10	12.13	4.10
2100 + (4°C GWL)	Percentage change (%) relative to 1981-2000	30.67	19.30	14.86

Table 12: Winter Precipitation Change in mm for winter months (90 days) for Coventry

Range	Description	Upper	Median	Lower
1981-2000 Baseline	Average value for the period (mm for 3 winter months)	166.5	166.5	165.6
2001-2020 Recent-Past	Average value for the period (mm for 3 winter months)	193.5	174.6	162
2021 – 2040 (1.5°C GWL)	Average value for the period (mm for 3 winter months)	195.9	174.5	155.5
2037 – 2056 (2°C GWL)	Average value for the period (mm for 3 winter months)	198.4	178.3	164.0
2052 – 2071 (2.5°C GWL)	Average value for the period (mm for 3 winter months)	195.1	176.2	170.0
2066 – 2085 (3°C GWL)	Average value for the period (mm for 3 winter months)	206.6	186.7	172.4
2100 + (4°C GWL)	Average value for the period (mm for 3 winter months)	217.6	198.6	190.3

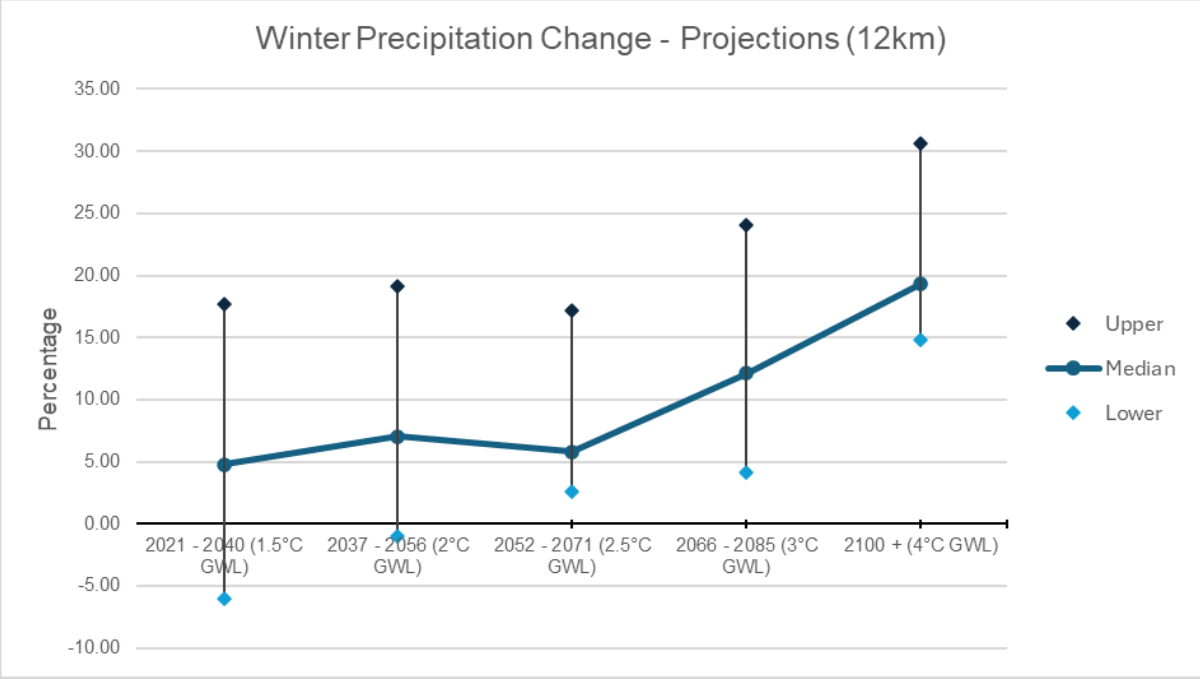


Figure 9: Winter Precipitation Change for Coventry

4.19 Table 11 and Figure 9 show a projected increase in winter precipitation. This could be as much as 20% higher overall precipitation by the turn of the century. This shift in precipitation can lead to more frequent and severe winter storms, which exacerbate risks of flooding, disrupt transportation systems, and increase the likelihood of infrastructure

damage. The increase in precipitation can also overwhelm drainage systems, leading to waterlogging and the potential compromise of road safety, thereby causing delays and accidents. The added moisture also contributes to soil saturation, increasing the risk of landslides and erosion in susceptible areas.

Localised Hazard Data

4.20 The UK Met Office data summarised above is provided in 12km quadrants. This data is often not granular enough for detailed city level climate risk assessments. City level climate response planning often needs to identify nodes within the city that are particularly vulnerable to climate hazards. To address this need for more granular hazard data, two additional datasets were used. These were for localised flooding data and for localised Urban Heat Island Data.

Localised Flooding Data

4.21 The Coventry City Council has done extensive flood risk assessment and planning. The council has conducted a Preliminary Flood Risk Assessment for the Coventry Council and Flood Risk and Hazard Mapping exercise. Based on this assessment a Local Flood Risk Management Strategy was develop as well as Surface Water Management Plan. This flood risk planning integrates with the regional flood risk planning processes (e.g. Severn River Basin District Flood Risk Management plan) as well as feeds into local planning and development processes such as the Coventry Local Plan. The context for flood risk management planning in the Coventry is summarised in Figure 10.

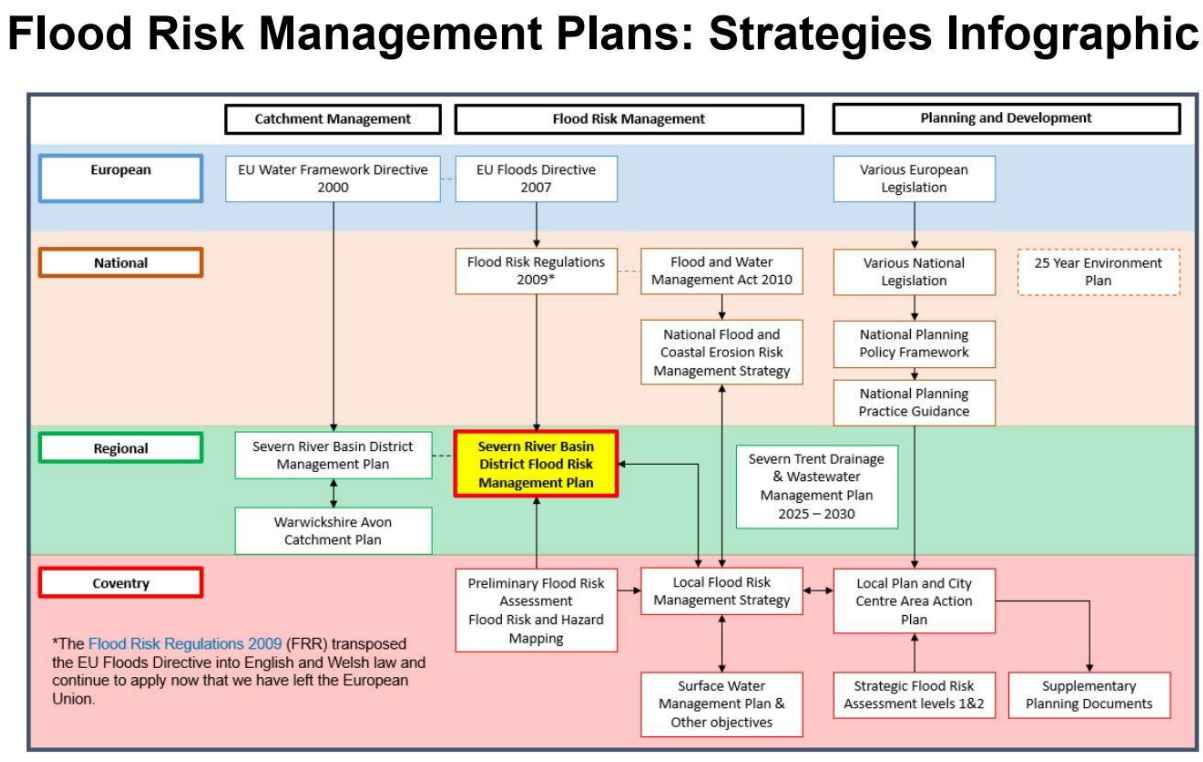


Figure 10: Flood Risk Management Planning Environment for Coventry

4.22 The underlying data used to spatially map the flood risk area was a combination of the following national surface water flood datasets:

1) Flood Map for Planning (Rivers and Sea) – Flood Zone 2
2) Flood Map for Planning (Rivers and Sea) – Flood Zone 3
3) Risk of Flooding from Surface Water Extent: 3.3 percent annual chance
4) Risk of Flooding from Surface Water Extent: 1 percent annual chance
5) Risk of Flooding from Surface Water Extent: 0.1 percent annual chance

4.23 In order to be consistent with the with the Coventry Flood Risk Management processes, this this climate change risk assessment has used the same flood risk layers to determine climate change risks from flooding. For medium term risks (e.g. GWL 2°C) the first four layers listed above were used (excluding 01. percent annual change) and for end of century (GWL 4°C) all five layers were used. The localised surface water flood risk map for Coventry is provided in *Figure 11*.

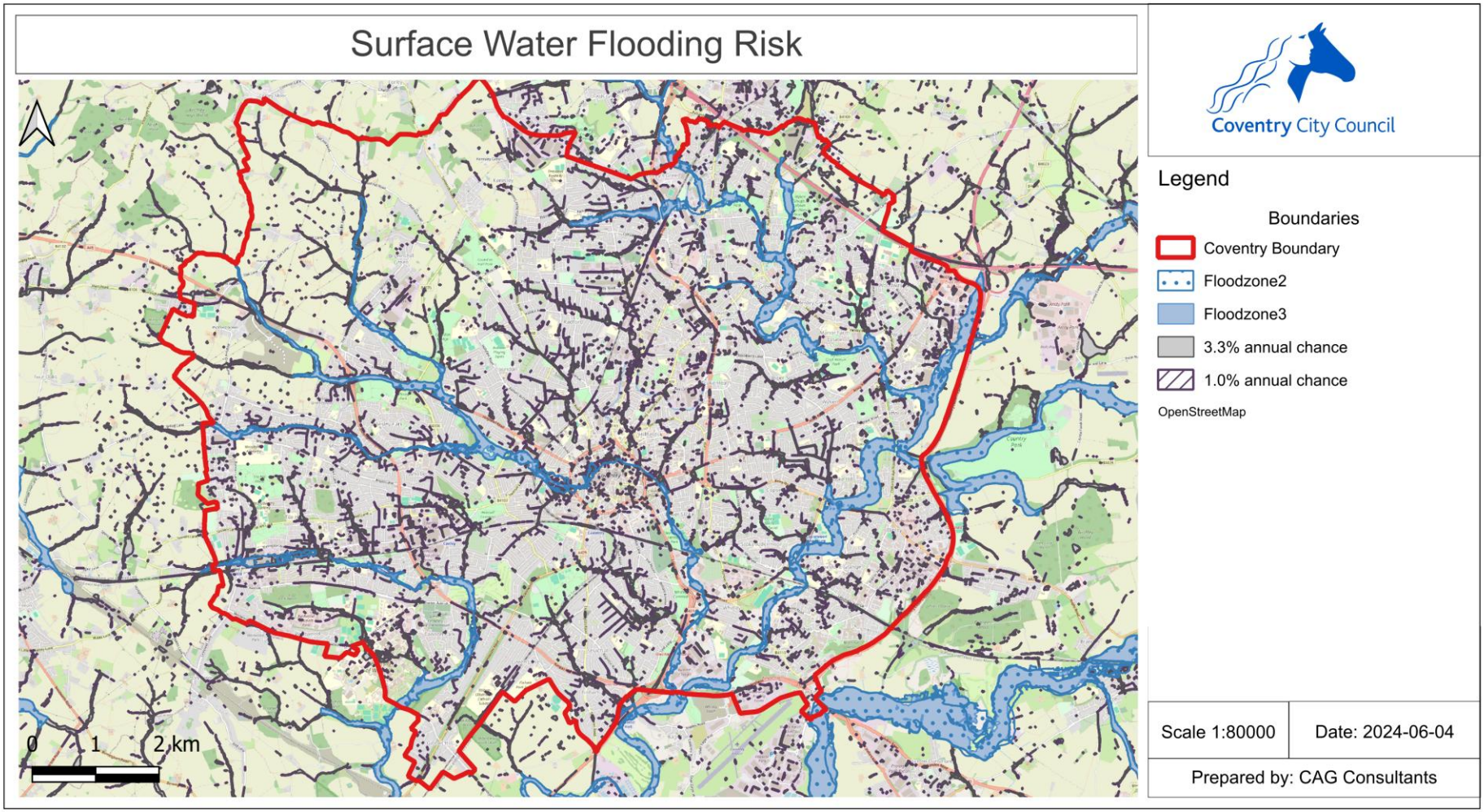


Figure 11: Surface water flood risk map for Coventry

Localised Urban Heat Island

4.24 Urban Heat Islands (UHI) occur where urban areas experience significantly warmer temperatures than their rural surroundings. This effect is primarily due to the extensive use of building materials that absorb and retain heat, limited vegetation, and human activities that generate heat. A UHI map typically highlights temperature variations across different parts of a city, identifying hotspots where the heat accumulation is most pronounced.

4.25 Coventry has not yet prepared a localised UHI map. UHI data was therefore sourced from the Global Surface UHI Explorer from the Yale University Center for Earth Observation. This tool provides a range of UHI datasets for urban clusters around the world (see *Text Box 2*). For the purpose of this climate change risk assessment, the Pixel-Level Composites of Yearly Summertime Daytime and Nighttime Intensity data set and specifically the daytime band within this dataset was used. This dataset provides an average of summer day time temperatures for urban clusters. It therefore estimates how much higher urban areas will be, on average, on a summer day, when compared to surrounding rural areas.

Text Box 2: Description of YCEO Surface Urban Heat Islands Data

The Yale University Center for Earth Observation describes this dataset as follows: The dataset contains annual, summertime, and wintertime surface urban heat island (SUHI) intensities for day and night for over 10,000 urban clusters throughout the world. The dataset was created using the MODIS 8-day TERRA and AQUA land surface temperature (LST) products, the Landscan urban extent database, the Global Multi-resolution Terrain Elevation Data 2010, and the European Space Agency (ESA) Climate Change Initiative (CCI) land cover data using the Simplified Urban-Extent Algorithm. The product is available both at the pixel level (at 300 m resolution after downscaling) and as urban cluster means from 2003 to 2018.

4.26 The Urban Heat island map for Coventry Is provided in *Figure 12*. This map shows that there are large areas in the centre and north centre of the city that can experience temperatures in excess of 4° C compared to the surrounding rural areas.

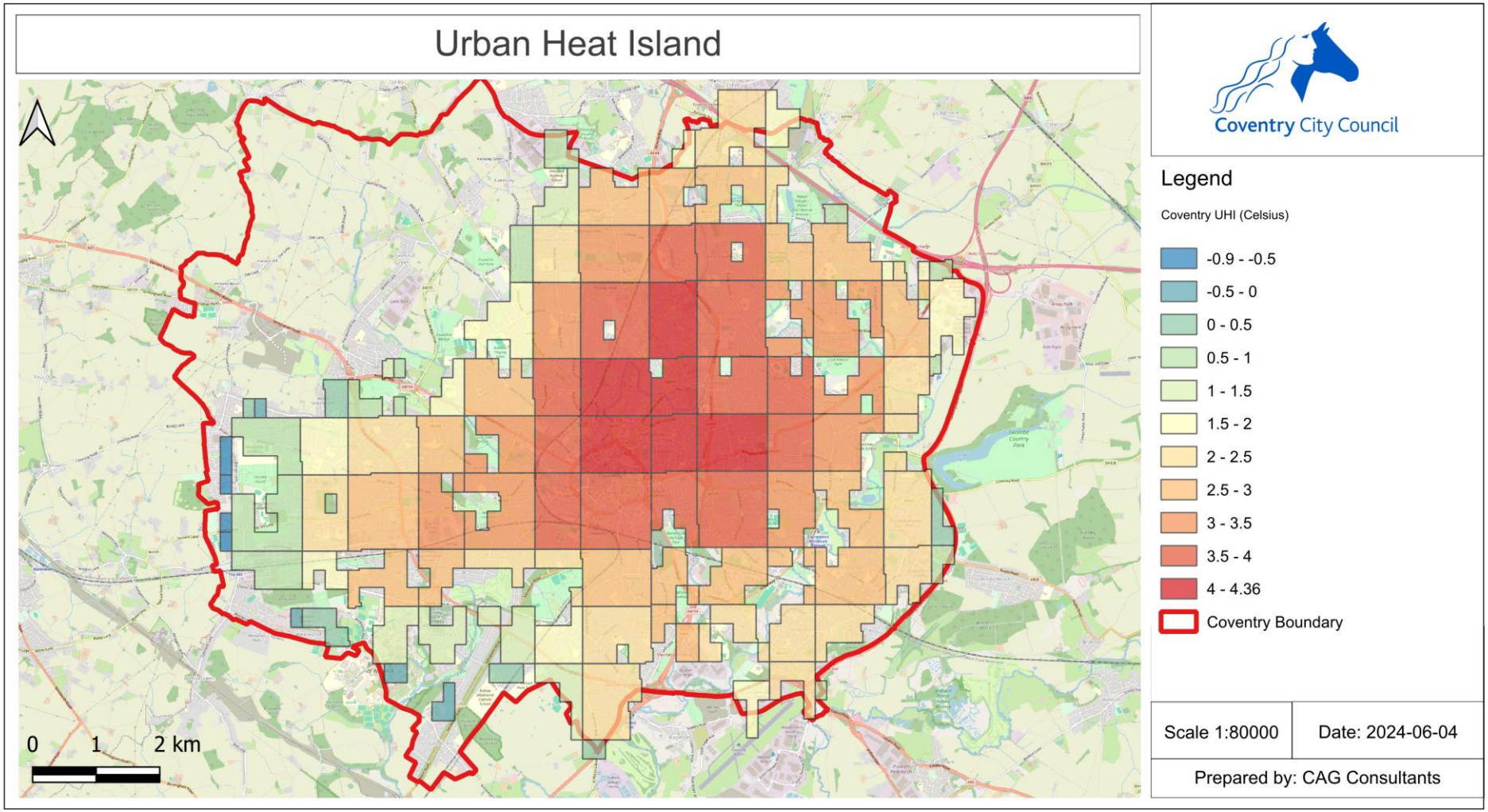


Figure 12: Urban Heat Island map for Coventry

5 Risk and Opportunity Assessment – Business and Industry

5.1 This chapter provides a summary of the assessment of each climate change risk identified under the theme of *Business and Industry*.

Risks to businesses from flooding

Context

Type:	CCRA Reference:	Risk or Opportunity:
Business and Industry	B01	Risk

Description

5.2 Flooding of business sites refers to the inundation of areas where commercial activities occur, due to excessive rainfall, river overflows, or sea level rise leading to water entering these areas unexpectedly. This risk impacts buildings, infrastructure, and inventory crucial for business operations.

5.3 In cities like Coventry, which may not be coastal but are still vulnerable to intense rainfall and riverine floods, the economic impact can be significant. Flooding disrupts business operations, damages property and assets, and can lead to substantial financial losses for local economies. Flooding also affects the livelihoods of individuals employed at these sites and disrupts supply chains.

5.4 Adapting to this risk is crucial to mitigate financial losses and ensure business continuity. Implementing flood defences, modifying building practices, and developing emergency response strategies can reduce the vulnerability of business sites to flooding.

Geospatial Assessment

5.5 To assess risks to businesses from flooding, building, surface water flooding and groundwater flooding spatial data was used. Building polygons were sourced from OpenStreetMap. These polygons were assigned Basic Land and Property Unit (BLPU) Class 1 and 2 categories, using the Local Land and Property Gazetteer (LLPG). Commercial buildings (excluding Agricultural parcels) were filtered from this data. Those building polygons intersecting with the surface water and groundwater flood layer where then filtered. Exposure was calculated as the percentage of these filtered building polygons in relation to all commercials buildings polygons in the city (see *Figure 13* and *Figure 14*).

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Approximately 24% of business premises fall within potential surface water or groundwater flood areas (3,027 businesses in surface water and 410 in groundwater flood areas from a total of 14,310).	1
Sensitivity	When businesses experience flooding, they are significantly impacted and typically need to suspend operations. In some cases, this damage may be permanent.	3
Adaptive Capacity	Coventry City Council has a comprehensive Local Flood Risk Management Strategy 2023 and a Flood Risk Assessment 2017, which include the identification of areas most susceptible to surface and groundwater flooding. The Council has been declared a Lead Local Flood Authority (LLFA), with associated powers and duties for managing flooding. The Coventry, Solihull and Warwickshire (CSW) Resilience Team has an adverse weather plan that addresses other flooding issues. Additionally, there is an Emergency Plan for Coventry, a Recovery Plan, and various recovery strategies. Business continuity plans (BCPs) are also in place for different departments, assisting services in dealing with emergency issues. Coventry City Council has a dedicated flood risk management team, a Flood Advisory Team, and the Coventry, Solihull, and Warwickshire (CSW) Resilience Team. The Environmental Health and Street Care teams also assist with clean-up after flooding events. The Environmental Authority (EA) proactively promotes a flood warning service and helps organisations understand their risk of flooding and the steps they need to take to improve resilience. As a result, there is awareness within the private sector (businesses) of potential impacts from flooding. However, businesses have limited in-house skills and resources to respond directly to flood risk.	2
Total Vulnerability Score		**2**

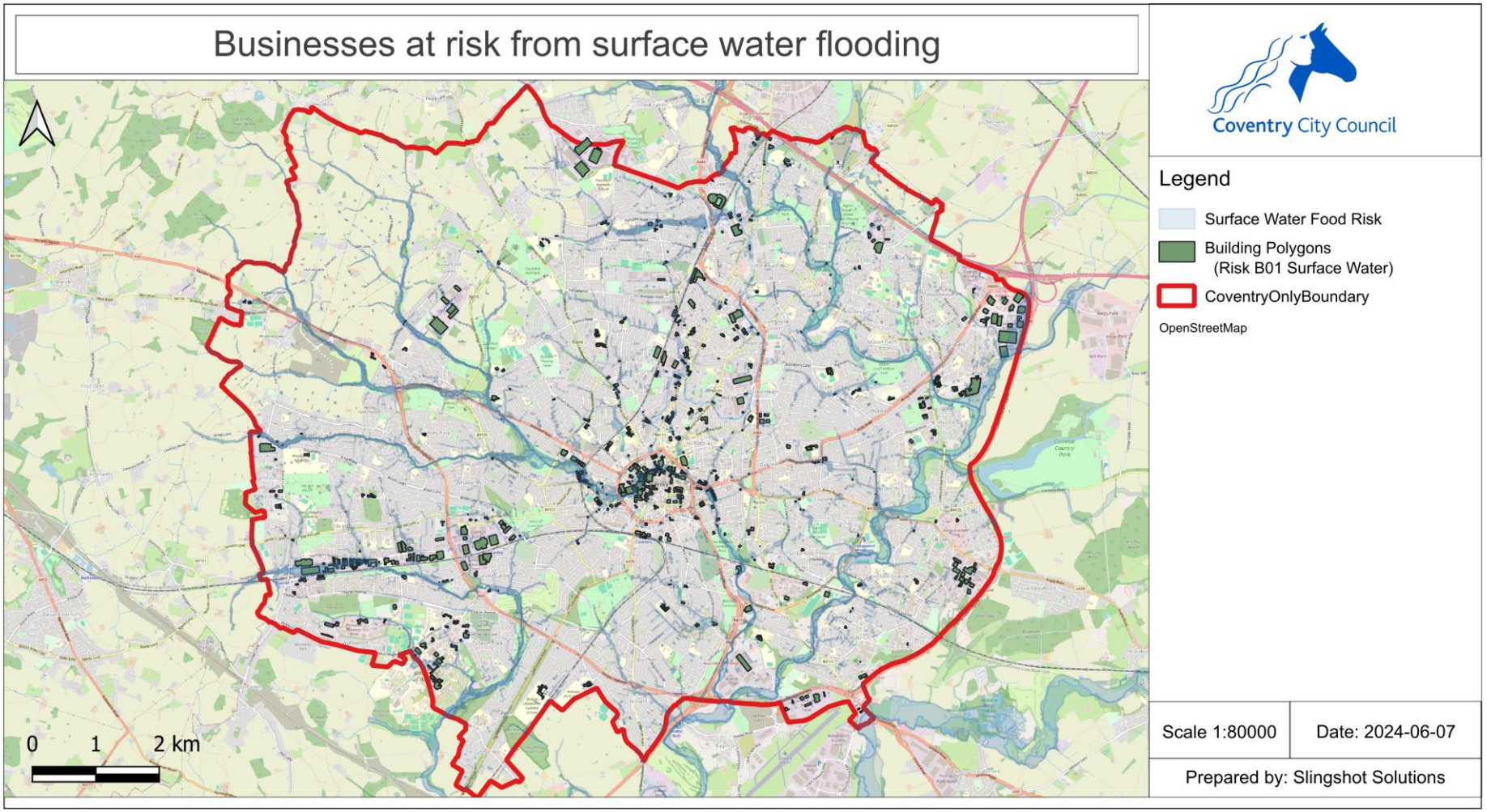


Figure 13: Business at risk from surface water flooding in Coventry

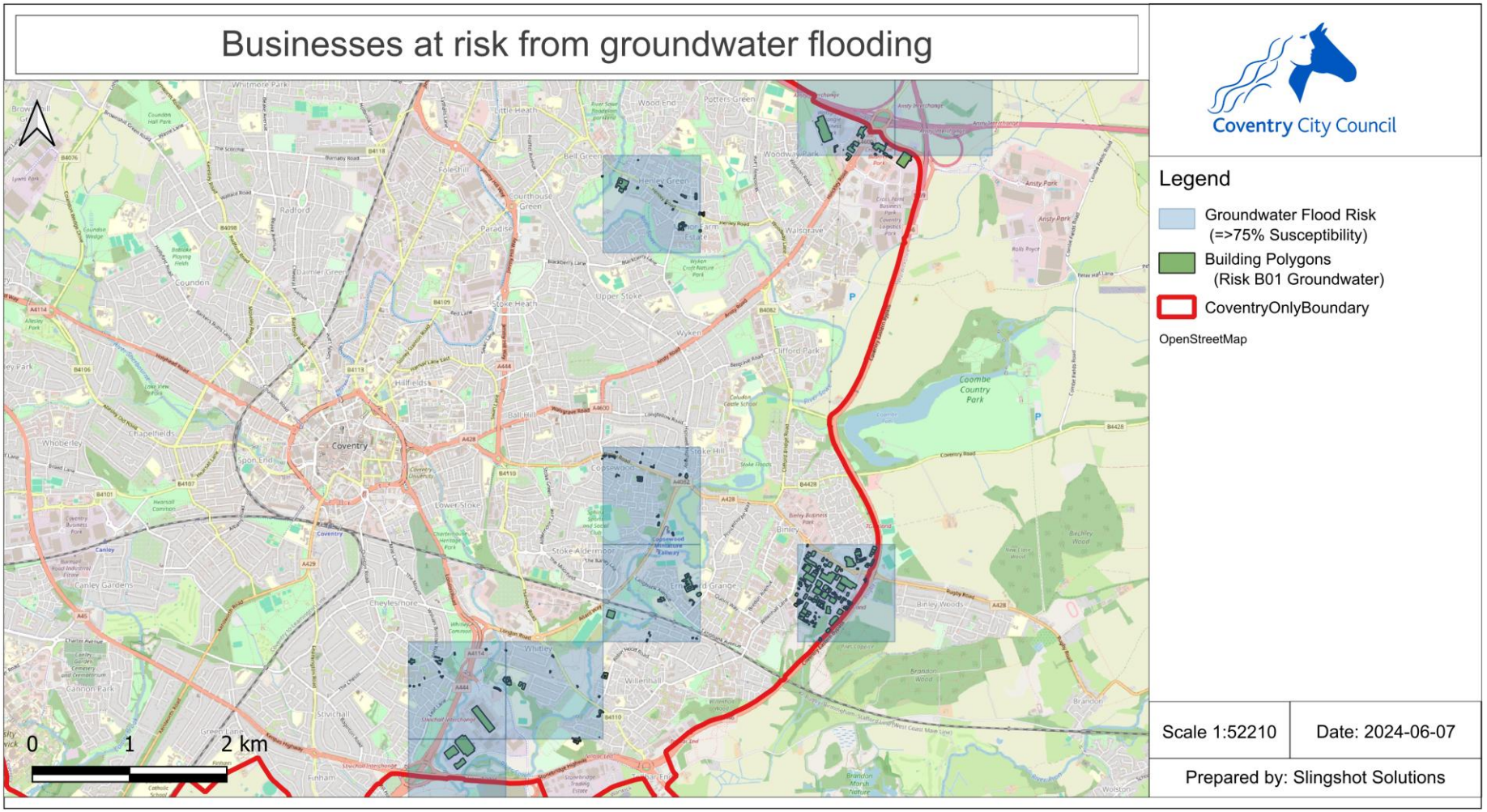


Figure 14: Business at risk from groundwater flooding in Coventry

Risks to business from water scarcity

Context

Type:	CCRA Reference:	Risk or Opportunity:
Business and Industry	B02	Risk

Description:

5.6 Water scarcity affects business operations by impacting cooling, heating, and manufacturing processes. It also poses health and safety risks to employees. Nationally, this risk is currently considered low but could become medium to potentially high in the future.

5.7 In Coventry, water is vital for industrial processes, energy production, and agriculture. A water shortage would disrupt businesses, potentially leading to economic downturns and risks to employee welfare.

5.8 Adapting is critical to reduce future water scarcity impacts, ensure employee safety, maintain production, and achieve sustainability goals. Measures like efficient water use, improved water management, and investment in water-saving technologies are necessary to mitigate these risks.

Geospatial Assessment

5.9 To assess risks to business from water scarcity building polygons were sourced from OpenStreetMap. These polygons were assigned BLPU Class 1 and 2 categories, using the LLPG. Commercial buildings considered high water users (Agriculture, Industrial Applications, Leisure and Utilities) were filtered. Exposure was calculated as the percentage of all these filtered commercials buildings polygons as a total of all commercial buildings (see *Figure 15*).

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Approximately 5% of businesses were identified as potentially at risk from water scarcity (752 out of a total of 14,310).	0
Sensitivity	Industries and businesses that heavily rely on water will be significantly impacted by water scarcity, which may result in some businesses being unable to operate.	2
Adaptive Capacity	Severn Trent has a drought management plan, a water resource management plan, and a wastewater drainage plan in place. These plans include enhancing water supply	2

Assessment Area	Details	Score
	resilience and implementing drought management strategies to ensure continuous water provision during drought conditions. Water is supplied by a private company possessing significant technical skills. However, the financial capacity to address potential future water scarcity remains unclear.	
Total Vulnerability Score		**0**

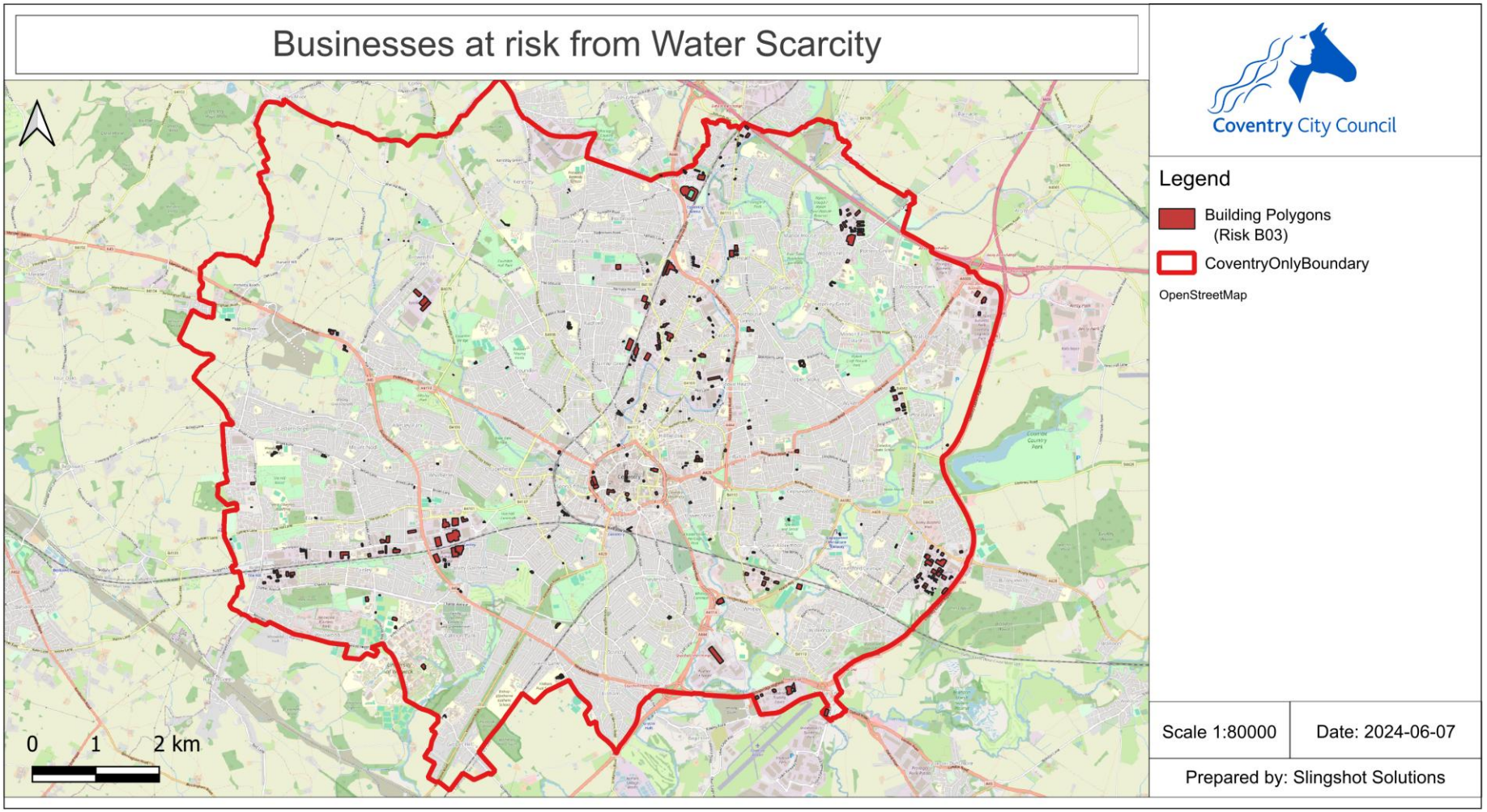


Figure 15: Business at risk from water scarcity in Coventry

Risks to finance, investment and insurance including access to capital for businesses

Context

Type	CCRA Reference	Risk or Opportunity
Business and Industry	B4. Business access to finance, investment and insurance	Risks

Description

5.10 Climate change threatens financial stability due to increased risks and costs related to extreme weather, impacting the availability and cost of insurance, finance, and investment.

5.11 Coventry's businesses depend on stable finance and insurance sectors. Climate change-induced instability could undermine economic growth and business continuity.

5.12 It's essential to manage these risks proactively to ensure financial stability, prepare businesses for extreme events, and support the UK's role as a global financial hub.

Geospatial Analysis Summary

5.13 No geospatially analysis was conducted for this risk.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	The potential risk to financing, investment, and insurance in the city is not well-known. This risk would likely be relevant to larger, capital-intensive businesses in the city.	0
Sensitivity	The risk of access to finance and investment could significantly affect businesses and have a substantial impact on the local economy.	2
Adaptive Capacity	The Coventry Climate Change Strategy emphasises the need to innovate financing mechanisms, such as exploring grant funding, interest-free government loans, and leveraging private sector investment, to address the challenges and costs associated with climate change. The finance sector is already adapting to the risk of climate change. In the future, there is likely to be an increase in adaptive capacity within this sector.	3
Total Vulnerability Score		**0**

Risks to business from reduced employee productivity due to infrastructure disruption and higher temperatures in working environments

Context

Type	CCRA Reference	Risk or Opportunity
Business and Industry	B5. Reduced employee productivity in businesses	Risks

Description

5.14 Climate change could lead to reduced productivity due to higher temperatures in work environments and infrastructure disruption.

5.15 In Coventry, productivity loss can affect business output, economic health, and employees' well-being, especially in sectors like construction. However, it should also be noted that office occupancy has been reduced since the COVID 19 pandemic.

5.16 Adapting work environments to manage temperatures and considering flexible work arrangements are key to maintaining productivity amid rising temperatures and mitigating health risks for employees.

Geospatial Analysis Summary

5.17 To assess risks to business from reduced employee productivity due to infrastructure disruption and higher temperatures in working environments, UHI and business categories were used. Building polygons were sourced from OpenStreetMap. These polygons were assigned BLPU Class 1 and 2 categories, using the LLPG. Commercial buildings considered at risk of heat exposure (agriculture, some community services and some industrial applications) were filtered. Those building polygons intersecting with the high Urban Heat Island parcels (>4°C) were then filtered (see *Figure 16*). The exposure score took into account the percentage of these filtered commercial buildings in comparison to all commercials buildings polygons. However, because impacts from infrastructure disruptions were considered to affect most businesses across the city, the overall exposure score was considered as high.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Approximately 4% of all businesses were identified as potentially at risk from reduced employee productivity due	3

Assessment Area	Details	Score
	to higher temperatures (560 out of a total of 14,310). It was not possible to determine reduced productivity due to infrastructure disruptions. However, this impact is expected to be widespread and as a result, the overall exposure score was considered to be high.	
Sensitivity	Unmanaged high temperatures can result in a reduction of productivity and health issues. However, this impact will be limited to exceptionally hot summer days. Businesses should be able to continue to operate on most days of the year.	1
Adaptive Capacity	The Net Zero Carbon Route Map for Coventry highlights opportunities to reduce energy bills for businesses by 24%, underscoring efforts to improve business resilience and productivity. There are also national guidelines in place around health and heat stress. The city is conducting a comprehensive review of their office space, primarily with service delivery and efficiency in mind. There is recognition that post the COVID-19 pandemic, the city will be occupying less office space. There are existing skills to manage heat risk among employees, but these may not be widespread across the business environment. Technical solutions like air conditioning are already well established in office and warehousing facilities. However, these interventions can have significant cost implications.	2
Total Vulnerability Score		**2**

Figure 16: Businesses at risks from reduced employee productivity due to heat stress in Coventry

Risks to business from disruption to supply chains and distribution networks

Context

Type	CCRA Reference	Risk or Opportunity
Business and Industry	B6. Disruption to business supply chains and distribution networks	Risks

Description

5.18 Extreme weather events lead to increased risk of supply chain and distribution network disruptions.

5.19 In Coventry, local businesses rely on stable supply chains for economic health. Disruptions can result in financial penalties, profitability risks, and threats to business continuity, especially for those relying on imported goods.

5.20 Adapting to mitigate these risks involves strategic planning, diversification, and new technologies to ensure supply chain resilience. This adaptation is vital to maintaining business operations and economic stability in the face of climate change.

Geospatial Analysis Summary

5.21 To assess risks to business from disruption to supply chains and distribution networks, supply chain business categories and flood risk data was used. Building polygons were sourced from OpenStreetMap. These polygons were assigned BLPU Class 1 and 2 categories, using the LLPG. Commercial buildings considered involved in supply chain processes and transport (Warehouses, Stores, Storage Depot and transport related parcels) were filtered. Exposure was calculated as the percentage of all these filtered commercials buildings polygons as a total of all supply chain related buildings (see *Figure 17* and *Figure 18*).

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Approximately 28% of all supply chain-related businesses in the city are exposed to flood risk (1,275 businesses in surface water and 124 in groundwater flood areas from a total of 5,020). However, it should be noted that most businesses are exposed to disruptions in supply chains if they occur.	2

Assessment Area	Details	Score
Sensitivity	It is unlikely that multiple supply chains will experience problems simultaneously. In the event of supply chain disruptions, many businesses will be significantly impacted, but this will likely be limited to a specific sector.	1
Adaptive Capacity	The Resilient Network plan of Coventry Council underscores the significance of identifying and preserving a resilient network that prioritises critical infrastructure and services essential for economic activity and access during extreme weather events. The Adverse Weather Plan for Coventry (2023/24) also notes that Coventry's transportation network, including road and rail infrastructure, is susceptible to disruptions caused by extreme weather events like prolonged rainfall and heatwaves. Operation Mighty Oak a national exercise simulating a National Power Outage (NPO) also noted the dependency of Coventry's infrastructure on the power grid, indicating that a power failure could lead to severe disruptions across multiple essential services and networks. The supply chain industry is relatively well-established, with technical skills within the sector. However, their ability to respond to climate impact in not well understood.	1
Total Vulnerability Score		**2**

Figure 17: Supply chain related businesses at risk from surface water flooding in Coventry

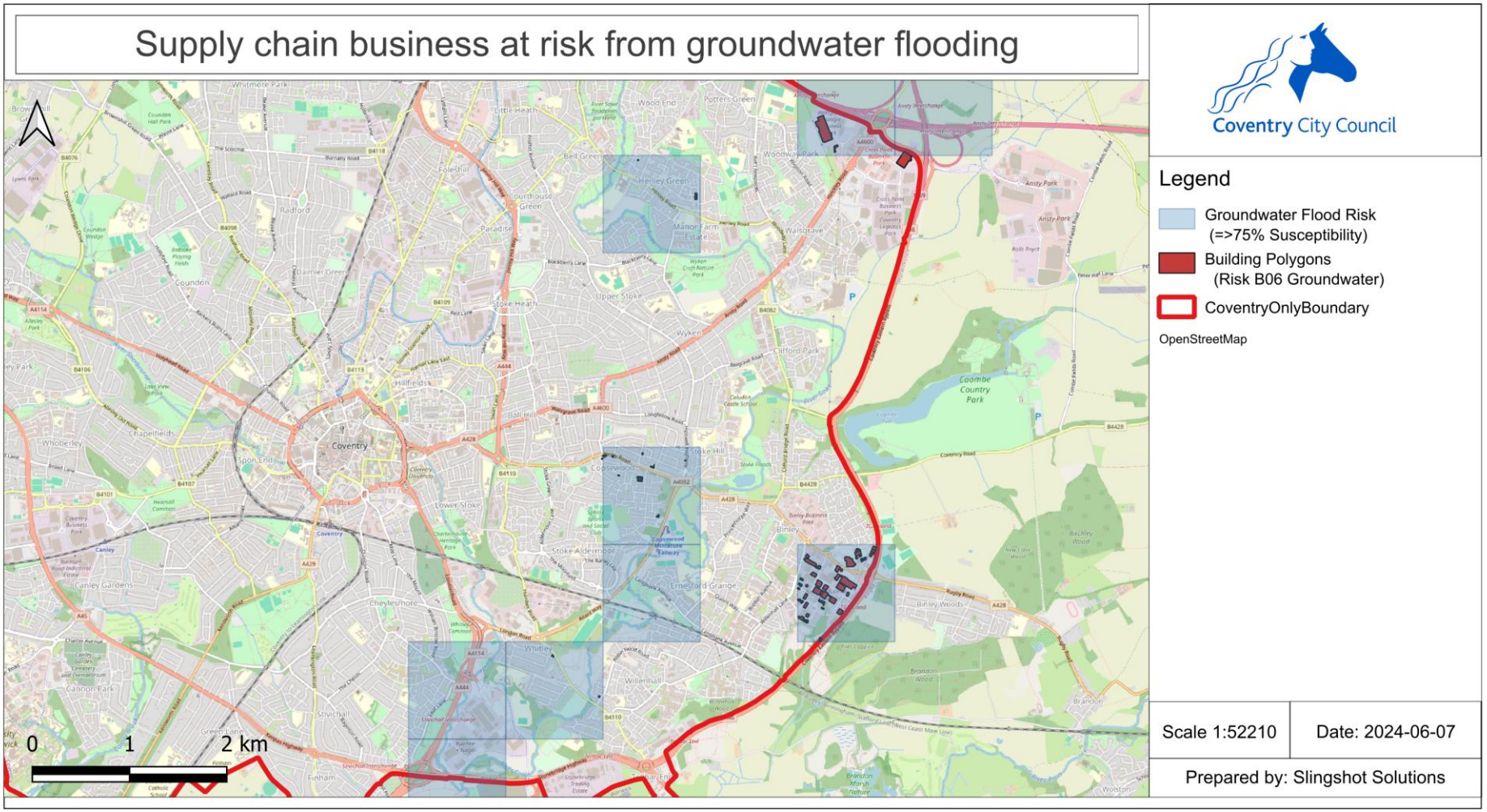


Figure 18: Supply chain related businesses at risk from groundwater flooding in Coventry

Opportunities for business from changes in demand for goods and services

Context

Type	CCRA Reference	Risk or Opportunity
Business and Industry	B7. Changes in demand for goods and services	Opportunities

Description

5.22 Climate change will alter production costs and demand, offering profitability opportunities for some sectors. Current opportunities are low but may rise to medium/high by the century's end. There are barriers, such as upfront costs, that may require government intervention to overcome.

5.23 For cities like Coventry, this shift in demand could represent economic growth opportunities in sectors like construction, heritage, and advisory services but could also pose risks if not managed properly, affecting local businesses and employment.

5.24 Adapting to these shifts by identifying opportunities in new sectors, investing in workforce retraining, and ensuring business agility is crucial for leveraging potential growth areas and ensuring that the local economy is resilient to these changes.

Geospatial Analysis Summary

5.25 No geospatially analysis was conducted for this.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	The exposure to changing business opportunities is unknown and assumed to be low at this stage.	0
Sensitivity	Further research is required to better understand the evolving business opportunities. It is presumed that potential opportunities could be realised due to the changing demand driven by climate change.	1
Adaptive Capacity	Coventry has a well-developed Economic Development Plan, the draft Climate Change Strategy and the supporting Net Zero Carbon Route Map for Coventry which outline strategies to create an environment conducive to innovative and sustainable business practices. There are significant skills within the business sector of the city to capitalise on new economic opportunities.	3

Assessment Area	Details	Score
	Capital and technology are available for innovative opportunities.	
Total Vulnerability Score		**0**

6 Risk and Opportunity Assessment – Health, Communities and the Built Environment

6.1 This chapter provides a summary of the assessment of each climate change risk identified under the theme of Health, Communities and the Built Environment.

Risks to health and wellbeing from high temperatures

Context

Type	CCRA Reference	Risk or Opportunity
Health, Communities and the Built Environment	H1. Health and wellbeing	Risks

Description

6.2 High temperatures lead to increased illness or mortality, particularly among vulnerable populations like the elderly. The risk includes exacerbated impacts from concurrent crises, such as the COVID-19 pandemic. There is also increasing evidence of buildings overheating, which poses additional health risks.

6.3 Coventry, along with other UK cities, experiences increasingly frequent and intense heatwaves, which can severely impact public health, especially in densely populated urban areas. This risk is aggravated by the urban heat island effect and poor ventilation in homes.

6.4 High temperatures lead to increased illness or mortality, particularly among vulnerable populations like the elderly. This risk is compounded by concurrent crises, such as the COVID-19 pandemic, and exacerbated by the urban heat island effect and poor ventilation in homes. According to the Grantham Institute's "Turning up the Heat" report, England is ill-prepared for extreme heat events. The report highlights that over half of UK homes are at risk of overheating, with a lack of comprehensive strategies to address this growing threat. The report also notes that in 2022 heatwaves were associated with 2,985 excess deaths in England and cost the UK economy and estimated £260 - 300 million per year. This under-preparedness, combined with Coventry's increasing frequency and intensity of heatwaves, underscores the urgent need for robust heat risk management to protect public health.

6.5 It is essential to begin adapting to minimize heat-related health risks. This includes improving building designs to enhance thermal efficiency without compromising air quality or increasing moisture levels. Proactive measures, like setting overheating standards in residential buildings and promoting better ventilation and shading practices, can significantly reduce the adverse health outcomes associated with high indoor

temperatures. Additionally, community awareness programs on managing heat stress could enhance resilience.

Geospatial Analysis Summary

6.6 Population groups exposed to risks and opportunities from increased temperatures were identified by firstly filtering population data per Output Area (OA) for those areas where there were high percentage of under 10 or over 65 years in age (a high percentage was defined as those areas in the 75th percentile). Index of Multiple Deprivation 2019 (IMD 2019) was then used to filter for LSOAs where the Health Deprivation and Disability Domain (HDDD) risk ranked as 3 or lower (where 1 is most deprived). These 2 filters (age and IMD) were combined to show OAs and LSOAs that either have a high disability decile OR a high % of people in the vulnerable age category. Finally, LSOAs that were intersecting with the high Urban Heat Island parcels (>4°C) were then filtered. This analysis therefore shows area where there are high level of vulnerability (defined by age and health IMD) that are in areas of high UHI (see *Figure 19*). Exposure was calculated as the total population living in LSOA and OA with high vulnerability (age and health IMD) and in high UHI areas.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Approximately 14% of the total population (51,362 out of 376,133) were identified as being in areas with high vulnerability (age and health IMD) and in high UHI areas. A previous SHIFT assessment report also noted that 81.7% of homes are at low risk of overheating, although the source of this data is unclear.	1
Sensitivity	Vulnerable groups are highly sensitive to extreme heat events. Extreme heat can lead to increased health stress and, in some instances, death.	3
Adaptive Capacity	There are no specific policies or plans at a local level that deal with impacts from extreme heat events, although there are warm weather protocols in place. The Coventry Climate Change Strategy outlines the importance of utilising the urban forestry and green infrastructure for urban cooling to alleviate heat stress. There are also national regulations and guidelines in responding to heat stress. The NHS also prepares Task Force on Climate-related Financial Disclosure (TCFD) reports which look at the financial impacts of climate change and the NHS is starting to collect data on extreme weather impacts. The NHS possesses substantial skills and expertise in managing heat stress. However, the NHS is limited in terms of resources and capacity to respond to large-scale heat stress events. Additionally, active charities, such as	1

Assessment Area	Details	Score
	the Salvation Army, support vulnerable communities and homeless individuals.	
Total Vulnerability Score		**3**

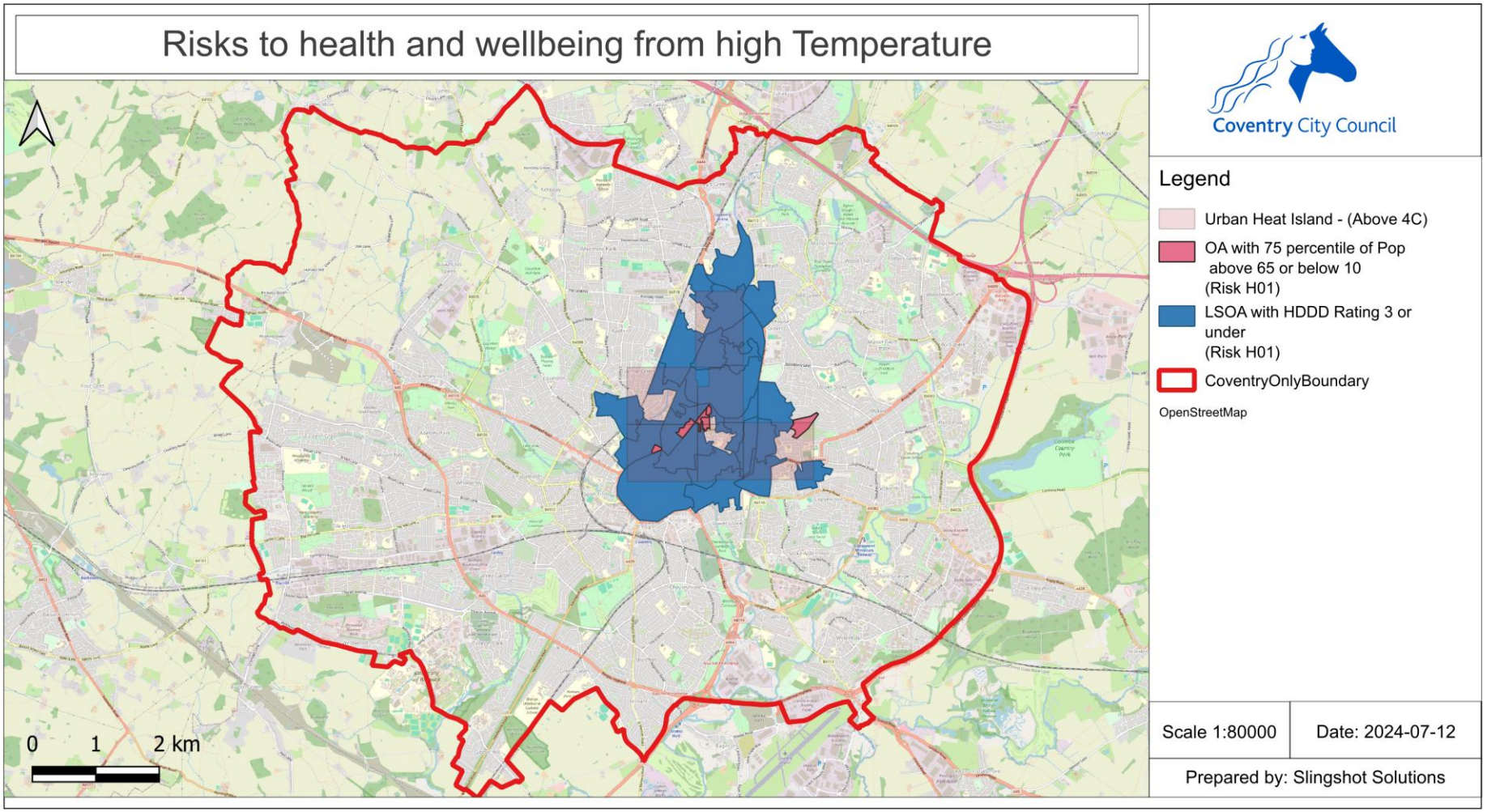


Figure 19: Risks to health and wellbeing from high temperatures for Coventry

Opportunities for health and wellbeing from higher temperatures

Context

Type	CCRA Reference	Risk or Opportunity
Health, Communities and the Built Environment	H2. Health and wellbeing	Opportunities

Description

6.7 Higher winter temperatures may reduce cold-related health issues and deaths, potentially easing the burden on health services. Warmer temperatures could increase outdoor activities, improving physical and mental health through increased contact with nature and physical exercise.

6.8 In Coventry, milder winters could decrease mortality linked to cold conditions and improve general public health through enhanced outdoor activity and better nutrition. These changes are important for managing long-term health costs and improving quality of life.

6.9 Adapting involves further research to understand and harness these benefits fully. Planning for increased outdoor activities and improved urban spaces to encourage physical activity and interaction with nature will capitalise on warmer temperatures. Maintaining readiness for cold weather impacts remains crucial, as the risk, while diminished, will persist. Adaptations in urban planning and health policy must reflect these evolving climate conditions to optimise public health outcomes.

Geospatial Analysis Summary

6.10 Population groups likely to benefit from increased temperatures were identified by firstly filtering population data per Output Area (OA) for those areas where there were high percentage of under 10 or over 65 years in age (a high percentage was defined as those areas in the 75th percentile). Index of Multiple Deprivation 2019 (IMD 2019) was then used to filter for LSOAs where the Health Deprivation and Disability Domain (HDDD) risk ranked as 3 or lower (where 1 is most deprived). These 2 filters (age and IMD) were combined to show OAs and LSOAs that either have a high disability decile OR a high % of people in the vulnerable age category. Finally, LSOA and OAs were filtered for domestic EPCs to include only those within those with a Mean EPC score with a current rating of D or below. Exposure was therefore calculated as the % of people living in area where there are high level of vulnerability (defined by age and health IMD) and low EPC ratings (see *Figure 20)*.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Approximately 36% of the total population (135,790 of 376,133) were identified as being in areas with high vulnerability (age and health IMD) and low energy (EPC) ratings.	1
Sensitivity	There can be some improvements to lifestyle and health by capitalising on opportunities from higher temperatures. However, these improvements will likely be outweighed by other lifestyle choices such as diet.	1
Adaptive Capacity	The Urban Forestry Strategy and Green Spaces Policy emphasise the importance of green infrastructure for their health benefits. Planning processes and policies also explicitly include provisions for optimising multi-functional green infrastructure. There are significant skills in place to promote health and wellbeing in the city. However, there may be a need to increase awareness of emerging health benefits from climate-driven temperature increases.	2
Total Vulnerability Score		**0**

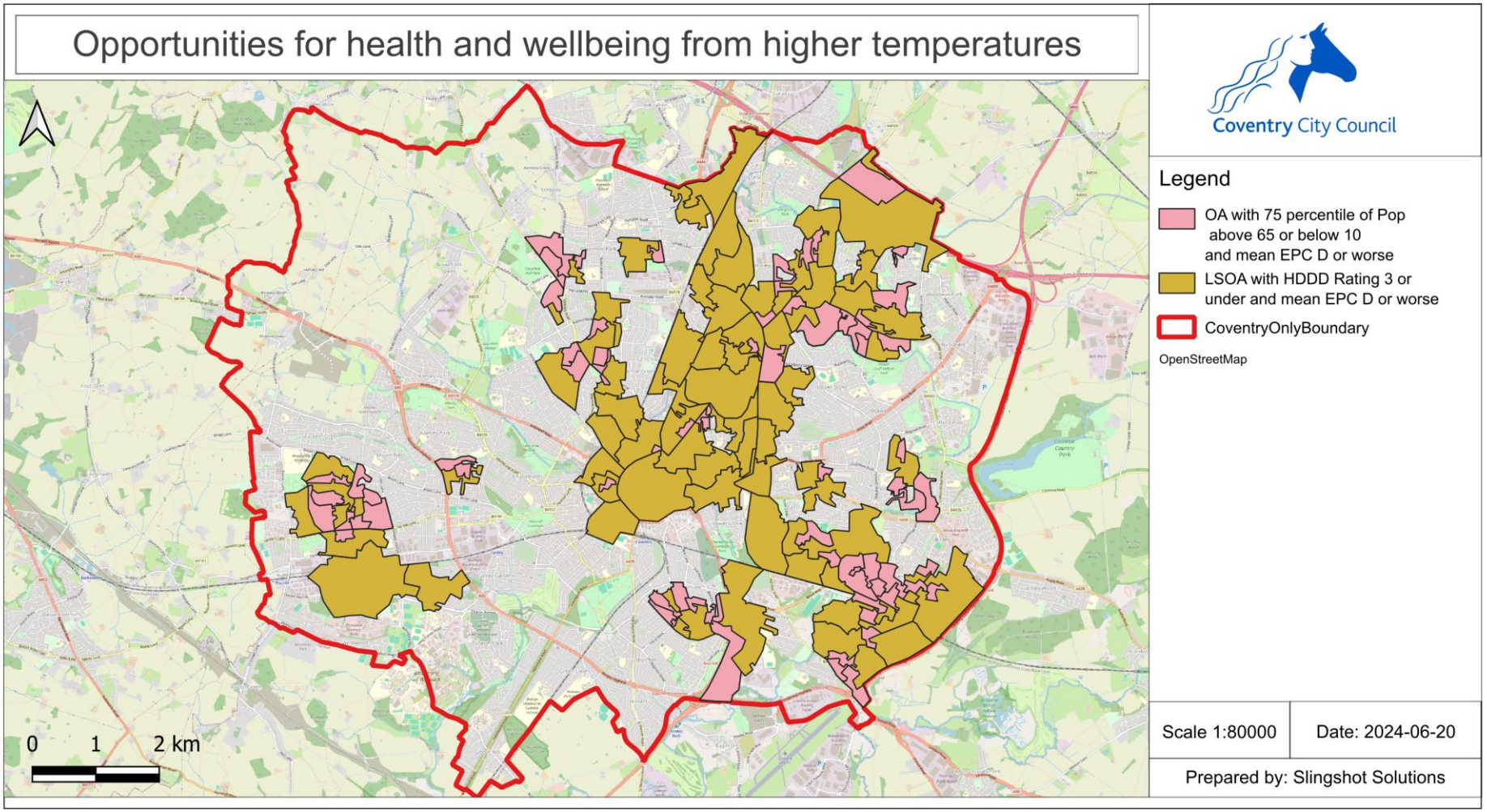


Figure 20: Areas of opportunities for health and wellbeing from higher temperatures for Coventry

Risks to people, communities and buildings from flooding

Context

Type	CCRA Reference	Risk or Opportunity
Health, Communities and the Built Environment	H3. People, communities and buildings	Risks

Description

6.11 The risk of flooding affects people, communities, and buildings significantly due to river, and surface water sources. Flooding impacts include physical damage to properties, potential loss of life, and substantial economic costs. Additionally, flooding exacerbates mental health issues like anxiety, PTSD, and depression among affected populations. The 2011 Surface Water Management Plan (SWMP) for Coventy identified approximately 10,600 properties are at risk from surface water flooding alone.

6.12 Coventry is particularly vulnerable to flooding from various sources, including river, surface water, groundwater, and sewer systems. Notable areas frequently impacted by flooding include communities along the River Sherbourne, which has experienced repeated fluvial flooding incidents. Additionally, surface water flooding is a significant concern in urban areas such as Earlsdon and Tile Hill, where heavy rainfall can overwhelm drainage systems, leading to waterlogging and property damage. The Coventry Canal and Coombe Pool also pose flood risks due to overtopping or structural failures, which could severely impact nearby properties and infrastructure.

6.13 Proactive adaptation measures are necessary to mitigate risks. This includes tackling flooding at source in upstream catchments to both slow and reduce flow, flood defences, property resilience measures, drainage improvements and integrating Sustainable Drainage Systems (SUDS) in public realm, parks, public highway corridors and tackling urban creep. These steps can significantly reduce the potential physical and economic damages from future flooding events.

Geospatial Analysis Summary

6.14 To assess risks to people, communities and buildings from flooding residential building data and flooding data was used. Building polygons were sourced from OpenStreetMap. These polygons were assigned BLPU Class 1 and 2 categories, using the LLPG. Residential buildings were filtered from this data. Those building polygons intersecting with the surface water and groundwater flood layer where then filtered. Exposure was calculated as the percentage of these filtered building polygons in relation to all residential buildings polygons in the city (see *Figure 21* and *Figure 22*).

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Approximately 12% of residential properties are located within potential surface water or groundwater flood areas (10,474 residents in surface water and 8,431 in groundwater flood areas out of a total of 162,349).	2
Sensitivity	Flooding can cause significant damage to residential properties and well-being. In extreme cases, there can be a threat to life.	3
Adaptive Capacity	Coventry City Council has a comprehensive Local Flood Risk Management Strategy 2023 and a Flood Risk Assessment 2017, which include the identification of areas most susceptible to surface and groundwater flooding. Coventry Council has been declared a Lead Local Flood Authority (LLFA) with associated powers and duties for managing flooding. The Coventry, Solihull and Warwickshire (CSW) Resilience Team has an adverse weather plan that addresses other flooding issues. Additionally, there is an Emergency Plan for Coventry, a Recovery Plan, and various recovery strategies. Business continuity plans (BCPs) are also in place for different departments to help services deal with emergency issues. Coventry City Council has a dedicated flood risk management team, a Flood Advisory Team, and the Coventry, Solihull, and Warwickshire (CSW) Resilience Team. The Environmental Health and Street Care teams also assist with clean-up after flooding events. The Environmental Authority (EA) proactively promotes a flood warning service and helps organisations understand their risk of flooding and the steps they need to take to improve resilience. However, residents have limited skills to respond to flooding. The availability of flood relief funding is limited, but there are already a number of technical solutions that could be adopted.	2
Total Vulnerability Score		**3**

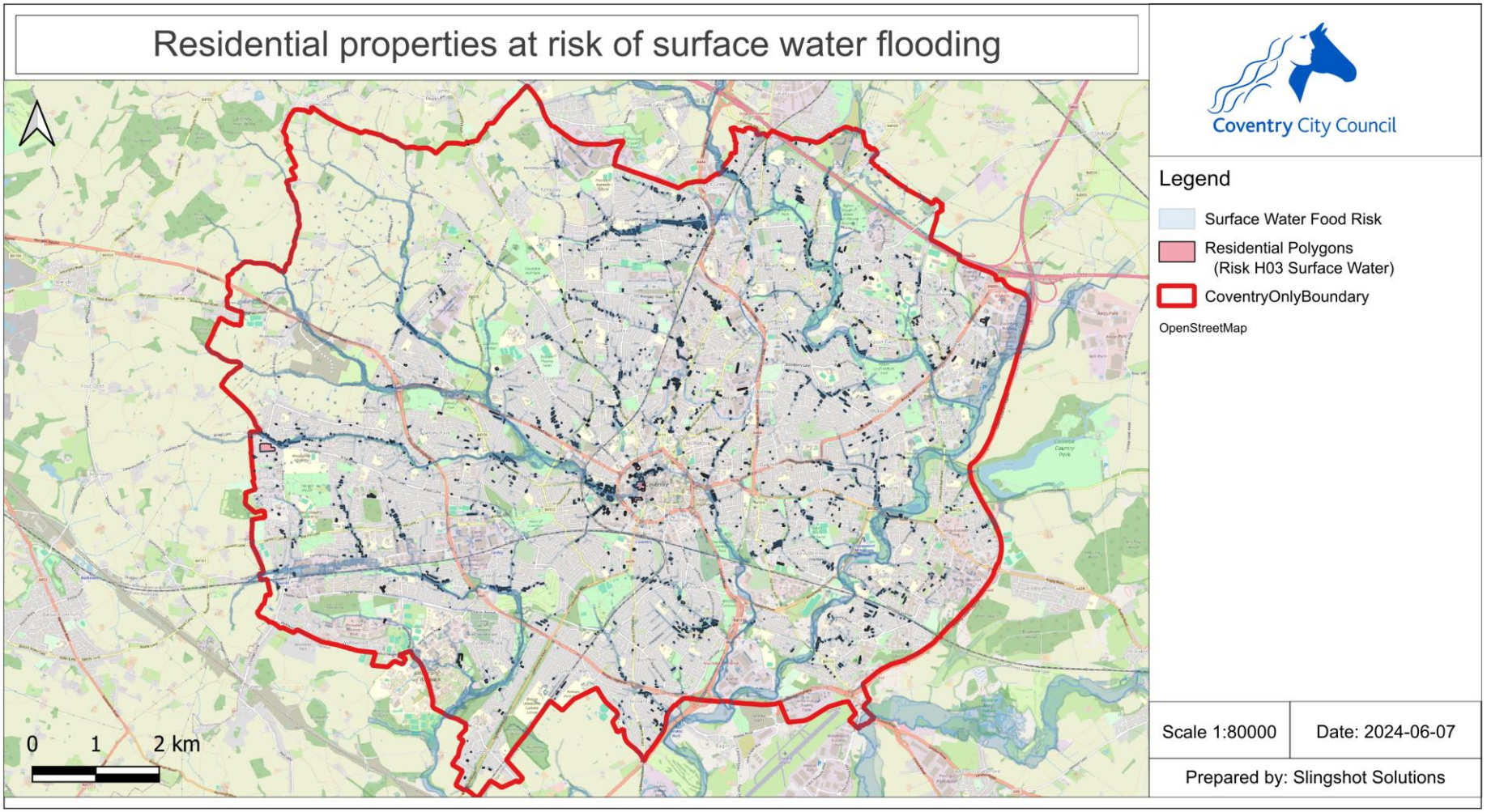


Figure 21: Residential properties at risk from surface water flooding in Coventry

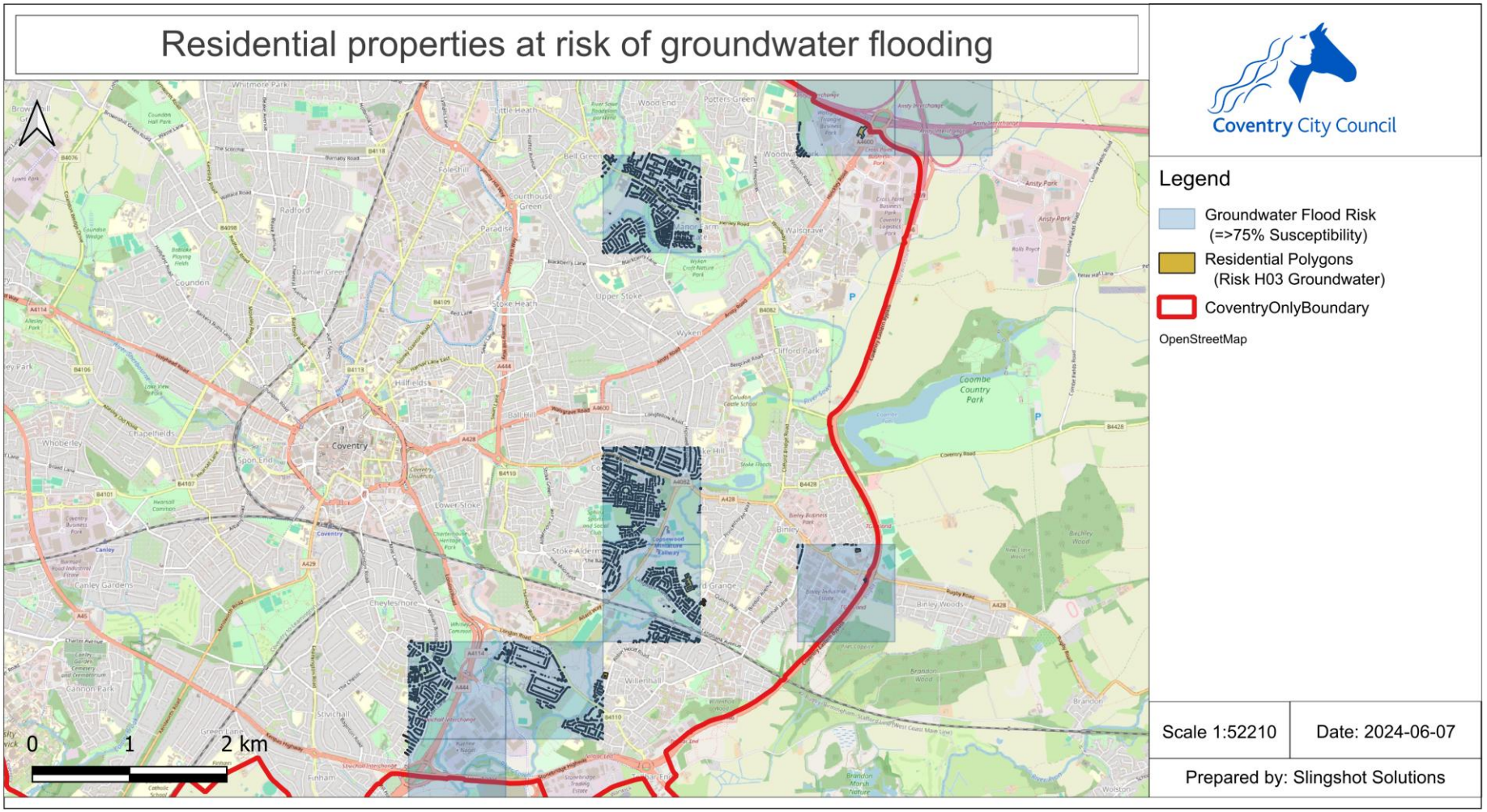


Figure 22: Residential properties at risk from groundwater flooding in Coventry

Risks to building fabric

Context

Type	CCRA Reference	Risk or Opportunity
Health, Communities and the Built Environment	H5. Building fabric	Risks

Description

6.15 Moisture, wind, and driving rain affect building integrity, leading to structural damage and increased indoor dampness.

6.16 In Coventry, as in other parts of England, these risks pose significant challenges to the durability and safety of buildings affecting occupant health and potentially leading to high repair costs.

6.17 Proactive adaptation measures are needed to incorporate future climate risks into building designs and refurbishments to protect buildings against predicted increases in moisture and wind intensity. This includes enhancing building standards and practices to manage moisture effectively and strengthen structures against wind damage.

Geospatial Analysis Summary

6.18 There is no readily available spatial data set for building fabric. However, Energy Performance Certificate (EPC) ratings were considered a proxy for building fabric as EPC rating take the characteristics of the building itself (the fabric) into account. The total count of buildings where the EPC ratings was D of lower was compared to the total count of EPC ratings for all buildings in each OA. Those OAs where 90% of the buildings had an OA with EPC rating of D or lowered were filtered (see *Figure 23*). Exposure was therefore calculated as the % of OAs in the city where 90% of buildings had an EPC rating of D or lower.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Approximately 31% (310 out of 1,005) of Output Areas in the city have a 95% buildings with an EPC rating of D or worse, equating to around 108,000 homes.	2
Sensitivity	Most buildings in the city are well-built and in accordance with the required building regulations. However, in the future, the current building conditions may not be robust enough to withstand the impacts of climate change.	1

Assessment Area	Details	Score
Adaptive Capacity	The Coventry Local Plan specifies that all new developments must be designed to be resilient to the impacts of climate change. This includes using suitable construction techniques and materials to mitigate risks associated with fluctuating temperatures and managing water effectively to handle increased rainfall and prevent building dampness. There are already well-established building regulations in place that can be adapted to accommodate future climate impacts. There are significant skills in the marketplace to implement retrofit programmes or revised building regulations. The technology for improved building fabric is still under development, and funding for the retrofit of the existing building fabric does not exist.	2
Total Vulnerability Score		**1**

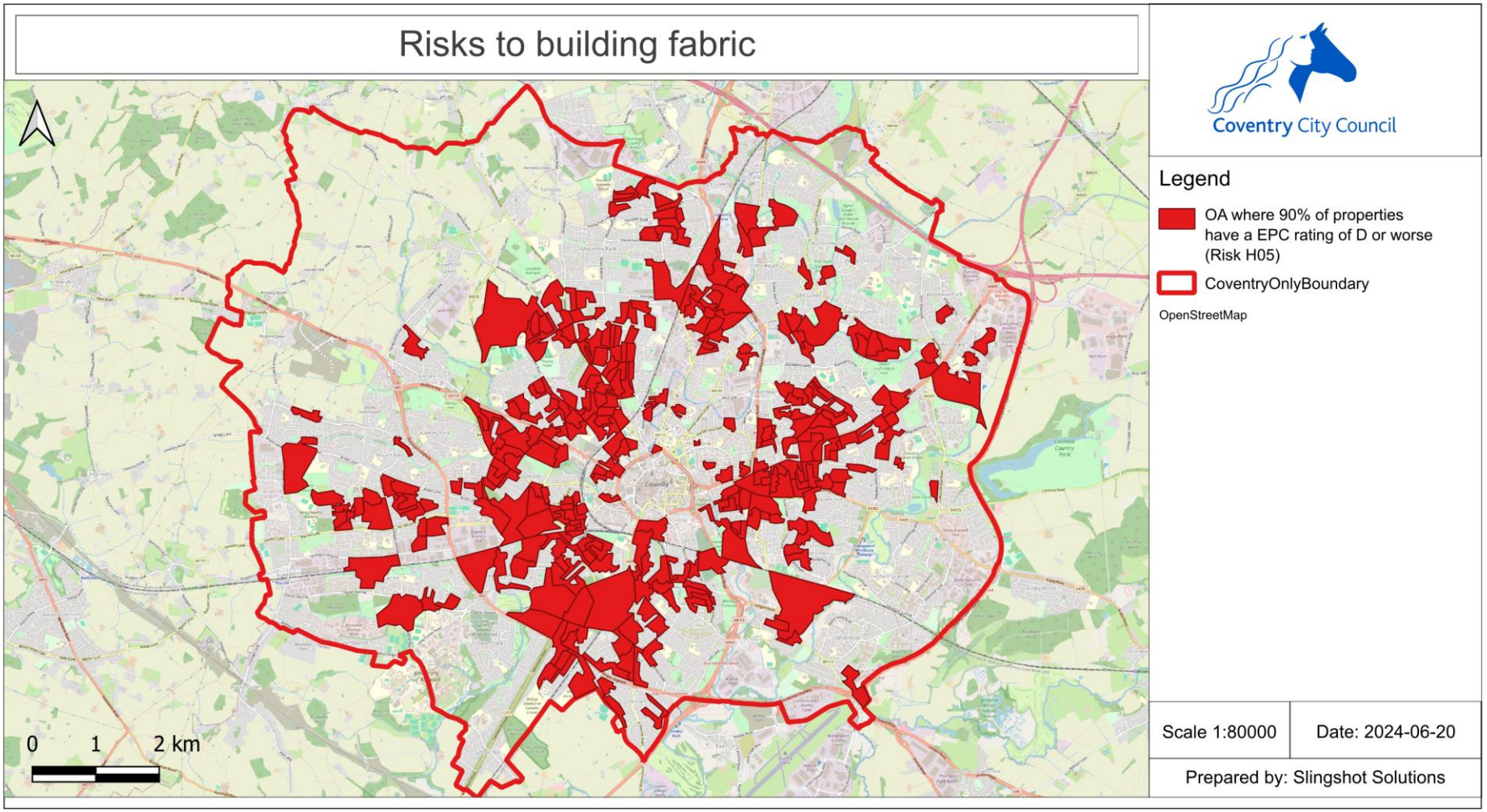


Figure 23: OA with 90% of buildings with current EPC rating of D or worse in Coventry

Risks and opportunities from summer and winter household energy demand

Context

Type	CCRA Reference	Risk or Opportunity
Health, Communities and the Built Environment	H6. Household energy demand	Risks & Opportunities

Description

6.19 Changes in summer and winter temperatures will decrease heating demand in winter and increase cooling demand in summer.

6.20 In Coventry, where changes in temperature can significantly affect indoor comfort, the shifting balance between heating and cooling demands can impact household energy costs and emissions.

6.21 Adapting to these changes is crucial to manage the increased risk of "summer fuel poverty" and to capitalise on reduced winter heating costs. Incorporating climate change projections into energy policies and building standards will ensure that homes are efficient and comfortable year-round.

Geospatial Analysis Summary

6.22 The same methodology used for *Risks to building fabric* was used for the geospatial analysis for risks and opportunities from summer and winter household energy demand. Those are OA with 90% of buildings with current EPC rating of D or worse (see *Figure 23*).

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Approximately 31% (310 out of 1,005) of Output Areas in the city have a 95% buildings with an EPC rating of D or worse, which equates to 108,000 homes.	2
Sensitivity	The city's households are sensitive to these temperature changes, particularly in summer, as most houses are not designed to manage heat. However, potential savings may be realised from reduced winter heating costs.	1
Adaptive Capacity	The Net Zero Carbon Route Map for Coventry outlines opportunities that can reduce carbon emissions through the use of energy-efficient technologies that can be retrofitted in homes. The Council is working on a retrofit programme, securing investment to support retrofit of	1

Assessment Area	Details	Score
	2,500 homes in the last 2 years and is working with a number of partners to identify opportunities to scale up activity. There are already well-established building regulations in place, which can be adapted to accommodate future climate impacts. Air conditioning technology is well developed, however there are significant skill gaps in the marketplace to implement retrofit programmes or revised building regulations. There is also limited funding to implement retrofit programmes.	
Total Vulnerability Score		**2**

Risks to health and wellbeing from changes in air quality

Context

Type	CCRA Reference	Risk or Opportunity
Health, Communities and the Built Environment	H7. Health and wellbeing	Risks

6.23

Description

6.24 Changes in indoor and outdoor air quality due to climate change, including increased particulate matter from wildfires and potential increases in pollen and mold.

6.25 Coventry, like many urban areas, could see varying air quality impacts due to climate change, affecting health outcomes related to respiratory and cardiovascular conditions.

6.26 Adapting to these changes involves integrating air quality improvements in climate policies, enhancing building standards to manage indoor air quality, and preparing for increased wildfire incidents that could affect outdoor air quality.

Geospatial Analysis Summary

6.27 Air quality data is only available for select metering points around the city. These monitoring site record Nitrogen Dioxide levels as an indication of air quality[3]. The World Health Organisation has updated their guidelines for ambient air pollutants, noting that acceptable level for nitrogen dioxide was reduced from 40 µg/m^3 to 10 µg/m^3[4]. All point

[3] https://www.coventry.gov.uk/pollution-1/air-quality/3

[4] WHO updates guideline levels for air pollutants – Defra in the media (blog.gov.uk)

measured in 2022 were above 10 µg/m^3 (see *Figure 24*). Exposure was scored as high (3) because of the widespread nature of air quality impacts.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	The recent air quality report indicates that air quality in the city has improved over the past few years. The primary areas of concern are those with housing "in close proximity to the major arterial routes with high levels of queuing traffic". However, all monitoring stations recorded Nitrogen Dioxide levels above 10 µg/m3, indicating a widespread exposure to poor air quality. In the future, a rising population and more dense development could further impact on air quality across the city.	3
Sensitivity	Specific sectors of the Coventry population are more sensitive to changes in air quality, particularly those with pre-existing respiratory and cardiovascular conditions. Alterations in air quality can exacerbate these conditions, leading to increased hospital admissions and potentially, premature deaths.	1
Adaptive Capacity	The Coventry Local Air Quality Action Plan is in place. The Air Quality Supplementary Planning Document (SPD) also focuses on reducing nitrogen dioxide (NO2) concentrations and other pollutants, which can exacerbate respiratory issues in conjunction with climate changes. The city has a dedicated, skilled team to address air quality and is working closely with WMCA on the delivery of a West Midlands wide Air Quality Plan However, addressing air quality often requires large-scale changes in behaviour to influence changes in travel and the use of woodburning stoves which exacerbate local air quality issues.	2
Total Vulnerability Score		**2**

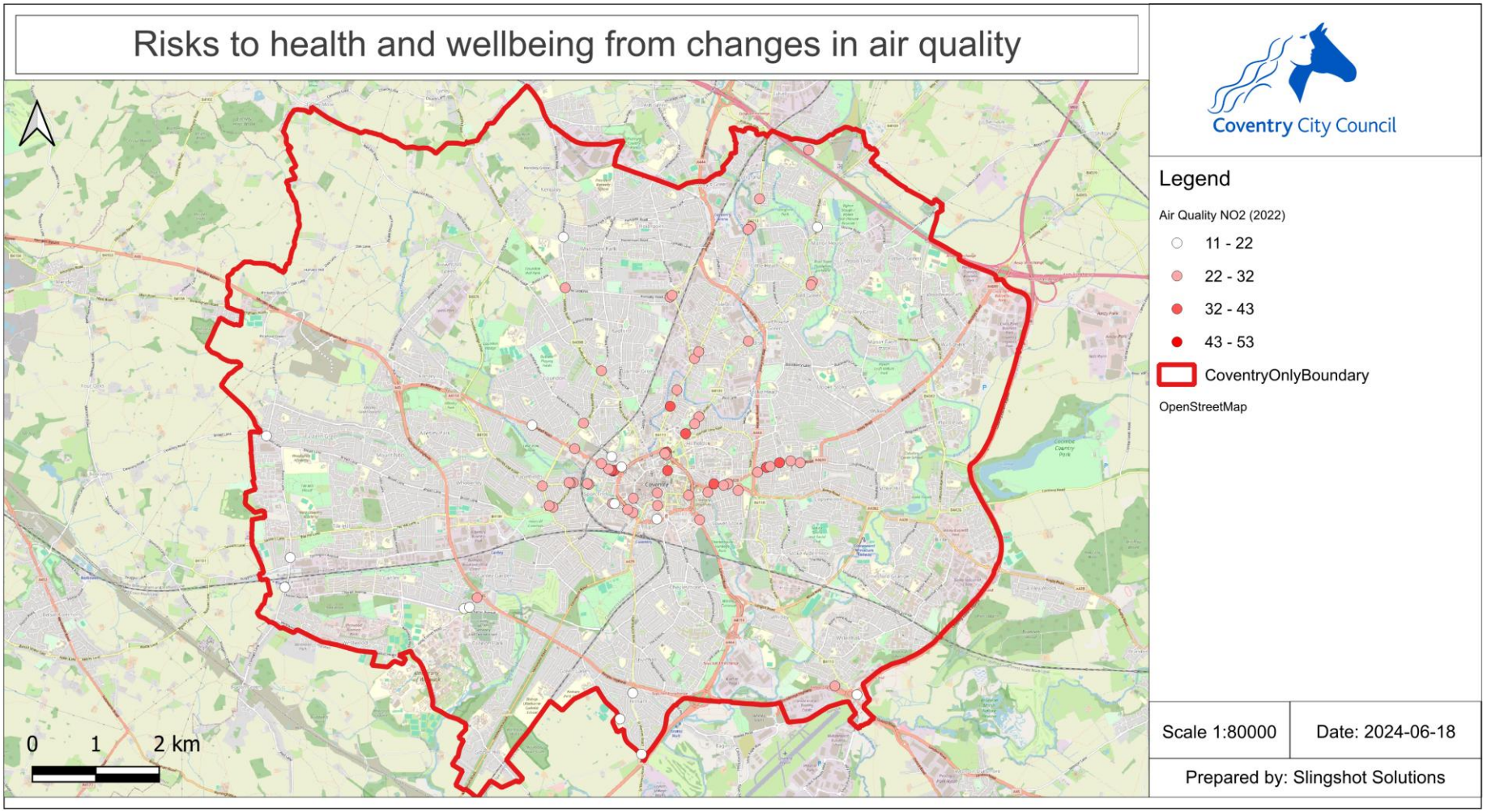


Figure 24: Air Quality readings (NO2 µg/m3) in 2022 for Coventry

Risks to health from vector-borne disease

Context

Type	CCRA Reference	Risk or Opportunity
Health, Communities and the Built Environment	H8. Health	Risks

Description

6.28 Vector-borne diseases like Lyme disease and West Nile Virus potentially increasing due to climate change affecting vector habitats and behaviors.

6.29 In Coventry, as in other parts of England, warmer temperatures could extend the transmission season of disease-carrying insects, increasing health risks to the population.

6.30 Proactive measures including enhanced surveillance and vector control are essential to prevent the establishment and spread of new diseases, which could have significant health and economic impacts.

Geospatial Analysis Summary

6.31 No geospatial analysis was conducted for this risk.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Coventry's population currently has limited exposure to the risk of vector-borne diseases. However, this exposure may increase over time due to potential changes in vector habitats and behaviours caused by warmer temperatures. New developments are being encouraged to incorporate green and blue infrastructure such as marshlands and lakes, which could pose a problem in the future as they attract vectors like mosquitoes.	0
Sensitivity	The health system and population of Coventry are sensitive to these diseases. Warmer temperatures could extend the transmission season of disease-carrying insects, leading to increased health risks.	2
Adaptive Capacity	The Coventry Health and Wellbeing Strategy does not directly address vector-borne diseases. Currently, the approach is reactive. The UK Health Security Agency (UKHSA) monitors clinical reports for vector-related diseases, and a Lyme disease map has been published.	0

Assessment Area	Details	Score
	Health protection responsibilities are currently being updated to address health issues that were never found this far north previously. There is a need for improved communication between public health and planning concerning new build developments in Coventry. The local NHS has limited skills available to respond to vector-borne diseases. However, the NHS is well-equipped with facilities and resources.	
Total Vulnerability Score		**2**

Risks to food safety and food security

Context

Type	CCRA Reference	Risk or Opportunity
Health, Communities and the Built Environment	H9. Food safety and food security	Risks

Description

6.32 Increased temperatures and extreme weather events pose significant risks to both food safety and food security in Coventry. Coventry is not immune to the global impacts of climate change on food production. Failures in grain harvests and other staple crops worldwide due to extreme weather can disrupt food availability in Coventry. This can lead to higher food prices, reduced nutritional quality, and greater difficulty in accessing essential food supplies.

6.33 The local impacts of extreme weather also affect food production within Coventry, particularly for low-income families who rely on community gardens and allotments to grow their own food. Changes in temperature, rainfall, and the frequency of extreme weather events can reduce crop yields, affecting food availability for these vulnerable groups. In addition, rising temperatures increase the risk of food spoilage and the growth of harmful bacteria during storage, posing a significant food hygiene risk. Improperly stored food can lead to a higher incidence of foodborne illnesses, further straining public health systems.

6.34 Adapting through enhanced food safety regulations, improved food handling education, and robust monitoring of emerging risks can mitigate the impact on public health. Increasing resilience in food supply chains and ensuring robust food security monitoring can minimize costs and protect vulnerable populations from the adverse effects of climate change.

Geospatial Analysis Summary

6.35 To assess risks to food safety and security, business involved in the food industry and flood risk data was used. Building polygons were sourced from OpenStreetMap. These polygons were assigned BLPU Class 1 and 2 categories, using the LLPG. Commercial buildings considered involved in the food industry (Restaurant / Cafeteria, Markets, Warehouse parcels) were filtered based on whether they intersected with surface water flooding, groundwater flooding or high Urban Heat Island parcels (>4°C) spatial layers. Exposure was calculated as the percentage of all these filtered commercials buildings polygons as a total of all food related buildings (see *Figure 25*, *Figure 26* and *Figure 27*).

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Approximately 37% of all food-related businesses in the city are exposed to climate risks (946 businesses that are in either surface water, groundwater flood, or high-risk UHI areas from a total of 2,582). However, it should be noted that businesses exposed to flood and heat risk are only indicators for risks to food safety and security. It is likely that impacts on food security would be widespread and impact households that are already vulnerable.	2
Sensitivity	A reduction in food availability and quality can have dramatic impacts on the health and wellbeing of the affected communities.	3
Adaptive Capacity	There are no specific policies or plans that address food security. Coventry has a Food Safety and Advisory Service, and the Climate Change Strategy emphasises partnerships with local food networks to combat food poverty. This is achieved by creating community growing spaces, making better use of allotments and promoting the development of new skills in cookery and healthy eating. There are existing skills to address risks related to food safety, but not necessarily for food security. There are a small number of food bank present across the city that provide food parcels through a voucher referral system. In general, there is limited funding or other resources available to address food security.	1
Total Vulnerability Score		**4**

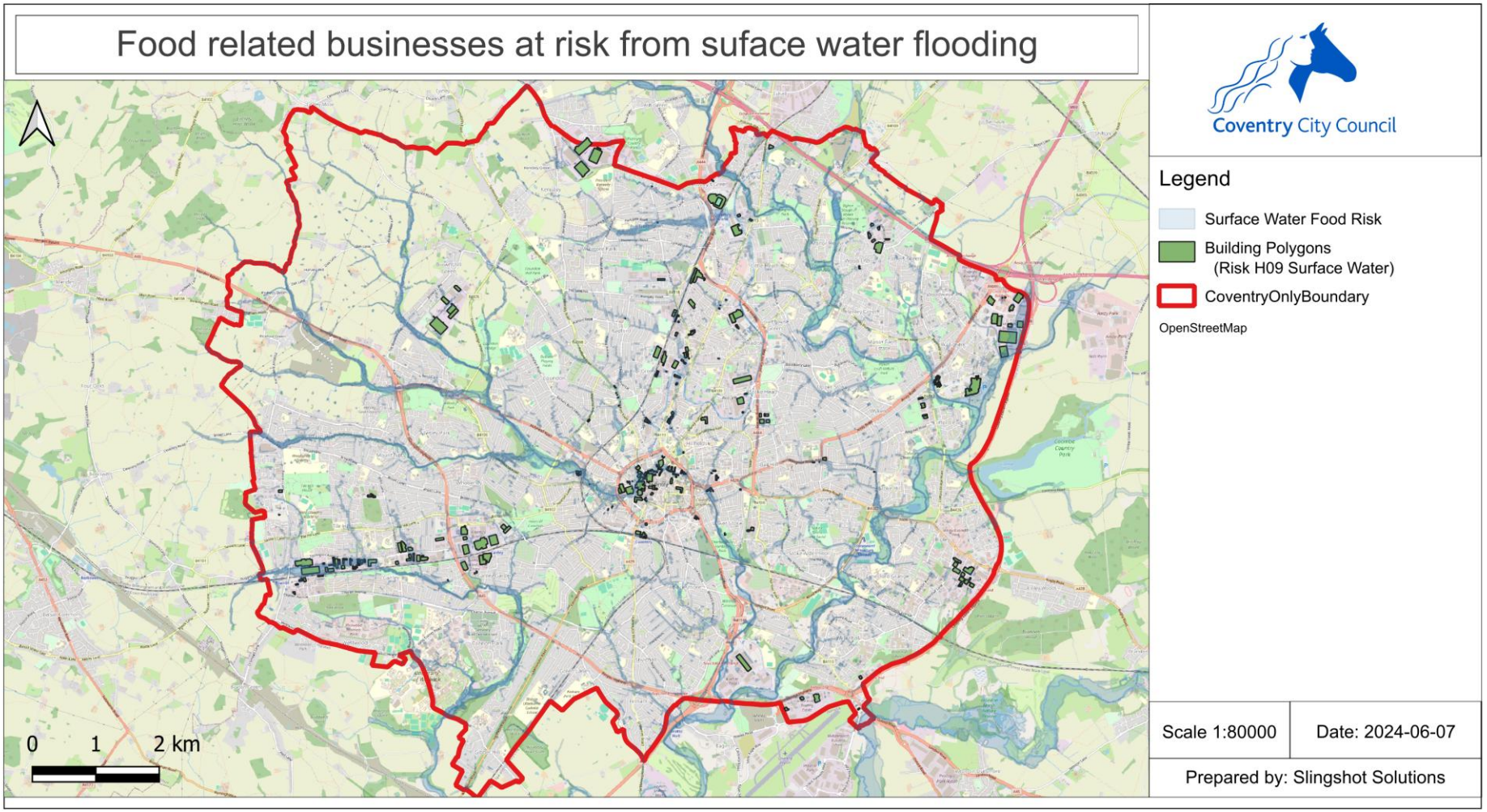


Figure 25: Food related businesses at risk from surface water flooding in Coventry

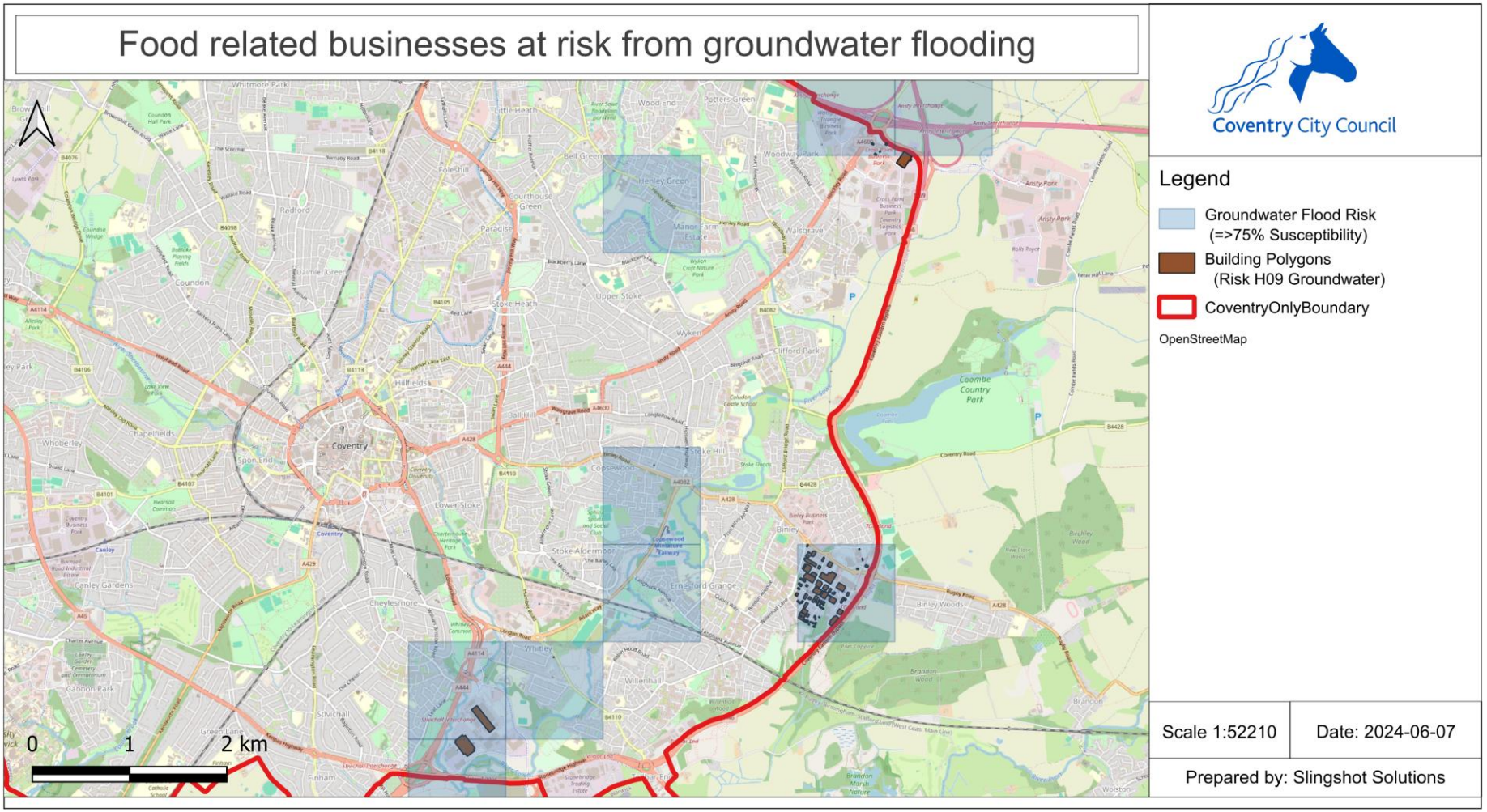


Figure 26: Food related businesses at risk from groundwater flooding in Coventry

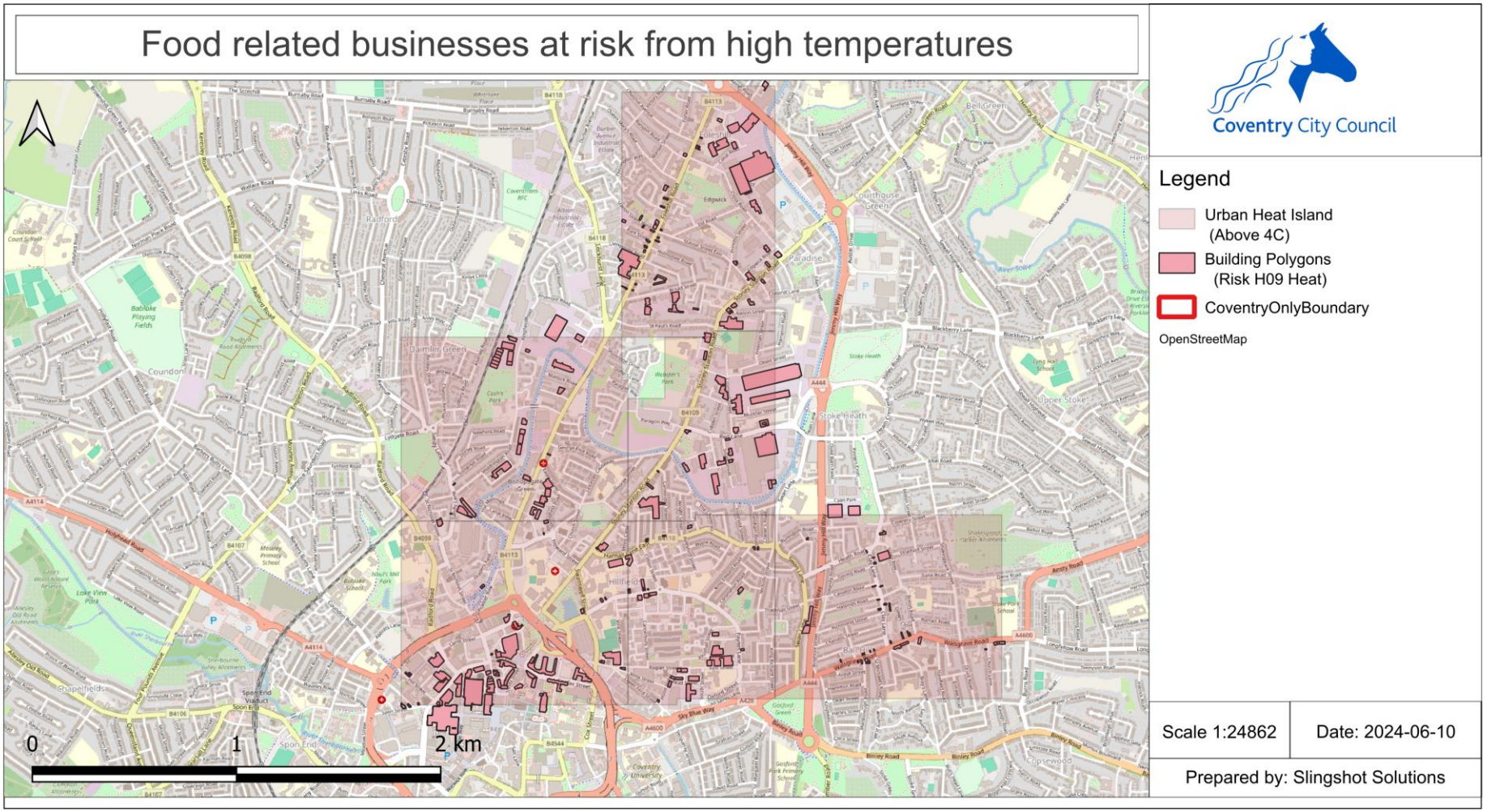


Figure 27: Food related businesses at risk from UHI in Coventry

Risks to water quality and household water supplies

Context

Type	CCRA Reference	Risk or Opportunity
Health, Communities and the Built Environment	H10. Health	Risks

Description

6.36 Climate change is likely to lead to reduced summer precipitation and increase the likelihood of water scarcity and droughts. This can interrupt household water supplies and degrade water quality, potentially leading to health risks from waterborne pathogens like Cryptosporidium and E.Coli, and increased incidents of harmful algal blooms.

6.37 In cities like Coventry, the health risks associated with poor water quality and supply are significant, especially for vulnerable populations. Interruptions in water supply and contamination can lead to widespread health and social issues, straining public health systems and economic stability.

6.38 Adapting to these risks involves improving water infrastructure to handle heavy rainfall and prevent flooding, implementing water-saving measures, the introduction of increased water filtering using retrofit natural and non- natural sustainable drainage solutions in public highway corridors and parks, reducing urban creep together with strengthening water quality improvements in new developments. These actions can mitigate health risks, ensure a stable water supply, and reduce potential economic and social disruptions.

Geospatial Analysis Summary

6.39 Population groups at risk from water quality and supply were identified by firstly filtering population data per Output Area (OA) for those areas where there were high percentage of under 10 or over 65 years in age (a high percentage was defined as those areas in the 75th percentile). Index of Multiple Deprivation 2019 (IMD 2019) was then used to filter for LSOAs where the Health Deprivation and Disability Domain (HDDD) risk ranked as 3 or lower (where 1 is most deprived). These 2 filters (age and IMD) were combined to show OAs and LSOAs that either have a high disability decile OR a high % of people in the vulnerable age category. (see *Figure 28*). Exposure was therefore calculated as the % of OAs with young and old and LSOAs that have high percentate of people in the Health Deprivation and Disability Domain.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Approximately 30% (302 out of 1,005) of LSOAs and 35% (75 out of 212) of OAs fall into this risk category. Coventry has a high population density and relies heavily on a consistent water supply from external catchments. Climate change could lead to reduced summer precipitation, increasing the likelihood of water scarcity and droughts. This exposes a large number of residents to potential water supply interruptions and degraded water quality.	2
Sensitivity	The population of Coventry City, particularly vulnerable groups such as the elderly, infants, and those with pre-existing health conditions, are highly sensitive to changes in water quality and supply. Waterborne pathogens and harmful algal blooms resulting from water scarcity and droughts can lead to significant health issues, including gastrointestinal illnesses and other water-related diseases.	3
Adaptive Capacity	Severn Trent's draft Water Resources Management Plan for 2024, focuses on securing a long-term water supply, even during periods of low rainfall. A Water Resources Regional Action Plan for the Midlands Region is in place, which incorporates the risks of climate change. There are significant skills available in the water sector. However, the clarity regarding the availability of budget and other resources to implement the regional action plan is lacking.	2
Total Vulnerability Score		**3**

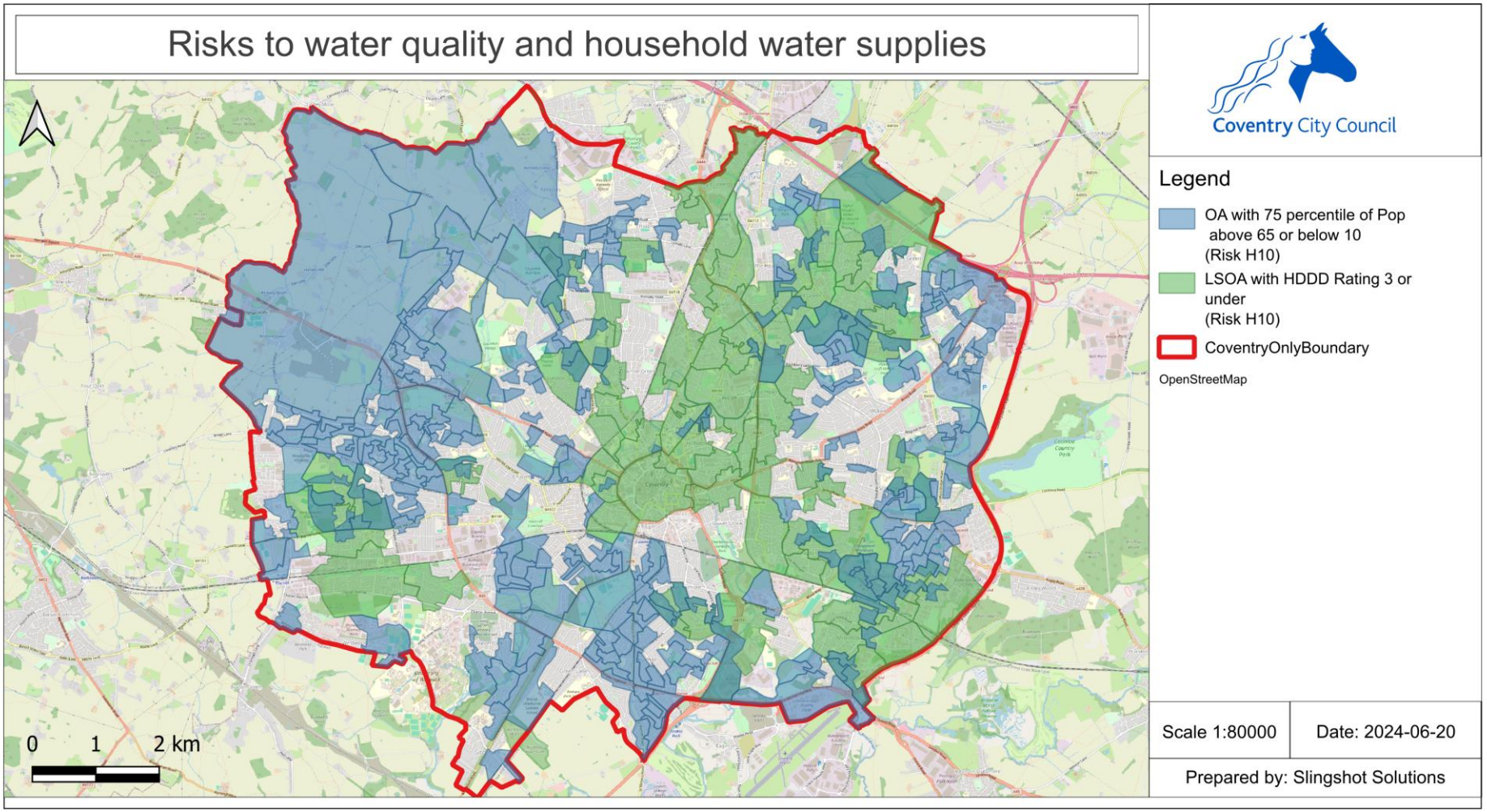


Figure 28: LSOA and OAs at risks of water quality and household water supplies for Coventry

Risks to cultural heritage

Context

Type	CCRA Reference	Risk or Opportunity
Health, Communities and the Built Environment	H11. Cultural heritage	Risks

Description

6.40 Climate change affects cultural heritage, including buildings, archaeological sites, and intangible heritage through extreme weather, increased temperatures, and flooding. These changes threaten the physical and accessible heritage.

6.41 Coventry's cultural heritage is crucial for its historical identity and tourism. Damage to this heritage due to climate changes could lead to a significant cultural and economic loss.

6.42 Adapting involves improving resilience through better materials and techniques, strategic planning for climate risks, and integrating heritage conservation into broader climate change adaptation policies to preserve both tangible and intangible heritage assets.

Geospatial Analysis Summary

6.43 Building polygons were sourced from OpenStreetMap. These polygons were assigned BLPU Class 1 and 2 categories, using the LLPG. Cultural assets (Listed Buildings, Scheduled Monuments,Museum / Gallery and Statues) were filtered from this data. Those building polygons intersecting with the surface water and groundwater flood layer where then filtered. Exposure was calculated as the percentage of these filtered building polygons in relation to all residential buildings polygons in the city (see *Figure 29*).

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Coventry has a range of cultural heritage, including buildings, archaeological sites, and intangible heritage, all of which will be exposed to climate change. However, these sites are fairly dispersed across the city.	0
Sensitivity	Coventry's cultural heritage is somewhat sensitive to climate change. Some heritage sites are relatively resilient, as demonstrated by their longevity. Future damage from extreme weather events could lead to significant cultural and economic loss. This is due to the	2

Assessment Area	Details	Score
	importance of these heritage sites to Coventry's historical identity and tourism.	
Adaptive Capacity	The city can utilise its statutory powers to take necessary actions for maintaining the structural and historical integrity of at-risk assets. The city can enforce restoration and adaptation measures on owners of listed buildings and heritage sites to ensure that these structures are equipped to handle extreme weather conditions such as floods, storms, or heatwaves which are expected to become more frequent due to climate change. This might include approving plans for restoration that enhance resilience, encouraging the use of climate-resilient materials in construction, and facilitating funding for preservation projects aimed at mitigating climate-related risks. There are skills and dedicated staff currently available in Coventry and partner organisations such as the Historic Coventry Trust to deal with risks to cultural heritage.	2
Total Vulnerability Score		**0**

Figure 29: Risks to cultural heritage for Coventry

Risks to health and social care delivery

Context

Type	CCRA Reference	Risk or Opportunity
Health, Communities and the Built Environment	H12. Health and social care delivery	Risks

Description

6.44 Climate change increases the risk of extreme weather events such as floods and heatwaves that can damage health and social care facilities and disrupt services. This includes overheating of hospitals and care homes, flooding risks to healthcare infrastructure, and impacts on transport and ICT systems essential for care delivery. These effects increase the demand for health services due to the direct impacts on people's health and wellbeing.

6.45 In Coventry, where health and social care infrastructure might be vulnerable, the robustness of these services is crucial for public safety, especially given the projected increase in frequency and severity of extreme weather events. The disruption of these services can have severe immediate health impacts and long-lasting social consequences.

6.46 Adapting to these risks means enhancing the resilience of healthcare buildings against overheating and floods, improving emergency response capabilities, and designing new facilities with future climate scenarios in mind. This includes using building materials and designs that are resilient to extreme weather, and planning healthcare delivery to accommodate increased demands during and after climate events. Strategic and localised adaptation actions are essential to safeguard health and social care services from future climate impacts.

Geospatial Analysis Summary

6.47 To assess risks to health and social care delivery, health care building data, flood data and UHI data was used. Building polygons were sourced from OpenStreetMap. These polygons were assigned BLPU Class 1 and 2 categories, using the LLPG. Buildings considered involved in the health and social care delivery (Community Service Centres, Hospital / Hospice, General Practice Surgery / Clinic etc, parcels) were filtered based on whether they intersected with surface water flooding, groundwater flooding or high Urban Heat Island (>4°C) spatial layers. Exposure was calculated as the percentage of all these filtered buildings polygons as a total of all health and social care buildings (see *Figure 31*,*Figure 32* and *Figure 33*).

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Approximately 25% of Coventry's health and social care infrastructure is exposed to the risk of extreme weather events such as floods and heatwaves (131 buildings that are in either surface water, groundwater flood or high risk UHI areas from a total of 531).	2
Sensitivity	The health and social care system in Coventry is highly sensitive to the impacts of climate change. Disruption of these services can have severe immediate health impacts and long-lasting social consequences. The demand for health services may increase due to the direct impacts on people's health and wellbeing from extreme weather events.	2
Adaptive Capacity	Coventry Council has adopted recommendations through its designation as a Marmot City. The key recommendations prioritise interventions that reduce health inequalities and mitigate climate change effects. This includes improving active travel, the quality of public spaces, local food quality, and housing energy efficiency. The city is also working with health and social care partners (by integrating climate risks into business continuity plans) to ensure that climate risks to buildings and infrastructure affecting hospitals, care homes, and other health settings are incorporated into corporate risk and business continuity planning. Coventry possesses certain capabilities to manage risks associated with health and social care delivery.	1
Total Vulnerability Score		**3**

Figure 30: Health and social care delivery services at risk from surface water flooding in Coventry

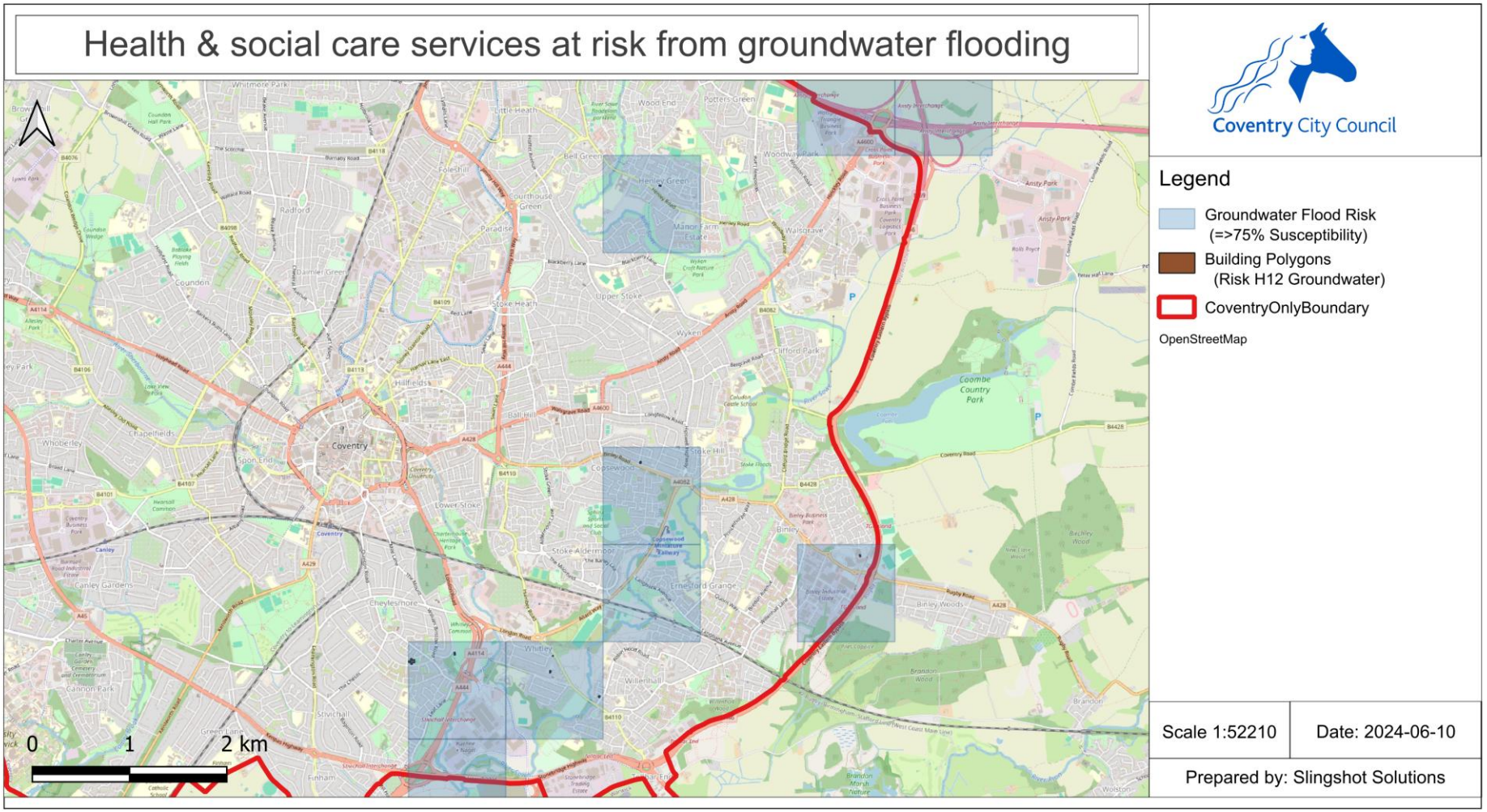


Figure 31: Health and social care delivery services at risk from groundwater flooding in Coventry

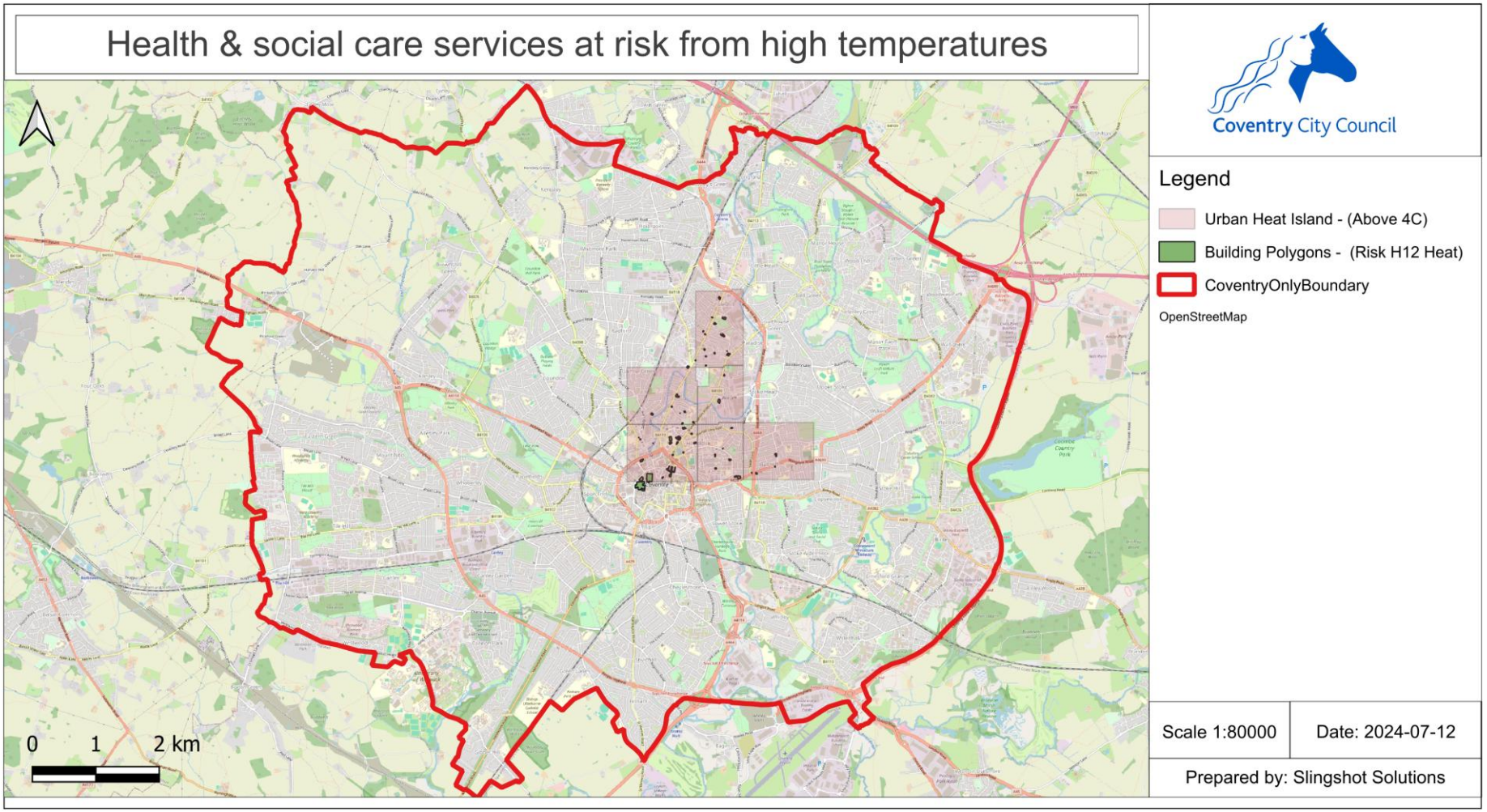


Figure 32: Health and social care delivery services at risk from UHI in Coventry

Risks to education and care home services[5]

Context

Type	CCRA Reference	Risk or Opportunity
Health, Communities and the Built Environment	H13. Delivery of education and prison services	Risks

Description

6.48 Climate-related risks to education and care services in Coventry are significant and complex. Overheating in schools and care homes can impair learning and cognitive performance in children and heighten discomfort and health risks for elderly residents. Increased flooding risks can disrupt the operations of these essential services.

6.49 Heat stress particularly impacts vulnerable groups, including young children, the elderly, and those with medical conditions such as Chronic Obstructive Pulmonary Disease (COPD) and heart disease. Staff working in schools, nurseries, care homes, and community outreach services need to be particularly vigilant in these conditions.

6.50 Beyond education and care homes, other critical services, including those supporting people in their homes, must also adapt to these climate-related challenges. This means updating building designs and infrastructure across a broader range of services to effectively manage heat and flood risks. In Coventry, it is essential that facilities, whether educational, residential, or community-based, remain safe and functional under future climate scenarios.

6.51 Adapting to these risks requires a comprehensive approach that includes implementing heat management strategies, improving flood defences, and ensuring continuity of services. Strategic planning is key to maintaining the resilience of Coventry's educational and care systems. Additionally, specific training for staff is essential. This training should cover how to address heat stress and other climate-related challenges within facilities and provide guidance on helping individuals and families manage during extreme temperature events.

Geospatial Analysis Summary

6.52 To assess risks to education and prison services, education building data, flood data and UHI data was used (there are no prisons in Coventry). Building polygons were sourced from OpenStreetMap. These polygons were assigned BLPU Class 1 and 2 categories,

[5] The national risk descriptor for this risk is "Risks to education and prison services". However, there are no prisons or offender institutions in Coventry. This risk has been amended to rather include care homes as they are a particularly important facilities with vulnerable elderly residents most affected by extreme heat.

using the LLPG. Buildings considered involved in the health and social care delivery (Children's Nurseries, Schools, College, Universities etc, parcels) were filtered based on whether they intersected with surface water flooding, groundwater flooding or high Urban Heat Island (>4°C) spatial layers. Exposure was calculated as the percentage of all these filtered buildings polygons as a total of all health and social care buildings (see *Figure 33*,*Figure 34* and *Figure 35)*.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Approximately 26% of Coventry's education facilities are exposed to the risk of extreme weather events such as floods and heatwaves (165 buildings that are either in surface water, groundwater flood, or high-risk UHI areas out of a total of 640).	2
Sensitivity	Educational facilities are highly sensitive to the impacts of climate change. Overheating can impair learning and cognitive performance, and affect health in schools. Flooding can disrupt operations, causing damage that necessitates costly repairs and relocations.	2
Adaptive Capacity	There are no specific policies to address climate change risks in schools. Extreme weather typically falls under emergency planning, rather than climate change. However, the city's policies emphasise the importance of natural ventilation systems to maintain comfortable indoor temperatures without excessive use of air conditioning. The flood risk management strategy encourages flood risk management actions such as incorporating Sustainable Urban Drainage Systems (SUDS) in facilities like schools. Very few schools or children's homes have any individual guidance on what to do in extreme weather events. Schools have a maintenance schedule where climate issues can be embedded, but this is often restricted by funding availability.	1
Total Vulnerability Score		**3**

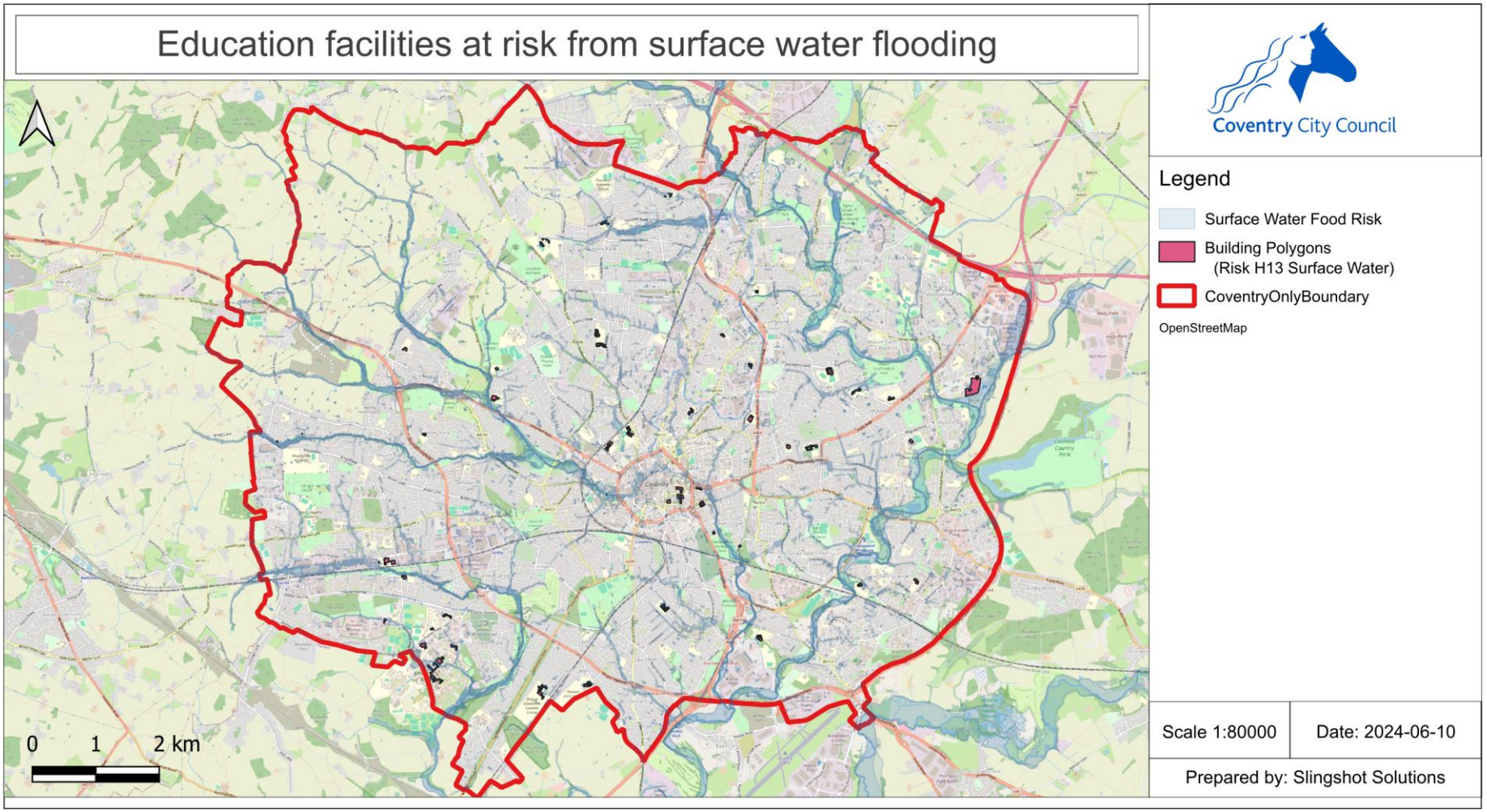


Figure 33: Education facilities at risk from surface water flooding in Coventry

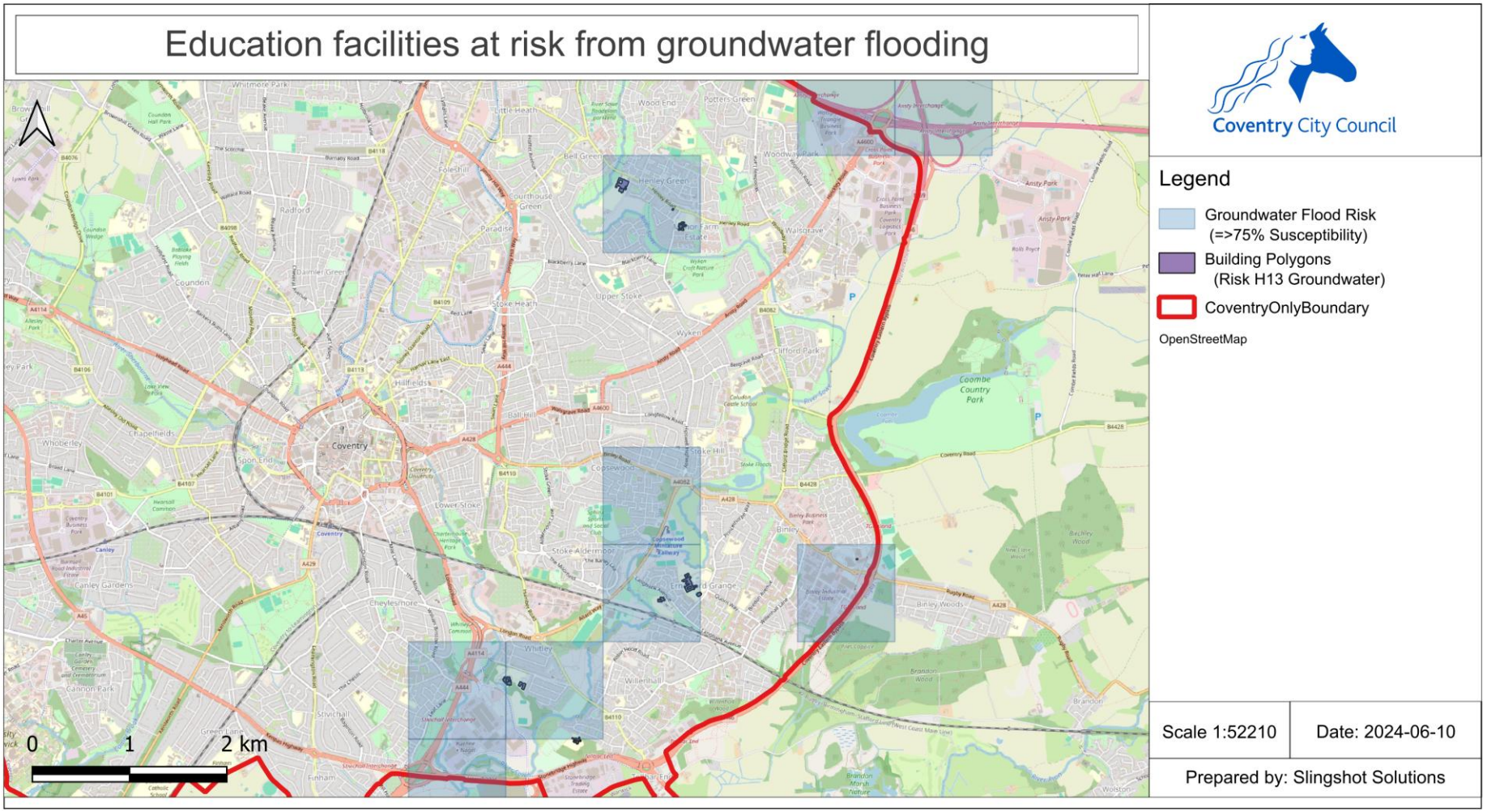


Figure 34: Education facilities at risk from groundwater flooding in Coventry

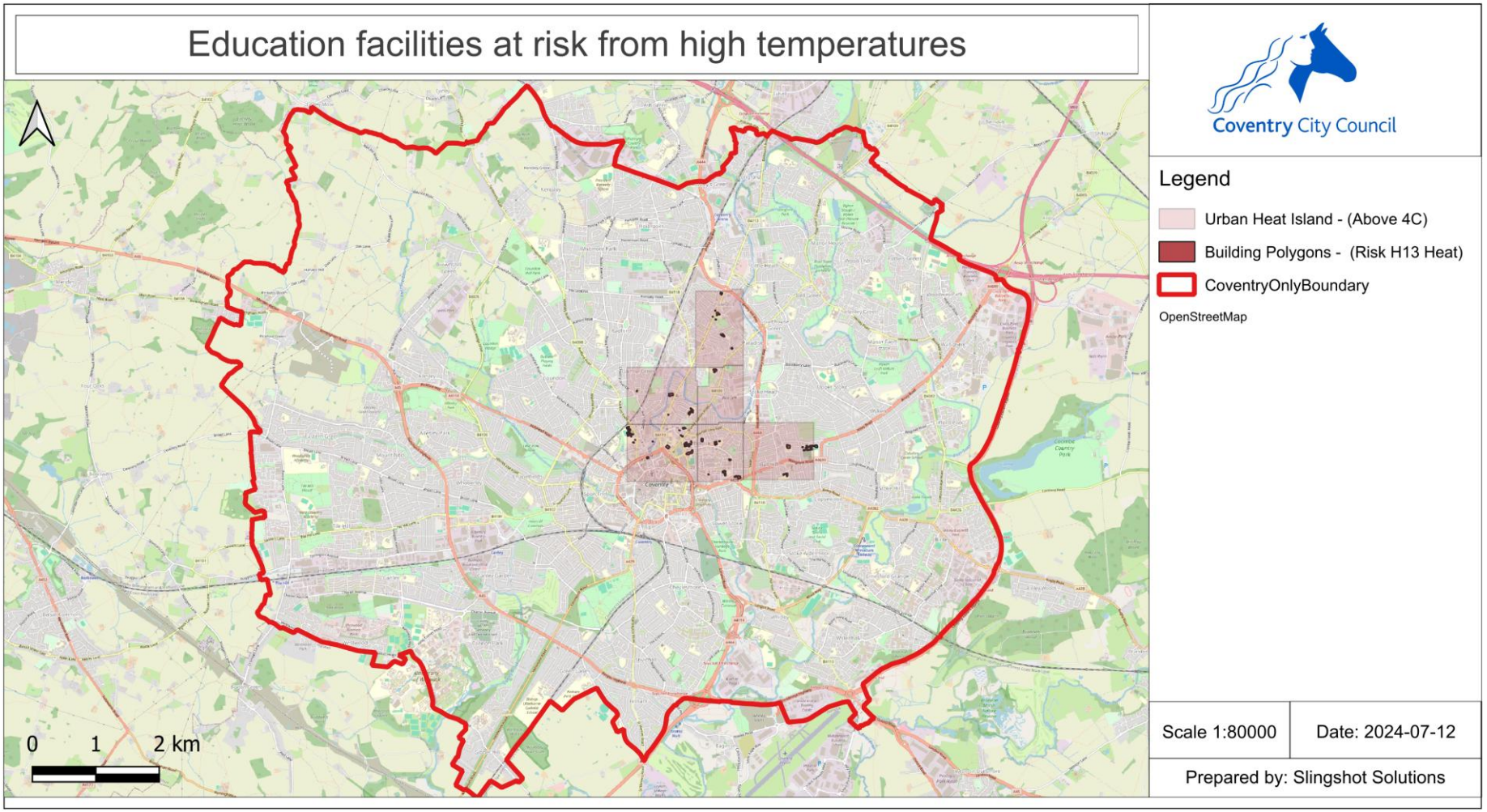


Figure 35: Education facilities at risk from UHI in Coventry

7 Risk and Opportunity Assessment - Infrastructure

7.1 This chapter provides a summary of the assessment of each climate change risk identified under the theme of Infrastructure.

Risks to infrastructure networks (water, energy, transport, ICT) from cascading failures

Context

Type	CCRA Reference	Risk or Opportunity
Infrastructure	I1. Infrastructure networks (water, energy, transport, ICT)	Risks

Description

7.2 Cascading failures occur when vulnerabilities in one infrastructure network cause problems in others, a risk that is exacerbated by extreme weather events and climate change. For example, a flood could lead to the failure of an electrical substation, which is already operating close to capacity. Since water supply in Coventry is 100% electrically pumped, this would result in an immediate disruption to water services. The lack of backup capacity means that this failure could not be quickly mitigated, leading to widespread water shortages. Furthermore, the disruption to the energy network could cascade to other critical services, such as transport and ICT, causing further chaos. For instance, traffic management systems and communications networks could fail, leading to gridlock on the roads and loss of communication capabilities. This interconnected vulnerability highlights the importance of enhancing the resilience of each network to prevent such cascading failures, especially as extreme weather events become more frequent and severe.

7.3 Coventry relies on resilient infrastructure networks for its economy, public safety, and daily life. Disruptions can lead to widespread impacts, affecting millions in urban areas like Coventry.

7.4 Proactive adaptation measures, such as enhancing resilience of electricity substations and better information sharing among Local Resilience Forums, are essential to minimize disruptions and ensure stable operations across essential services.

Geospatial Analysis Summary

7.5 No geospatial analysis was conducted for this risk.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Coventry's infrastructure networks are distributed throughout the city. However, the interconnected nature of these networks is not well understood spatially. Given the widespread nature of all infrastructure, the exposure score was assumed to be high.	3
Sensitivity	These networks are, generally, well-designed and constructed, and therefore fairly resilient. However, if cascading failures occur, they can have significant impacts on the economy, public safety, and daily life in Coventry. This makes the city highly sensitve to this risk. Operation Mighty Oak a national exercise simulating a National Power Outage (NPO), revealed a critical dependency of Coventry's infrastructure on power, indicating that a power failure could lead to severe disruptions across multiple essential services.	2
Adaptive Capacity	The Resilient Networks scheme concentrates on strengthening transport infrastructure against extreme weather conditions by prioritising winter service on critical routes and maintaining accessibility during emergencies. Additionally, the Local Flood Risk Management Strategy addresses vulnerabilities in the water network by devising surface water management plans that proactively reduce flood risk and mitigate potential spillover effects on other infrastructures like transport and ICT. The Local Coventry Transport Strategy also includes some elements of climate change adaptation. West Midlands Fire Service is in the process of developing a long-term Community Risk Management Plan. Coventry possesses the skills to manage risks to infrastructure and networks. However, the capacity to handle cascading failures is not clear.	1
Total Vulnerability Score		**4**

Risks to infrastructure services from river, surface water and groundwater flooding

Context

Type	CCRA Reference	Risk or Opportunity
Infrastructure	I2. Infrastructure services	Risks

Description

7.6 River, surface water, and groundwater flooding pose significant risks to infrastructure networks including water sites, sewage treatment works, power stations, and transportation systems. The risk is set to increase, potentially doubling under a +4°C scenario by 2100.

7.7 Flooding can disrupt essential services in Coventry, such as drinking water, sanitation, energy, and transportation, crucial for city functioning.

7.8 Implementing adaptive measures such as improving flood defenses, enhancing drainage, and integrating green infrastructure are vital to sustain infrastructure functionality and resilience against increasing flood risks. This will help to secure public safety and economic stability in Coventry.

Geospatial Analysis Summary

7.9 To assess risks to infrastructure services a range of infrastructure layers were included. These include electricity substations, overhead power lines, underground power lines, roads, railway lines and LLPG buildings considered to be linked to infrastructure services. Those points, lines or polygons that intersect with the surface water and groundwater flood layer where then filtered. Exposure was calculated as the percentage of these filtered points, lines and polygons in relation to all infrastructure of that particular group in Coventry (see *Table 13* and *Table 14*).

Table 13: Infrastructure that are at risk from surface water flooding in Coventry

Layer Name	Value All	Value at risk of flooding	Unit	Percentage
Electricity Substations	1053	51	Count	5%
Buildings (OSM)	128371	6707	Count	5%
Roads (OSM)	2215481	286516	Meters	13%
Railway (OSM)	71952	11132	Meters	15%
Overhead Lines	9038	299	Meters	3%
Underground Lines	150231	20806	Meters	14%
Average				**9%**

Table 14: Infrastructure that are at risk from groundwater flooding in Coventry

Layer Name	Value All	Value at risk of flooding	Unit	Percentage
Electricity Substations	1053	3	Count	0%
Buildings (OSM)	128371	554	Count	0%
Roads (OSM)	2215481	24005	Meters	1%

Railway (OSM)	71952	100	Meters	0%
Overhead Lines	9038	9	Meters	0%
Underground Lines	150231	1830	Meters	1%
Average				**1%**

7.10 Mapping these infrastructure layers at risk closely matched the flood risk layers. An example of the risks to roads from surface water flooding is provided in *Figure 36*.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Approximately 9% of Coventry's infrastructure networks, which include water sites, sewage treatment works, power stations, and transportation systems, fall within areas that have a higher risk of surface and groundwater flooding.	1
Sensitivity	Infrastructure networks are sensitive to groundwater flooding. Groundwater flooding could disrupt essential services in Coventry, such as drinking water, sanitation, energy, and transportation, which are crucial for the city's functioning. This disruption can have significant impacts on public safety and economic stability.	2
Adaptive Capacity	The city has a detailed Local Flood Risk Management Strategy with comprehensive considerations about surface water flooding resulting from overwhelmed local drainage systems, particularly in urban and rural settings. Furthermore, the Surface Water Management Plan (SWMP) incorporates measures such as flow reduction, diversion, and storage to manage and mitigate potential risks from extreme weather events. There are also business continuity plans (BCPs) in place for different departments that help services deal with emergency issues. There are skills and dedicated staff currently available in Coventry City Council to deal with risks to infrastructure services from river, surface water, and groundwater flooding. However, resources for large-scale flooding protection infrastructure investment (e.g., improving the quality of roads with more expensive surfaces) are limited.	2
Total Vulnerability Score		**1**

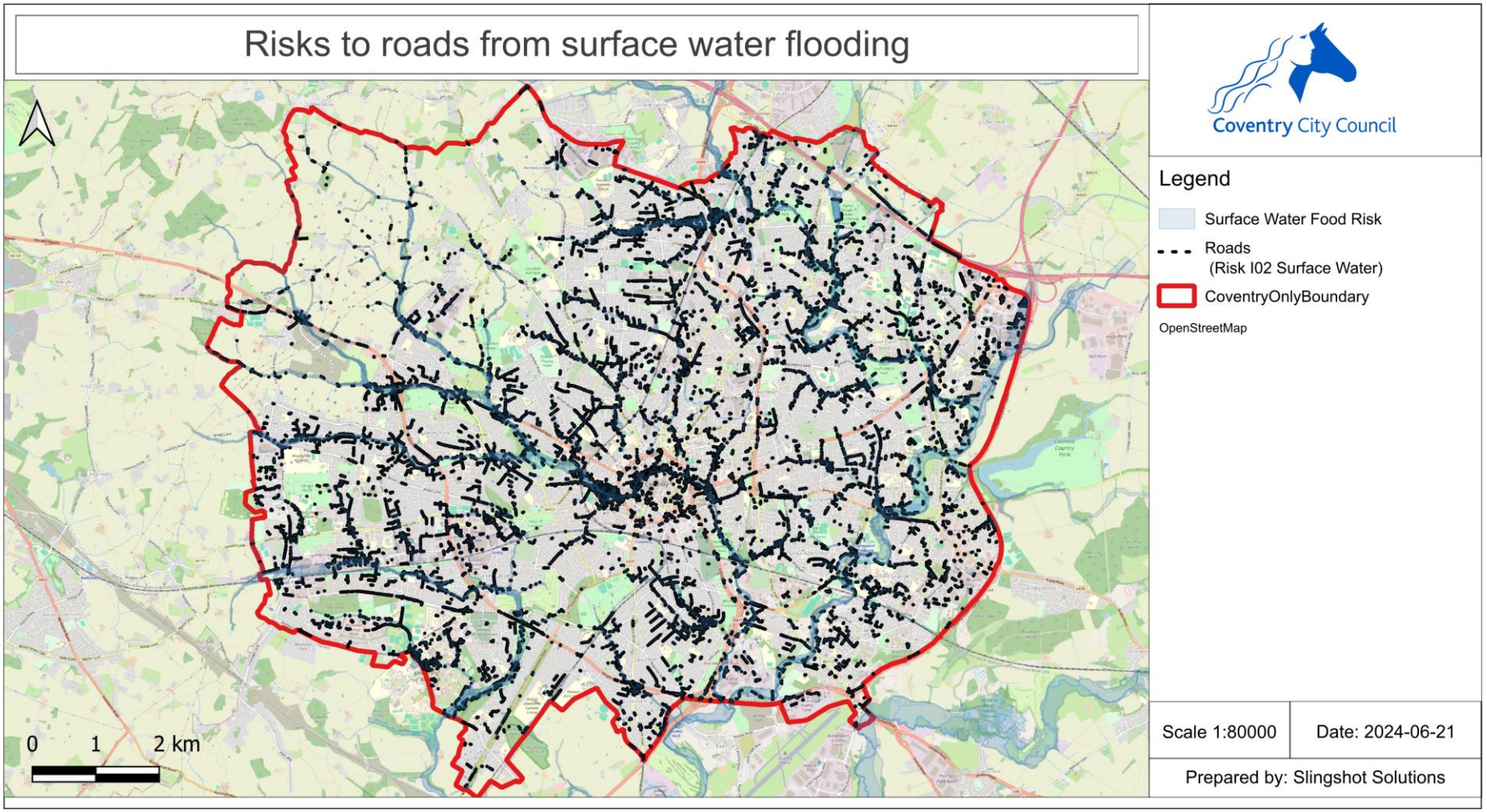


Figure 36: Risks to roads from surface water flooding in Coventry

Risks to bridges and pipelines from flooding and erosion

Context

Type	CCRA Reference	Risk or Opportunity
Infrastructure	I4. Bridges and pipelines	Risks

Description

7.11 Flooding and erosion pose risks to bridges and pipelines, with potential impacts including increased scour at bridges leading to structural failures, and damage to pipelines from land movements.

7.12 Coventry relies on its infrastructure for transportation and utility services, which are critical for the city's functioning and safety.

7.13 Adapting infrastructure to withstand flooding and erosion involves enhancing maintenance, improving drainage, and strengthening defenses. This will minimise disruptions and ensure continuity of essential services.

Geospatial Analysis Summary

7.14 No geospatial analysis was conducted for this risk.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Bridges and pipelines are at risk of flooding and erosion, particularly due to their location in flood-prone areas.	3
Sensitivity	The city's infrastructure, including bridges and pipelines, is generally well-designed and constructed, and therefore only somewhat sensitive to flooding and erosion. However, in the unlikely event that a severe storm event damages a large percentage of bridges and pipelines, the damage to these structures can lead to significant disruptions in transportation and utility services, potentially causing widespread impact on the city's functioning and safety.	2
Adaptive Capacity	The Local Flood Risk Management Strategy highlights various flood risk management measures, including the adoption of specific risk mitigation strategies related to infrastructure vulnerability, such as the flooding of bridges leading to structural weaknesses. Additionally, the Highway Infrastructure Asset Management Plan for Coventry discusses the strengthening of roads and associated infrastructure against extreme weather	3

Assessment Area	Details	Score
	conditions. Business Continuity Plans (BCPs) are also in place for different departments to help services manage emergency situations. There are skills and dedicated staff currently available in Coventry City Council to deal with risks to bridges and pipelines from flooding and erosion.	
Total Vulnerability Score		**2**

Risks to transport networks from slope and embankment failure

Context

Type	CCRA Reference	Risk or Opportunity
Infrastructure	I5. Transport networks	Risks

Description

7.15 Slope and embankment failures within transport networks, triggered by high rainfall following dry periods leading to soil cracking and subsequent weakening. This process is exacerbated by soil moisture fluctuations, particularly in high plasticity soils of south-east England.

7.16 Slope failures disrupt transport networks crucial for mobility in Coventry, affecting commuting, emergency services, and economic activities. This can lead to significant social and economic disruptions.

7.17 Adapting involves enhancing monitoring systems, improving predictive tools, and implementing soft engineering techniques to stabilise slopes. This will reduce repair costs, prevent significant travel delays, and ensure the resilience of critical transport infrastructure, thereby maintaining public safety and economic stability in Coventry.

Geospatial Analysis Summary

7.18 No geospatial analysis was conducted for this risk.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Coventry's infrastructure networks are distributed throughout the city. These networks are, generally, well-designed and constructed, and therefore fairly resilient. However, Coventry's transport networks could be exposed	2

Assessment Area	Details	Score
	to the risk of slope and embankment failures due to the city's geographical location and soil composition, which are prone to soil cracking and weakening after high rainfall following dry periods.	
Sensitivity	The transport system in Coventry is only somewhat sensitive to these failures, as they are unlikely to occur throughout the city. Disruptions in the transport network can, however, lead to significant social and economic impacts, including hindrance to commuting, delay in emergency services, and interruption of economic activities.	1
Adaptive Capacity	The Highway Infrastructure Asset Management Plan emphasises preventative maintenance to manage the impact of such events on the city's transport network, ensuring the safety and integrity of slopes and embankments. Currently, the highways design guide is being updated, and this may include future-proofing. There are some skills within Coventry City Council to deal with current levels of embankment failure. The capacity to handle future risks to transport networks from slope failure is not clear.	1
Total Vulnerability Score		**2**

Risks to hydroelectric generation from low or high river flows

Context

Type	CCRA Reference	Risk or Opportunity
Infrastructure	I6. Hydroelectric generation	Risks

Description

7.19 Vulnerability of hydroelectric power generation to variable river flows, including significantly low or damagingly high flows.

7.20 Coventry, while not directly reliant on local hydroelectric power, is affected by national energy grid stability and renewable energy targets. Hydroelectric power is a key renewable source that can be compromised by changing river flows.

7.21 Adapting to these changes involves integrating climate projections into site selection and design for new installations, and upgrading existing infrastructure to enhance resilience

against more frequent and severe variability in river flows. This includes turbine upgrades and additional spillways.

Geospatial Analysis Summary

7.22 No geospatial analysis was conducted for this risk.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	At present, there are no hydroelectric generation plants in Coventry. Coventry is solely exposed to the effects of variable river flows on the stability of the national energy grid and renewable energy targets.	0
Sensitivity	The city's energy system supply is currently not sensitive to changes in hydroelectric power generation. This may change in the future if hydroelectricity is piloted and adopted on a larger scale.	0
Adaptive Capacity	Given the low probability of this risk impacting Coventry, there is limited capacity in place to address it.	3
Total Vulnerability Score		**0**

Risks to subterranean and surface infrastructure from subsidence

Context

Type	CCRA Reference	Risk or Opportunity
Infrastructure	I7. Subterranean and surface infrastructure	Risks

Description

7.23 Susceptibility to subsidence, particularly due to shrink-swell effects in high plasticity clays.

7.24 Subsidence poses a threat to Coventry's infrastructure integrity, impacting transport and utility networks crucial for city functioning.

7.25 Proactive adaptation is necessary to manage and mitigate subsidence risks as they intensify with climate change. Measures include improved monitoring, real-time decision support, and strategic vegetation management on vulnerable infrastructures.

Geospatial Analysis Summary

7.26 No geospatial analysis was conducted for this risk.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Coventry's subterranean and surface infrastructure, including transport and utility networks, is extensive. The degree of exposure to the risk of subsidence is not well understood but could be significant, particularly due to shrink-swell effects in high plasticity clays.	1
Sensitivity	Coventry's subterranean and surface infrastructure is only somewhat sensitive to subsidence as it is unlikely to occur throughout the city. However, impacts on infrastructure can lead to significant social and economic impacts, and interruption of economic activities.	1
Adaptive Capacity	The Local Flood Risk Management Strategy incorporates elements designed to mitigate subsidence risks associated with changing soil moisture content. This includes natural water drainage and infrastructure resilience approaches to managing geological shifts that can impact subterranean infrastructures like pipelines. The HIAMP discusses overall infrastructure resilience against extreme weather conditions, indirectly addressing concerns such as subsidence which can affect road and utility networks. Coventry City Council has some capability to manage current levels of subterranean subsidence. However, the capacity to handle future risks remains uncertain.	2
Total Vulnerability Score		**0**

Risks to public water supplies from reduced water availability

Context

Type	CCRA Reference	Risk or Opportunity
Infrastructure	I8. Public water supplies	Risks

Description

7.27 Reduced water availability due to climate impacts such as increased temperature and reduced summer rainfall, impacting river flows and groundwater recharge.

7.28 Coventry's public water supply is crucial for domestic, industrial, and agricultural needs. A deficit impacts daily life, economic activities, and ecological balance.

7.29 Adapting to water scarcity by improving water use efficiency and enhancing supply infrastructure will ensure sustainability and resilience against future climate variability.

Geospatial Analysis Summary

7.30 No geospatial analysis was conducted for this risk.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Coventry has a high population density and relies heavily on a consistent water supply from external catchments. Potential climate impacts, such as increased temperature and reduced summer rainfall, can affect river flows and groundwater recharge. This is likely to impact most people in the city.	3
Sensitivity	The city's public water supply system is highly sensitive to these changes as it is crucial for domestic, industrial, and agricultural needs. A deficit in the water supply can significantly impact daily life, economic activities, and the ecological balance of the city.	3
Adaptive Capacity	A Water Resources Regional Action Plan for the Midlands Region is in place, which takes into account the risks of climate change. Strategies are also focused on utilising sustainable urban drainage systems (SuDS) and strategically including green infrastructure. These not only reduce runoff but also aid in water conservation. For instance, all new developments in Coventry are mandated to apply SuDS principles, ensuring that surface water runoff is managed as close to its source as possible and with ecological considerations. There are significant skills available in the water sector. The availability of budgets and other resources to implement the regional action plan is not clear.	2
Total Vulnerability Score		**4**

Risks to energy generation from reduced water availability

Context

Type	CCRA Reference	Risk or Opportunity

Infrastructure	I9. Energy generation	Risks

Description

7.31 Reduced water availability impacts thermal power generation, crucial for energy supply due to high water use for cooling.

7.32 Although there are no large scale power generation plants in Coventry, the city relies on importing a stable energy supply for economic stability, healthcare, education, and more. Water scarcity poses a threat to energy security.

7.33 Adapting involves enhancing water use efficiency, transitioning to less water-intensive energy sources, and incorporating climate projections in planning for new energy projects.

Geospatial Analysis Summary

7.34 No geospatial analysis was conducted for this risk.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	There are currently no energy generation plants in Coventry that rely on the availability of large volumes of water. Coventry is only exposed to the effects of variable river flows on the national energy grid stability and renewable energy targets.	0
Sensitivity	The city's energy system is currently not sensitive to changes in local power generation but may be impacted by a reduction from regional or national supply areas.	1
Adaptive Capacity	Given the low probability of this risk impacting Coventry, there is limited capacity in place to address the risk.	3
Total Vulnerability Score		**0**

Risks to energy from high and low temperatures, high winds, lightning

Context

Type	CCRA Reference	Risk or Opportunity
Infrastructure	I10. Energy	Risks

Description

7.35 Energy transmission and distribution infrastructure in Coventry is at risk from high and low temperatures, high winds, and lightning, which can disrupt power generation and distribution.

7.36 Reliable energy supply is vital for safety, health, economic stability, and daily life in Coventry. Energy disruptions can affect hospitals, transport, and other critical services.

7.37 Adapting the energy infrastructure to handle extreme weather and temperature fluctuations is essential to ensure stability, reduce potential economic losses, and maintain public safety.

Geospatial Analysis Summary

7.38 Although spatial data is available for electricity sub-stations and power lines, there is no localiosed wind and lightning data available. No geospatial analysis was conducted for this risk.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Coventry's energy infrastructure, distributed throughout the city, is exposed to extreme weather conditions such as high and low temperatures, high winds, and lightning. There have been incidents of electric wires buckling due to extreme heat in Coventry.	2
Sensitivity	The energy system in Coventry is sensitive to extreme weather events. Disruptions in energy supply can have severe consequences, affecting critical services such as hospitals and transport, impacting economic stability, and posing risks to public safety.	1
Adaptive Capacity	There are no specific policies or plans related to energy infrastructure risk management. However, Coventry's Local Plan emphasises the need for future building developments to be designed to be robust against the impacts of climate change, significantly considering the requirements to withstand extreme weather conditions. Additionally, Coventry's Urban Forestry Strategy 2022-2032 has been developed to help counteract urban heat island effects and manage stormwater, further mitigating potential damage from high winds and storms to the city's energy infrastructure. There are limited skills currently available in Coventry City Council to deal with risks to energy from high and low temperatures, high winds, and lightning, as these risks are still relatively infrequent. The Council has recently partnered with E.ON as part of a 15 year Strategic Energy Partnership, energy securty and improving the resilience of	1

Assessment Area	Details	Score
	the city's energy infrastructure is one of the key anchor projects the partnership will seek to address.	
Total Vulnerability Score		**2**

Risks to transport from high and low temperatures, high winds, lightning

Context

Type	CCRA Reference	Risk or Opportunity
Infrastructure	I12. Transport	Risks

Description

7.39 Transport infrastructure in Coventry is vulnerable to high and low temperatures, high winds, and lightning strikes. These can cause significant disruptions and damage to rail, road, air, and water networks.

7.40 Reliable transport networks are crucial for the functioning of the city, affecting everything from emergency services and economic activities to daily commuting and logistics.

7.41 Adapting to these risks is essential to maintain transport reliability and safety, minimise economic losses, and reduce disruption during extreme weather events.

Geospatial Analysis Summary

7.42 Although spatial data is available for transport infrastructure, there is no localised wind and lightning data available. No geospatial analysis was conducted for this risk.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Coventry's transport infrastructure is extensive, encompassing rail, road, air, and water networks. The city's exposure to climate risks is currently well understood. There have been instances where rail services were disrupted due to heat impacts.	2
Sensitivity	The transport system is sensitive to these extreme weather events. Disruptions or damages to the transport infrastructure can significantly impact the functioning of the city, affecting emergency services, economic activities, daily commuting, and logistics. However, the	1

Assessment Area	Details	Score
	transport systems are also well-designed and managed, and therefore fairly resilient to climate impacts.	
Adaptive Capacity	The Resilient Network, as outlined in the Coventry Council Resilient Network 2019, is a strategic initiative aimed at maintaining functionality and safety within the transport network during extreme weather events. This includes priority salting routes and reinforced infrastructure to endure severe climatic conditions. Additionally, the Winter Service Plan, integrated into this network, ensures continued operation and minimal disruption during winter, underpinning the resilience against high and low temperature extremes. Coventry City Council and other transport operators such as Transport for West Midlands and Highways England currently have limited skills to deal with transport risks from high and low temperatures, high winds, and lightning, as these risks are still relatively infrequent.	1
Total Vulnerability Score		**2**

Risks to digital from high and low temperatures, high winds, lightning

Context

Type	CCRA Reference	Risk or Opportunity
Infrastructure	I13. Digital	Risks

Description

7.43 Climate-related risks such as high and low temperatures, high winds, and lightning can disrupt digital infrastructure like data centers, telecommunications, and ICT. This includes failures from power outages, physical damage to hardware, and performance issues due to temperature extremes.

7.44 Digital infrastructure underpins almost all sectors including emergency services, healthcare, finance, and general consumer services in Coventry. Its reliability is crucial for the socioeconomic stability of the city.

7.45 Adapting to these risks is essential to ensure continuity of services, especially as digital dependency grows. Enhancing resilience through improved infrastructure design, robust contingency planning, and climate-proofing ICT assets will minimise disruptions and maintain service integrity during extreme weather events.

Geospatial Analysis Summary

7.46 There is limited publically available spatial data for ICT infrastructrure and there is no localiosed wind and lightning data available. No geospatial analysis was conducted for this risk.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Coventry's digital infrastructure, including data centres, telecommunications, and ICT, is all exposed to climate-related risks such as high and low temperatures, high winds, and lightning.	2
Sensitivity	The digital infrastructure in Coventry is sensitive to climate-related disruptions. Any damage or performance issues due to temperature extremes can significantly impact most sectors, including emergency services, healthcare, finance, and general consumer services. This could lead to socio-economic instability in the city. However, the ICT systems are also well-designed and managed, and therefore fairly resilient to climate impacts.	1
Adaptive Capacity	A revised Digital Strategy for the local authority, which combines the existing Corporate ICT Strategy and the Digital Strategy, is currently being drafted. Coventry's Resilient Network Report underscores the critical need for protective measures against extreme temperatures, which could lead to hardware damage and service disruption. The report emphasises the importance of developing a Resilient Network that includes not only transport but also a robust digital communications infrastructure resilient to climate-related threats. Developing skills to deal with risks to digital infrastructure from high and low temperatures, high winds, and lightning is not currently a priority, as these risks are still relatively infrequent.	1
Total Vulnerability Score		**2**

8 Risk and Opportunity Assessment - Natural Environment and Assets

8.1 This chapter provides a summary of the assessment of each climate change risk identified under the theme of Natural Environment and Assets.

Risks to terrestrial species and habitats from changing climatic conditions and extreme events.

Context

Type	CCRA Reference	Risk or Opportunity
Natural Environment and Assets	N1. Terrestrial species and habitats	Risks

Description

8.2 Climate change affects terrestrial species and habitats through temperature changes, altered rainfall patterns, wildfire, and other extreme weather events. This results in shifts in species distributions and population dynamics.

8.3 In Coventry, these changes impact biodiversity which is integral for ecological health, recreational spaces, and local climate regulation, affecting overall urban quality of life.

8.4 Proactive adaptation is necessary to mitigate risks like species loss and to capitalise on opportunities for species range expansions.

Geospatial Analysis Summary

8.5 Although there are a range of Biodiversity Action Plan (BAPs) available for species and habitats in Warwickshire, there is no readily available spatial data providing an overview of terrestrial species and habitats at risk from climate change. Sites of Special Scientific Interest (SSSI) and Local Nature Reserves (LNRs) and conservation area data was used as a proxy to map these areas (see *Figure 37*) . Exposure was calculated as the total area of SSSI, LNRs and conservation area as a percentage of the entire city.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	A variety of terrestrial species and habitats are listed in the BAPs. However, the geographical extent of all these habitats is not clearly understood. Coventry is predominantly an urban space, as evidenced by the small	1

Assessment Area	Details	Score
	percentage area (approximately 8%) that SSSIs, LNRs, and conservation areas constitute in the city.	
Sensitivity	The terrestrial species and habitats in Coventry are potentially sensitive to climate change. Changes in temperature and rainfall can alter species distributions and population dynamics, leading to potential loss of biodiversity. This can impact ecological health, recreational spaces, and local climate regulation, affecting the overall urban quality of life.	2
Adaptive Capacity	The Biodiversity Net Gain Supplementary Planning Document (SPD) integrates ecological assessments to protect and enhance biodiversity, supporting compensatory measures for habitat restoration when direct preservation is not feasible. The Warwickshire Local Biodiversity Action Plan (LBAP) includes twenty-seven plans for vulnerable species and twenty-five for habitats. The Green Spaces strategy will be revised in the next eighteen months, and this revision will likely take adaptation into account. The Local Nature Recovery Strategy (LNRS) is also currently being developed for the West Midlands. Currently, there are limited resources available within Coventry City Council City to deal with the risk to terrestrial species and habitats from changing climatic conditions. But there are skills and resources available through partners including the Warwickshire Wildlife Trust, Coventry University, University of Warwick and the broader public.	2
Total Vulnerability Score		**1**

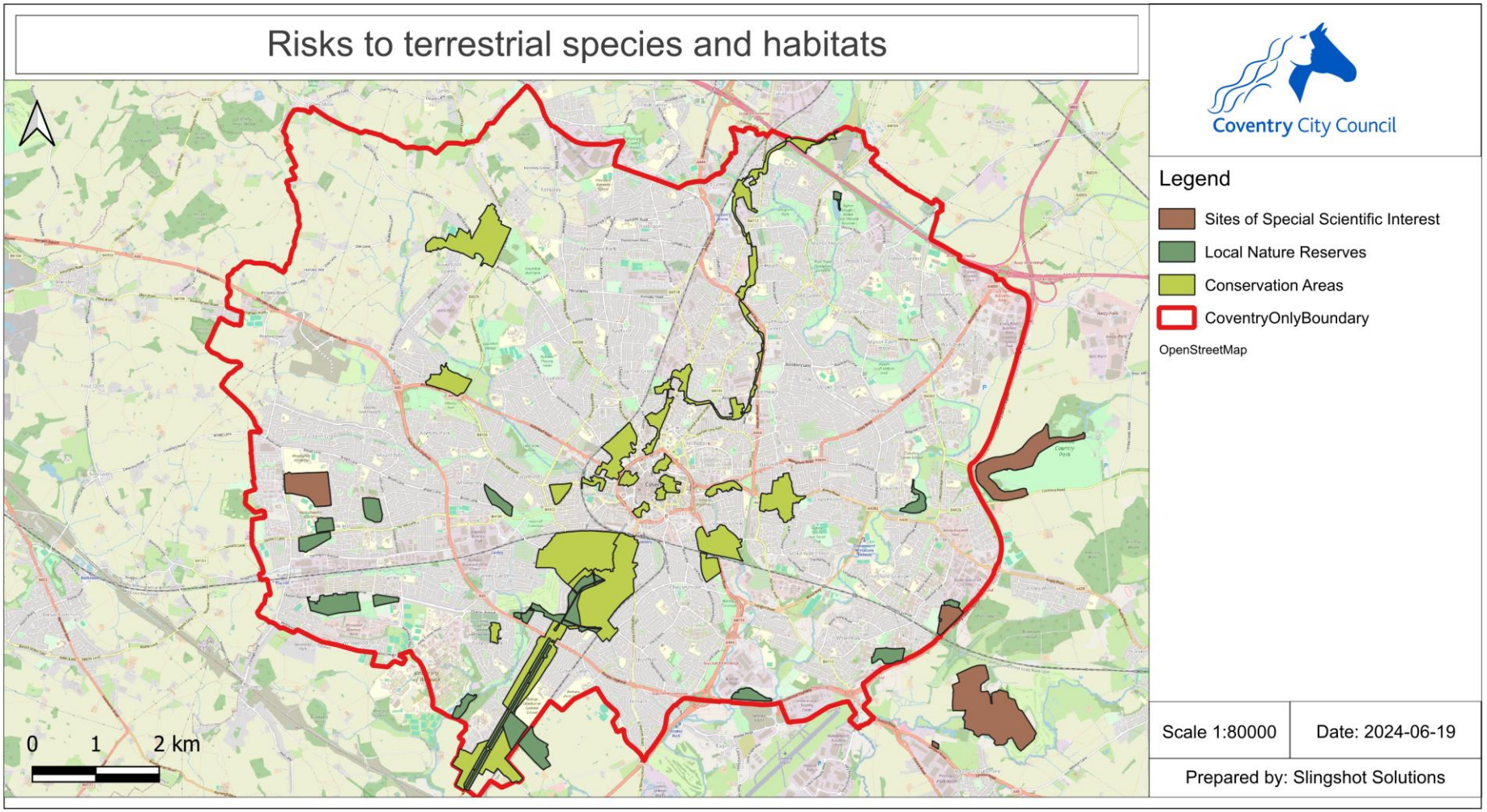


Figure 37: SSSI, LNR and Conservation areas in Coventry

Risks to terrestrial species and habitats from pests, pathogens and invasive species

Context

Type	CCRA Reference	Risk or Opportunity
Natural Environment and Assets	N2. Terrestrial species and habitats	Risks

Description

8.6 The presence of pests, pathogens, and invasive non-native species (INNS) threatens terrestrial habitats by disrupting ecosystem functions, impacting biodiversity, and causing economic losses in agriculture, forestry, and cultural heritage.

8.7 In Coventry, these species can severely affect local ecosystems, parks, and gardens that are crucial for community well-being and local biodiversity.

8.8 Early and proactive adaptation is crucial to prevent establishment and manage the high economic and environmental costs of these species.

Geospatial Analysis Summary

8.9 No geospatial analysis was conducted for this risk.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	The extent to which Coventry's terrestrial habitats, including local ecosystems, parks, and gardens, are exposed to the threat of pests, pathogens, and Invasive Non-native Species (INNS) is not well understood. However, these threats can be exacerbated by climate change, which can create more favourable conditions for these species.	1
Sensitivity	Terrestrial habitats in Coventry are sensitive to the introduction and spread of pests, pathogens, and invasive non-native species (INNS). These species can disrupt ecosystem functions, impact biodiversity, and cause economic losses in forestry, urban vegetation, cultural heritage, and agriculture. The local ecosystems, parks, and gardens, which are crucial for community well-being and local biodiversity, are particularly vulnerable.	2
Adaptive Capacity	Responding to pests primarily falls under the remit of the national government. The Coventry Urban Forestry	2

Assessment Area	Details	Score
	Strategy emphasises the necessity for species diversity in Coventry's urban forest to mitigate the impact of pests and diseases (such as Chalara Dieback of Ash) and enhance the resilience of habitats against climatic changes and diseases. The Warwickshire, Coventry and Solihull LBAP incorporates a variety of Species Specific Action Plans, some of which address the threats of pests and pathogens. There are skills and resources available in the Coventry City Council ecology team. There is also support available from including the Warwickshire Wildlife Trust, Coventry University, University of Warwick and the broader public to deal with risks to terrestrial species and habitats from pests, pathogens, and invasive species.	
Total Vulnerability Score		**1**

Opportunities from new species colonisations in terrestrial habitats

Context

Type	CCRA Reference	Risk or Opportunity
Natural Environment and Assets	N3. Terrestrial species and habitats	Opportunities

Description

8.10 New species colonisations present an opportunity as climate-driven range shifts could bring new species to areas like England, enhancing local biodiversity and potentially contributing positively to ecosystems if managed appropriately.

8.11 In Coventry, new species can enrich biodiversity, offering new opportunities for ecological study and conservation, but also pose challenges if they impact native species negatively.

8.12 It is essential to begin adapting to these changes through enhanced land management and conservation planning to maximise benefits while mitigating potential negative impacts.

Geospatial Analysis Summary

8.13 No geospatial analysis was conducted for this risk.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Coventry's terrestrial habitats are exposed to colonisation by new species due to climate-driven range shifts. However, the opportunities associated with these new species are not well understood at present.	1
Sensitivity	The local ecosystems are sensitive to these changes, as new species can both enrich biodiversity and potentially disrupt existing ecosystems if they negatively impact native species.	2
Adaptive Capacity	There are no specific examples of policies to make use of new species colonisation opportunities. The Urban Forestry Strategy emphasises the importance of diversity in urban forests, planning to deal with climate impacts and new species colonisations, with management interventions for invasive species and enhancement of native species resilience. The Warwickshire, Coventry and Solihull LBAP Species Actions plan also highlights the potential for some species to expand their habitats. There are skills and resources available in Warwickshire and the broader public, but not specifically within Coventry, to take advantage of opportunities from new species colonisations in terrestrial habitats.	2
Total Vulnerability Score		**1**

Risk to soils from changing climatic conditions, including seasonal aridity and wetness.

Context

Type	CCRA Reference	Risk or Opportunity
Natural Environment and Assets	N4. Soils	Risks

Description

8.14 Changing climatic conditions are leading to seasonal aridity and wetness, increasing soil erosion and impacting soil health.

8.15 Coventry's agricultural productivity, water management, and biodiversity are tied to soil health, which is threatened by these changes.

8.16 Implementing land management strategies that improve soil resilience and health is critical to maintaining local ecosystems and farming.

Geospatial Analysis Summary

8.17 No geospatial analysis was conducted for this risk.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Coventry's soils are increasingly exposed to seasonal aridity and wetness due to changing climatic conditions, leading to increased soil erosion.	2
Sensitivity	The health of Coventry's soils is fairly sensitive to these changes, as they directly impact agricultural productivity, water management, and biodiversity. Soil erosion can lead to the loss of fertile land, negatively affecting farming and local ecosystems.	1
Adaptive Capacity	There is limited specific policy around soil management. The Local Flood Risk Management Strategy emphasises the role of flood management in mitigating soil erosion, which helps maintain soil health and prevent degradation from sudden water surges. The skill and resources within Coventry City Council to deal with risks to soils from changing climatic conditions is unclear, but it is assumed to be low.	1
Total Vulnerability Score		**2**

Risks and opportunities for natural carbon stores, carbon sequestration from changing climatic conditions.

Context

Type	CCRA Reference	Risk or Opportunity
Natural Environment and Assets	N5. Natural carbon stores, carbon sequestration	Risks & Opportunities

Description

8.18 Changing climate conditions impact carbon stores and GHG emissions. Degradation and carbon loss from peatlands and coastal habitats are significant risks.

8.19 Coventry's commitments to reduce GHG emissions are affected by changes in natural carbon sequestration due to climate change.

8.20 Developing strategies to protect and enhance natural carbon stores is crucial for meeting climate goals and preserving ecosystem functions.

Geospatial Analysis Summary

8.21 To assess risks and opportunities for natural carbon stores, carbon sequestration from changing climatic conditions, the Living England Habitat Map Phase 4[6] was used. This layer was filtered for those parcels with high vegetation cover. These layers included Arable and Horticultural, Acid, Calcareous, Neutral Grassland, Fen, Marsh and Swamp, Improved Grassland, Bog. Dwarf Shrub Heath, Coniferous Woodland and Bracken (see *Figure 38*).

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Although Coventry is predominantly an urban environment, it has significant grasslands and agricultural parcels in the North West, as well as sporadic tree canopy cover throughout the city. Approximately 37% of the total area of Coventry is covered by natural carbon stores (36.12km2 out of a total of 98.724km2). However, it should also be noted that some of these areas are subject to development as part of Sustainable Urban Extensions, which could result in a reduction in green space.	2
Sensitivity	Recent warm and dry seasons have impacted new tree planting, resulting in an approximate loss of 10% of stock. Mature trees have also been affected by recent storms.	2
Adaptive Capacity	The Urban Forestry Strategy specifically addresses the role of trees in sequestering carbon. The Climate Change Strategy and supporting Net Zero Carbon Route Map outlines the city's overall approach to achieving net zero emissions, which directly relates to managing the city's carbon budget and enhancing its carbon sink capacity through measures such as increased tree planting and improved land management practices to increase carbon sequestration. A report on tree planting and rain garden opportunities has been produced, providing a map that can be integrated into GIS, examining opportunities for tree planting including considered appropriate species in locations across the city to cope with a changing climate. The city is currently exploring the Urban Tree Challenge Fund, Local Authority Tree Fund, and HS2 grant bids	3

[6] Natural England Open Data Geoportal (arcgis.com)

Assessment Area	Details	Score
	for woodland restoration. Generally, Coventry Council has the skills and staff available to deal with risks and opportunities related to natural carbon stores.	
Total Vulnerability Score		**1**

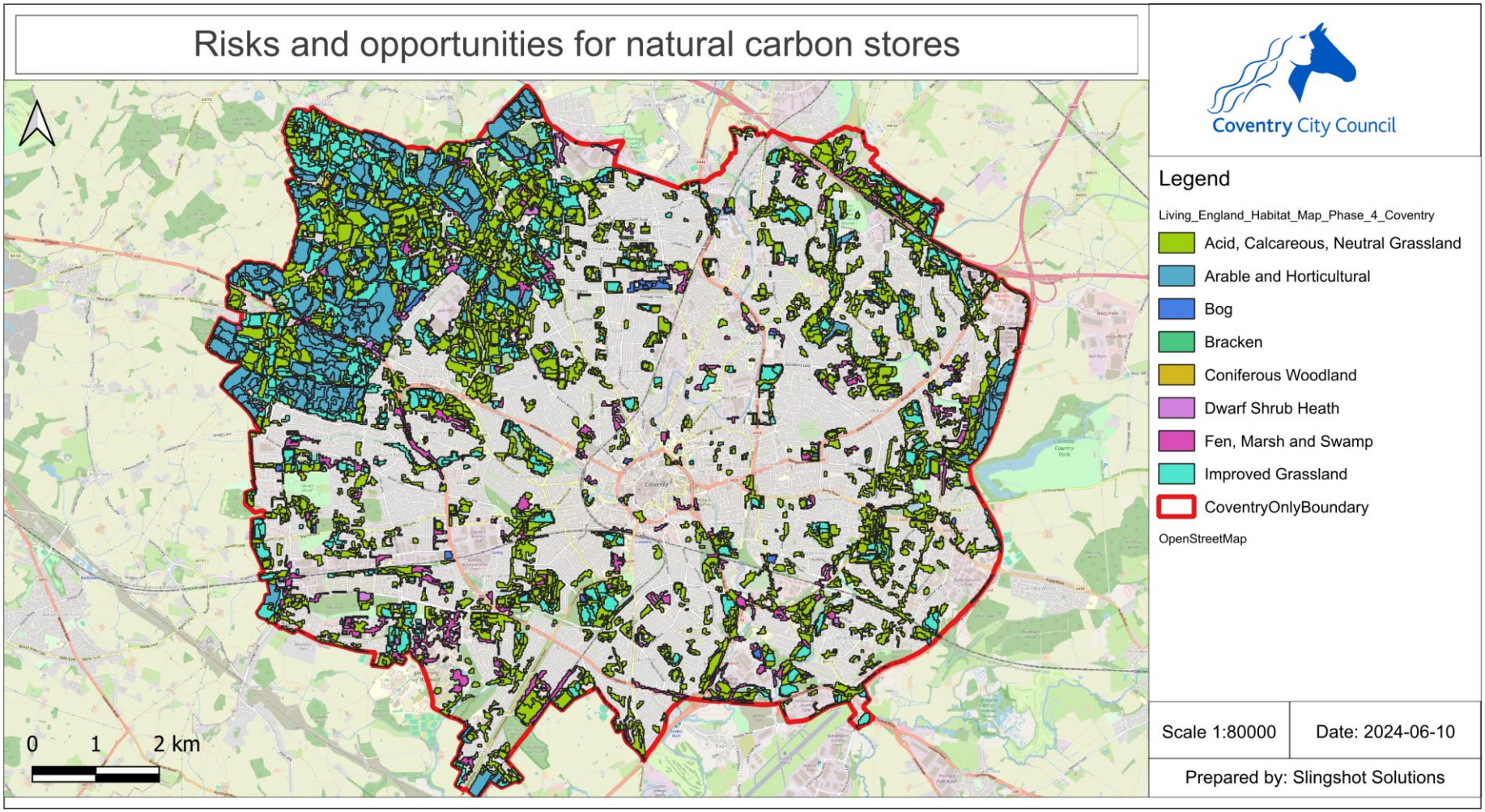


Figure 38: Risks and opportunities for natural carbon stores in Coventry

Risks to and opportunities for agricultural and forestry productivity from extreme events and changing climatic conditions.

Context

Type	CCRA Reference	Risk or Opportunity
Natural Environment and Assets	N6. Agricultural and forestry productivity	Risks & Opportunities

Description

8.22 Climate change brings risks to agriculture and forestry due to extreme weather events and changing conditions such as temperature change, water scarcity, and flooding. The risk is medium now but projected to be high in the future. The adaptation gap in addressing this risk is significant, particularly for agriculture.

8.23 For Coventry, this risk means potential impacts on local food production, forest health, and economic stability. Agriculture and forestry are crucial for local employment, biodiversity, and as carbon sinks, which are all important for the city's sustainability goals.

8.24 Adapting to climate impacts through diversification, integrated land and water management, and innovation in agricultural practices is essential to ensure long-term sustainability and resilience of the local agriculture and forestry sectors. Embracing these changes is also critical to meeting Net Zero targets and enhancing productivity in a changing climate.

Geospatial Analysis Summary

8.25 To assess risks and opportunities for agricultural productivity from changing climatic conditions, the Living England Habitat Map Phase 4[7] was used. This layer was filtered for those parcels defined as Arable and Horticultural. It was assumed there is no commercial forestry taking place within the city (see *Figure 39*)

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Coventry's agriculture and forestry sectors are relatively small, given the urban nature of the city. 6% of the total area is classified as 'Arable and Horticultural'. These sectors are exposed to climate change risks due to	0

[7] Living England Habitat Map (Phase 4) (arcgis.com)

Assessment Area	Details	Score
	extreme weather events and changing conditions such as temperature changes, water scarcity, and flooding.	
Sensitivity	Changes in weather patterns and extreme events can affect crop yields, forest health, and overall productivity. This can have knock-on effects on local employment, biodiversity, and the city's sustainability goals.	2
Adaptive Capacity	The Urban Forestry Strategy enhances the resilience of the agricultural and forestry sectors by advocating for diverse and robust urban forestry practices. These practices are crucial for mitigating risks such as temperature variations, water scarcity, and extreme weather conditions like flooding and high winds. There are certain skills and dedicated staff currently available in Coventry City Council to deal with risks and opportunities for agricultural and forestry productivity arising from changing climatic conditions.	2
Total Vulnerability Score		**0**

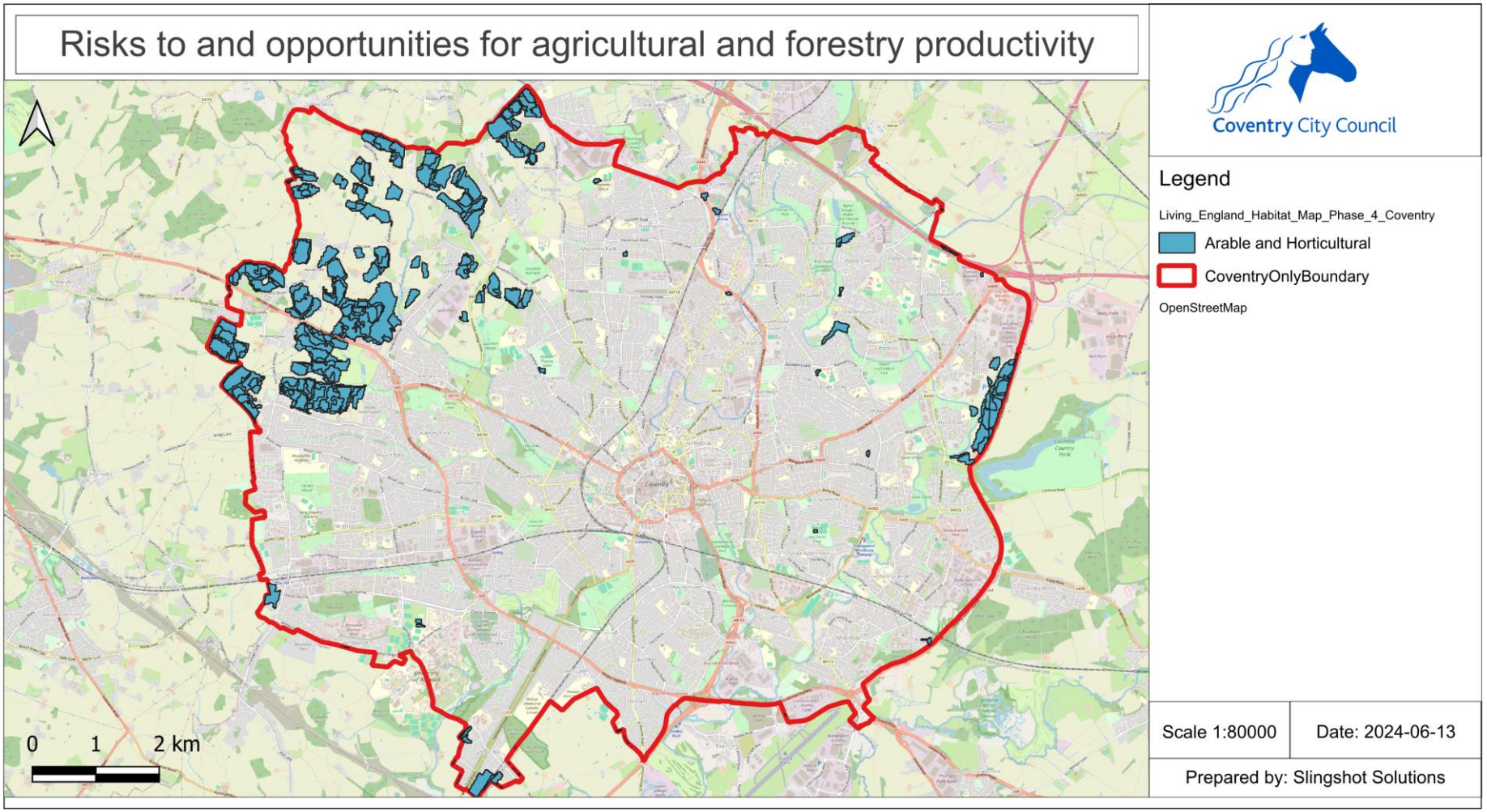


Figure 39: Agricultural and arable land parcels in Coventry

Risks to forestry from pests, pathogens and invasive species

Context

Type	CCRA Reference	Risk or Opportunity
Natural Environment and Assets	N8. Forestry	Risks

Description

8.26 Forestry in England is increasingly threatened by pests, pathogens, and invasive non-native species (INNS), exacerbated by climate change.

8.27 For Coventry, forestry is important for local ecosystems, recreation, and as a carbon sink. These threats compromise those values and economic benefits.

8.28 Proactive measures are needed to enhance forest resilience, including better pest management, biosecurity, and sourcing practices.

Geospatial Analysis Summary

8.29 No geospatial analysis was conducted for this risk.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Although Coventry does not have commercial forestry, there are a number of forested areas and the Coventry Urban Forestry Strategy 2022 -2032 has a target of planting an additional 360,000 trees. These forested areas are exposed to the threats of pests, pathogens, and invasive non-native species, which are exacerbated by climate change. This exposure is due to the city's geographical location, local climate conditions, and the presence of diverse forest ecosystems.	1
Sensitivity	Pests, pathogens, and invasive species can cause significant damage to the health and vitality of forests, affecting their ability to serve as recreational spaces, habitats for wildlife, and carbon sinks. This can also have economic implications, as forestry contributes to the local economy.	2
Adaptive Capacity	The Urban Forestry Strategy emphasises addressing pests and diseases such as Chalara Dieback of Ash, identified within the city's ash trees. It also underscores the role of	2

Assessment Area	Details	Score
	genetic diversity among trees in mitigating these threats, advocating the planting of a variety of species as a preventative measure. There is also support available from including the Warwickshire Wildlife Trust, Coventry University, University of Warwick and the broader public to deal with risks to forestry from pests and invasive species.	
Total Vulnerability Score		**1**

Risks to freshwater species and habitats from changing climatic conditions and extreme events.

Context

Type	CCRA Reference	Risk or Opportunity
Natural Environment and Assets	N11. Freshwater species and habitats	Risks

Description

8.30 Freshwater habitats are at risk from reduced water availability and higher temperatures, leading to loss of species and habitat changes.

8.31 Coventry's freshwater ecosystems are crucial for biodiversity, recreation, and provide ecosystem services which are threatened by these climate-induced changes.

8.32 Developing strategies to manage water resources, protect species, and restore habitats is essential for preserving these ecosystems and the services they provide. This also aids in meeting water quality regulations.

Geospatial Analysis Summary

8.33 No geospatial analysis was conducted for this risk.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Most of Coventry's freshwater habitats will be exposed to climate change risks due to potentially reduced water availability and higher temperatures. Many of these	2

Assessment Area	Details	Score
	systems are already under stress due to impacts such as the diffusion of sewage into sensitive habitats.	
Sensitivity	The extent to which freshwater ecosystems in Coventry are sensitive to the impacts of climate change is not well understood. Climate change may result in a loss of species and significant habitat alterations, affecting biodiversity, recreation, and ecosystem services.	2
Adaptive Capacity	There are no specific policies or plans from Coventry Council that deal directly with the risks to freshwater species. The Local Flood Risk Management Strategy highlights initiatives such as reinstating floodplains and creating blue and green infrastructure corridors, which include features like wetlands and woodlands. The Warwickshire, Coventry and Solihull LBAP also includes Habitat Action Plans for Lakes, Reservoirs, and Ponds. Warwickshire Wildlife Trust (WWT) is piloting river restoration projects (e.g., in Sherbourne) and is investigating financial models and business cases for nature-based solutions. Although there are limited skills and resources within the local authority to respond to freshwater risks, skills and resources are available in the broader public and through organisations such as WWT.	2
Total Vulnerability Score		**2**

Risks to freshwater species and habitats from pests, pathogens and invasive species

Context

Type	CCRA Reference	Risk or Opportunity
Natural Environment and Assets	N12. Freshwater species and habitats	Risks

Description

8.34 The increase in pests, pathogens, and invasive non-native species (INNS) due to climate change poses a high risk to freshwater ecosystems, leading to changes in species competition, disease spread, and habitat alteration.

8.35 Coventry's freshwater ecosystems are critical for biodiversity, flood mitigation, and provide numerous ecosystem services. INNS can significantly disrupt these systems and lead to ecological and economic costs.

8.36 Proactive biosecurity measures, effective legislation enforcement, and research into eradication and control methods are necessary to protect these ecosystems and the services they provide to the community.

Geospatial Analysis Summary

8.37 No geospatial analysis was conducted for this risk.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Coventry's freshwater ecosystems are likely to be exposed to an increased risk of INNS due to climate change. This is particularly true for increased levels of blue-green algae and blanket weed and their impact on freshwater organisms. However, the extent of this risk is not well understood.	1
Sensitivity	Freshwater ecosystems are highly sensitive to the introduction of INNS. The introduction of these species can lead to significant changes in species competition, disease spread, and habitat alteration, disrupting these systems and leading to ecological and economic costs.	2
Adaptive Capacity	Responding to pests and pathogens is primarily a national responsibility. Coventry City Council currently has no local policies or plans that directly address the risks freshwater species face from pests and pathogens. The Warwickshire, Coventry, and Solihull Local Biodiversity Action Plan (LBAP) includes a variety of Species-Specific Action Plans, some of which tackle the threats posed by pests and pathogens. There are limited skills and resources available to deal with risks to freshwater species and habitats from pests, pathogens, and invasive species.	1
Total Vulnerability Score		**2**

Opportunities to freshwater species and habitats from new species colonisations

Context

Type	CCRA Reference	Risk or Opportunity
Natural Environment and Assets	N13. Freshwater species and habitats	Opportunities

Description

8.38 The arrival of new species due to climate changes could enhance biodiversity and ecosystem adaptability by introducing new prey and habitats.

8.39 In Coventry, these changes could enhance local freshwater biodiversity, which supports ecosystem health and resilience.

8.40 Sustaining actions that promote ecological balance and prepare for new species can maximise biodiversity benefits while managing risks of invasive species.

Geospatial Analysis Summary

8.41 No geospatial analysis was conducted for this risk.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Coventry's freshwater ecosystems are at risk of the introduction of new species due to climate change. This could potentially enhance local biodiversity and ecosystem adaptability by introducing new prey and habitats.	1
Sensitivity	The freshwater ecosystems in Coventry are highly sensitive to changes in biodiversity. The introduction of new species could potentially disrupt the existing ecological balance, but could also enhance ecosystem health and resilience if managed properly. The risk of invasive species also increases, which could negatively impact the existing ecosystem.	2
Adaptive Capacity	There are no specific examples of policies to capitalise on freshwater species colonisation opportunities. The Warwickshire, Coventry and Solihull LBAP Species Actions	2

Assessment Area	Details	Score
	plan highlights the potential for some species to expand their habitats. There is also support available from including the Warwickshire Wildlife Trust, Coventry University, University of Warwick and the broader public to respond to opportunities arising from new species colonisations.	
Total Vulnerability Score		**1**

Risks from climate change to role of urban ecosystems

Context

Type	CCRA Reference	Risk or Opportunity
Natural Environment and Assets	N18. Landscape character	Risks & Opportunities

Description

8.42 Climate change poses significant risks to urban ecosystems through increased temperatures, pollution, habitat degradation, and the spread of invasive species. These factors can lead to a decline in biodiversity and affect ecosystem services in Coventry, a city already facing challenges with green space availability and green deprivation.

8.43 While biodiversity is important, the focus should be on developing ecologically sensitive approaches that mimic natural ecosystems. This strategy can reduce the need for costly interventionist land management practices. By creating systems that are closer to natural ecosystems, we can enhance resilience against climate impacts such as heatwaves and flooding, while potentially improving air quality and providing recreational spaces.

8.44 In some cases, the use of non-native, climate-adapted species may be appropriate, particularly in areas facing heat stress and low water availability. These species can survive in challenging conditions and contribute to cooling urban areas.

8.45 Adapting to these risks will strengthen Coventry's resilience against climate impacts, potentially improve quality of life for residents, and create a more sustainable urban environment. This approach balances ecological considerations with practical, cost-effective solutions for climate adaptation.

Geospatial Analysis Summary

8.46 No geospatial analysis was conducted for this risk.

Vulnerability Assessment

Assessment Area	Details	Score
Exposure	Approximately 11% of Coventry's land is currently allocated for nature, including parks, woodlands, river and canal corridors, allotments, street trees, and private gardens. However, in order to meet the '30 by 30' goal outlined in the Coventry Climate Change Strategy, Coventry needs to identify an additional 19% (or 1,874 hectares) of land for nature.	2
Sensitivity	Ecosystem services in Coventry are highly sensitive to the impacts of climate change. Rising temperatures, increased pollution, and extreme weather events disrupt these services, including temperature regulation, flood management, and carbon sequestration. Flooding risk increases with reduced natural water absorption, and air quality worsens without sufficient green cover. This sensitivity not only affects environmental health but also directly impacts public health and well-being.	3
Adaptive Capacity	Coventry has made strides in adaptive capacity through various policies and plans aimed at enhancing biodiversity and green infrastructure. The Green Space Strategy 2019-2024 promotes the multi-functional nature of green spaces and aims to ensure they are well-managed and accessible. Additionally, the Urban Forestry Strategy proposes planting a tree for every citizen by 2032. However, despite these initiatives, significant gaps remain. There is a lack of comprehensive funding dedicated to large-scale nature recovery projects, and the skills and resources needed for effective conservation management are insufficient. The absence of a fully developed Green and Blue Infrastructure Plan and detailed species and habitat surveys further hinder progress.	2
Total Vulnerability Score		**3**

9 Risk and Opportunity Prioritisation

9.1 The tables below are a summary of the risk and opportunity analysis that took place, including the scores for exposure, sensitivity, adaptive capacity and overall vulnerability.

Vulnerability assessment results

9.2 Table 15 shows the summary of the climate change risks that Coventry is highly vulnerable to (those with a vulnerability score of 3 or higher). The results from this vulnerability assessment indicates that food safety and food security is the main climate change risk for the city. Infrastructure and water availability are also key areas of vulnerability. High priority risks were only found in the *Health, Communities and the Built Environment* and *Infrastructure* risk themes. Generally, more sensitive risks have higher overall vulnerability.

Table 15: High priority climate change risks for Coventry

Risk and Opportunity Descriptor	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
H09 - Risks to food safety and food security	2	3	1	4
I01 - Risks to infrastructure networks (water, energy, transport, ICT) from cascading failures	3	2	1	4
I08 - Risks to public water supplies from reduced water availability	3	3	2	4
H01 - Risks to health and wellbeing from high temperatures	1	3	1	3
H03 - Risks to people, communities and buildings from flooding	2	3	2	3
H10 - Risks to water quality and household water supplies	2	3	2	3
H12 - Risks to health and social care delivery	2	2	1	3
H13 - Risks to education and care home services	2	2	1	3
N18 - Risks from climate change to role of urban ecosystems	2	3	2	3

9.3 Table 15 shows risks that were also highlighted as important, but not as significant as those listed Table 14. These medium priority risks were found across all risk themes and were mostly associated with risks that have medium to high exposure.

Table 16: Medium priority climate change risks for Coventry

Risk Type	Risk and Opportunity Descriptor	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Business and Industry	B01 - Risks to businesses from flooding	1	3	2	2
	B05 - Risks to business from reduced employee productivity due to infrastructure disruption and higher temperatures in working environments	3	1	2	2
	B06 - Risks to business from disruption to supply chains and distribution networks	2	1	1	2
Health, Communities and the Built Environment	H06 - Risks and opportunities from summer and winter household energy demand	2	1	1	2
	H07 - Risks to health and wellbeing from changes in air quality	3	1	2	2
	H08 - Risks to health from vector-borne disease	0	2	0	2
Infrastructure	I04 - Risks to bridges and pipelines from flooding and erosion	3	2	3	2
	I05 - Risks to transport networks from slope and embankment failure	2	1	1	2
	I10 - Risks to energy from high and low temperatures, high winds, lightning	2	1	1	2
	I12 - Risks to transport from high and low temperatures, high winds, lightning	2	1	1	2
	I13 - Risks to digital from high and low temperatures, high winds, lightning	2	1	1	2
Natural Environment and Assets	N04 - Risk to soils from changing climatic conditions, including seasonal aridity and wetness.	2	1	1	2
	N11 - Risks to freshwater species and habitats from changing climatic conditions and extreme events.	2	2	2	2
	N12 - Risks to freshwater species and habitats from pests, pathogens and invasive species	1	2	1	2

Risk summary by risk theme

9.4 The tables below provide a summary of all the risks, grouped by the four risk themes.

Table 17: Business and industry climate change risks for Coventry

Risk and Opportunity Descriptor	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
B01 - Risks to businesses from flooding	1	3	2	2
B03 - Risks to business from water scarcity	0	2	2	0
B04 - Risks to finance, investment and insurance including access to capital for businesses	0	2	3	0
B05 - Risks to business from reduced employee productivity due to infrastructure disruption and higher temperatures in working environments	3	1	2	2
B06 - Risks to business from disruption to supply chains and distribution networks	2	1	1	2
B07 - Opportunities for business from changes in demand for goods and services	0	1	3	0

Table 18: Health, Communities and the Built Environment climate change risks for Coventry

Risk and Opportunity Descriptor	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
H01 - Risks to health and wellbeing from high temperatures	1	3	1	3
H02 - Opportunities for health and wellbeing from higher temperatures	1	1	2	0
H03 - Risks to people, communities and buildings from flooding	2	3	2	3
H05 - Risks to building fabric	2	1	2	1
H06 - Risks and opportunities from summer and winter household energy demand	2	1	1	2
H07 - Risks to health and wellbeing from changes in air quality	3	1	2	2
H08 - Risks to health from vector-borne disease	0	2	0	2
H09 - Risks to food safety and food security	2	3	1	4
H10 - Risks to water quality and household water supplies	2	3	2	3
H11 - Risks to cultural heritage	0	2	2	0
H12 - Risks to health and social care delivery	2	2	1	3
H13 - Risks to education and care home services	2	2	1	3

Table 19: Infrastructure climate change risks for Coventry

Risk and Opportunity Descriptor	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
I01 - Risks to infrastructure networks (water, energy, transport, ICT) from cascading failures	3	2	1	4
I02 - Risks to infrastructure services from river, surface water and groundwater flooding	1	2	2	1
I04 - Risks to bridges and pipelines from flooding and erosion	3	2	3	2
I05 - Risks to transport networks from slope and embankment failure	2	1	1	2
I06 - Risks to hydroelectric generation from low or high river flows	0	0	3	0
I07 - Risks to subterranean and surface infrastructure from subsidence	1	1	2	0
I08 - Risks to public water supplies from reduced water availability	3	3	2	4
I09 - Risks to energy generation from reduced water availability	0	1	3	0
I10 - Risks to energy from high and low temperatures, high winds, lightning	2	1	1	2
I12 - Risks to transport from high and low temperatures, high winds, lightning	2	1	1	2
I13 - Risks to digital from high and low temperatures, high winds, lightning	2	1	1	2

Table 20: Natural Environment and Assets climate change risks for Coventry

Risk and Opportunity Descriptor	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
N01 - Risks to terrestrial species and habitats from changing climatic conditions and extreme events.	1	2	2	1
N02 - Risks to terrestrial species and habitats from pests, pathogens and invasive species	1	2	2	1
N03 - Opportunities from new species colonisations in terrestrial habitats	1	2	2	1
N04 - Risk to soils from changing climatic conditions, including seasonal aridity and wetness.	2	1	1	2
N05 - Risks and opportunities for natural carbon stores, carbon sequestration from changing climatic conditions.	2	2	3	1

Risk and Opportunity Descriptor	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
N06 - Risks to and opportunities for agricultural and forestry productivity from extreme events and changing climatic conditions.	0	2	2	0
N08 - Risks to forestry from pests, pathogens and invasive species	1	2	2	1
N11 - Risks to freshwater species and habitats from changing climatic conditions and extreme events.	2	2	2	2
N12 - Risks to freshwater species and habitats from pests, pathogens and invasive species	1	2	1	2
N13 - Opportunities to freshwater species and habitats from new species colonisations	1	2	2	1
N18 - Risks from climate change to role of urban ecosystems	2	3	2	3

10 Appendices

Appendix 1: Approach to describing future climate scenarios for Coventry Council

Background

10.1 A key element of the climate risk assessment process is to present future climate change projections for different climatic variables. The three key climate variables for a climate change risk assessment are temperature, precipitation, and sea level rise. Within each of these main variables, there are sub-sets of variables, such as maximum temperature variation, monthly precipitation projections, annual heating degree days, etc. The UK Met Office provides climate change projections for different variables in a spatial format in the following two categories:

1. **Emission Scenarios:**
    a. These are based on assumptions about future changes in emissions due to economic, social, and environmental factors.
    b. Representative Concentration Pathways (RCPs) are used within these scenarios to project greenhouse gas concentrations and their radiative forcing effects by 2100.
    c. RCPs include RCP2.6, RCP4.5, RCP6.0, and RCP8.5, indicating different levels of radiative forcing and potential temperature increases.
2. **Global Warming Levels:**
    a. Focus on the impact of specific global temperature increases above pre-industrial levels, such as 1.5°C, 2°C, etc.
    b. They allow exploration of climate metrics at various levels of global warming, regardless of the emission scenario followed.

10.2 The Met Office describes the key use case for each of these categories as follows:

Emission Scenarios

10.3 Emission scenarios describe how global carbon emissions might change in the future depending on factors such as population and GDP. Showing the possible future climate under different emission trajectories is important for deciding how strong Nationally Determined Contributions (NDCs) should be. They are especially important for knowing how much mitigation efforts need to reduce warming to 1.5°C and well below 2°C in the Paris Agreement.

Global Warming Levels

10.4 Global warming levels let you see how a defined global temperature rise above a pre-industrial level, e.g., 1.5°C, 2°C, 2.5°C, 3°C and 4°C, affects different temperature and precipitation variables without assuming which emission scenario might happen.

Warming levels can be relevant for policy making as they allow us to look at the climate metrics at different 'levels' of global average temperature change.

Presentation of climate scenarios

10.5 The new Met Office Climate Data Portal provides climate projection data in datasets at different resolutions. The *UK Dataset* is at 12km resolution, and the *Global Dataset* is at a 60km resolution. The types of data provided through the portal for these two datasets are summarised in the 2 tables below.

Table 21: UK Met Office UK Dataset (here)

Variable	Measure of variable	Resolution	Map projection	Dataset	RCP scenario
Precipitation	Monthly and annual averages (mm)	12km	BNG	UKCP18 regional	RCP8.5
Temperature	Monthly and annual averages of surface air temperature (°C)	12km	BNG	UKCP18 regional	RCP8.5

Table 22: UK Met Office Global Dataset (here)

Variable	Measure of variable	Resolution	Map projection	Datasets (Combination of observations and future projections)
Precipitation	Monthly average (mm)	60km	WGS84	CRU TS v 4.06 and UKCP18 global (RCP2.6)
Temperature	Monthly average of mean surface air temperature (°C)	60km	WGS84	CRU TS v 4.06 and UKCP18 global (RCP2.6)
Temperature	Monthly average of maximum surface air temperature (°C)	60km	WGS84	CRU TS v 4.06 and UKCP18 global (RCP2.6)
Temperature	Monthly average of minimum surface air temperature (°C)	60km	WGS84	CRU TS v 4.06 and UKCP18 global (RCP2.6)

10.6 For the purposes of the Coventry Council climate risk assessment, it would be preferable to use finer resolution climate projection data (*UK Dataset*) to reflect the localised climate risks more accurately. However, as is evident from the Table 21, the 12km projection data is not provided for all the different RCP scenarios. Rather, it is only provided for RCP8.5. The *UK Dataset* is, however, provided in for different global warming levels (1.5°C, 2°C, 2.5°C, 3°C and 4°C). For example, the data for *Annual Average Temperature Change - Projections (12km)* is provided as follows:

Table 23: Annual Average Temperature Change - Projections (12km)

Period	Description
1981-2000 baseline	Average temperature (°C) for the period
2001-2020 (recent past)	Average temperature (°C) for the period
2001-2020 (recent past) change	Temperature change (°C) relative to 1981-2000
1.5°C global warming level change	Temperature change (°C) relative to 1981-2000
2°C global warming level change	Temperature change (°C) relative to 1981-2000
2.5°C global warming level change	Temperature change (°C) relative to 1981-2000
3°C global warming level change	Temperature change (°C) relative to 1981-2000
4°C global warming level change	Temperature change (°C) relative to 1981-2000

10.7 The Met Office offers the following explanation for providing the *UK Dataset* for RCP8.5 only:

We cannot provide a precise likelihood for particular emission scenarios being followed in the real world future. However, we do note that RCP8.5 corresponds to emissions considerably above those expected with current international policy agreements. The results are expressed for several global warming levels because we do not yet know which level will be reached in the real climate as it will depend on future greenhouse emission choices and the sensitivity of the climate system, which is uncertain.

Climate models

10.8 Climate models predict the future state of the atmosphere. These predictions are made by observing the current and past atmospheric conditions and then using a computer model to project its future. Because the atmosphere is chaotic, tiny errors in its initial state can lead to big forecast errors.

10.9 To understand how these small initial differences affect the forecast, the Met Office uses an ensemble system. This involves running the computer model multiple times with slightly different starting conditions. The set of these forecasts is called an ensemble, and each individual forecast is an ensemble member.

10.10 The outcomes from this modelling are grouped into three categories by the Met Office ('upper', 'median', and 'lower'). The ‘median’, ‘upper’, and ‘lower’ values are statistical measures used to understand the range and tendency of climate model projections.

10.11 The climate models therefore include the following measures:

- **Ensemble Members:** The model projections consist of a different number of ensemble members. Each member represents a possible future climate scenario.
- **Climate Models:** These are numerical representations of the climate system. To capture uncertainty in future projections, an ensemble of climate models was run. Each model in the ensemble had slightly different starting conditions or setups.
- **'Lower' Fields:** These are the second lowest ranked ensemble member based on data for each location.
- **'Higher' Fields:** These are the second highest ranked ensemble member based on the same criterion.
- **'Median' Field:** This is the central value of the ensemble, providing a middle estimate of all the projections.

10.12 These measures give a range of possible outcomes in the projections, with the difference between the 'lower' and 'higher' fields indicating the level of uncertainty. The same measures are also given for the baseline period, allowing for a fair comparison between the model projections and the recent past.

10.13 Using the example from above, the *Annual Average Temperature Change - Projections (12km)* dataset not only contains data global warming levels (1.5°C, 2°C, 2.5°C, 3°C and 4°C), but also 3 sub sets of data *(*'upper', 'median', and 'lower'*)* for each GWL.

Linking with SSPs

10.14 Shared Socioeconomic Pathways (SSPs) represent five different storylines of projected future socioeconomic scenarios. SSPs have been developed for the UK between the years 2020 and 2100 by the UK-SSP project to align with global SSPs used by the IPCC community. While RCPs focus on the outcomes of different levels of greenhouse gas emissions on climate, SSPs explore the underlying societal paths that lead to these emissions and their broader impacts. The five SSPs are presented below.

Figure 40: Five UK SSPs

10.15 The five international SSPs (here) and their relationship to the RCPs, as outlined in IPCC sixth assessment report (AR6) (here) are summarised in Table 24 below.

Table 24: SSP and RCP relationship (source: US Department of Agriculture)

SSP	RCP(s) associated with SSP	Description
SSP1	RCP 1.9 RCP 2.6	**Sustainability:** The world shifts gradually, but pervasively, toward a more sustainable path, emphasizing more inclusive development that respects perceived environmental boundaries.
SSP2	RCP 4.5	**Middle of the road:** The world follows a path in which social, economic, and technological trends do not shift markedly from historical patterns.
SSP3	RCP 7.0	**Regional rivalry:** A resurgent nationalism, concerns about competitiveness and security, and regional conflicts push countries to increasingly focus on domestic or, at most, regional issues.
SSP4	RCP 3.4	**Inequality:** Highly unequal investments in human capital, combined with increasing disparities in economic opportunity and political power, lead to increasing inequalities and stratification both across and within countries.
SSP5	RCP 8.5	**Fossil-fueled development:** This world places increasing faith in competitive markets, innovation and participatory societies to produce rapid technological progress and development of human capital as the path to sustainable development. Global markets are increasingly integrated.

Example policies and behaviour for different SSPs

SSP1: Sustainability (Taking the Green Road)

10.16 Policy Action: The UK government invests heavily in renewable energy, including subsidies for wind and solar power, leading to significant reductions in greenhouse gas emissions. The UK enhances green infrastructure, such as urban parks and green roofs, to manage flood risks and improve urban resilience.

10.17 Behaviour Example: Citizens adopt low-carbon lifestyles by prioritising public transport, cycling, and walking over car use. They also support and engage in community-based initiatives to improve local green spaces and reduce flood risks.

SSP2: Middle of the Road

10.18 Policy Action: The UK implements moderate climate policies, such as improving energy efficiency in buildings and encouraging moderate uptake of electric vehicles through tax

incentives. The UK government introduces moderate adaptation measures, such as updating building codes to withstand extreme weather and investing in flood defences.

10.19 Behaviour Example: The public shows moderate engagement with green practices, including recycling and waste reduction. They support local initiatives for better flood defences and participate in community preparedness programs for extreme weather events.

SSP3: Regional Rivalry (A Rocky Road)

10.20 Policy Action: The UK focuses on energy security, increasing investment in domestic fossil fuel production, like North Sea oil and gas. Limited adaptation efforts are made, primarily focusing on short-term, reactive measures such as emergency response plans for natural disasters.

10.21 Behaviour Example: Citizens prioritise local over global concerns, leading to resistance against international climate agreements. They rely on ad-hoc measures to cope with extreme weather events and localised flooding.

SSP4: Inequality (A Road Divided)

10.22 Policy Action: Climate policies in the UK focus on protecting the wealthy, with investments in resilient infrastructure in affluent areas, while poorer regions see little support. Wealthy areas receive advanced flood defences and climate-resilient infrastructure, while poorer regions are neglected.

10.23 Behaviour Example: Wealthier citizens invest in personal renewable energy systems and climate-proof homes. Meanwhile, poorer communities struggle with outdated infrastructure and limited access to adaptive technologies, increasing their vulnerability to climate impacts.

SSP5: Fossil-fuelled Development (Taking the Highway)

10.24 Policy Action: The UK government invests heavily in fossil fuel industries, including subsidies for coal and oil, aiming for rapid economic growth. Adaptation measures focus on protecting key economic assets and infrastructure, such as major ports and industrial areas, from climate impacts.

10.25 Behaviour Example: The public adopts high-consumption lifestyles, with increased car use, frequent air travel, and high energy consumption. They expect the government to protect critical infrastructure from climate impacts but do not engage in personal adaptation efforts.

What does this mean for Coventry Council?

10.26 Given the publicly available geospatial data from the Met Office is now provided in different GWLs rather than RCPs, it is suggested that future climate scenarios for Coventry Council are presented in terms of GWLs. The following correspondence with the Met Office supports this recommendation:

It has been found that presenting the information on GWLs is often more useful because it does not rely on particular emissions scenarios, especially the very high emissions scenario RCP8.5 which is regarded as above the current policies trajectory. However, this does make it more complicated to use when the time horizon is important. The IPCC Working Group 1 Technical Summary has a useful table showing when specific global warming levels would be reached using different scenarios – and this does not just rely on models, it also takes account of recent observed trends and other information. Scenario SSP3-7.0 is within the group considered to represent 'currently-implemented policies" (Pers Comms; Met Office, March 13, 2024)

10.27 The table referred to in the comment about linking GWLs to timescales is provided below (Table 25). Based in this feedback from the Met Office, it is further suggested that when considering timeframes for different GWLs, the Scenario SSP3-7.0 be used as the principal scenario when presenting possible climate futures for the Coventry Council.

10.28 For example, if projections for *Annual Average Temperature Change* is presented for Coventry Council, this data can be presented for the four GWLs (1.5°C, 2°C, 2.5°C, 3°C and 4°C). In order to indicate a likely timeframe for these changes, the SSP3-7.0 scenario could be used.

Table 25: Relationship between global warming level timeframes and SSPs during the period 2021–2100 (Source: IPCC The Physical Science Basis. Contribution of Working Group I to the 6th ARP)

	SSP1-1.9	SSP1-2.6	SSP2-4.5	SSP3-7.0	SSP5-8.5
Near term, 2021–2040	1.5 [1.2 to 1.7]	1.5 [1.2 to 1.8]	1.5 [1.2 to 1.8]	1.5 [1.2 to 1.8]	1.6 [1.3 to 1.9]
Mid-term, 2041–2060	1.6 [1.2 to 2.0]	1.7 [1.3 to 2.2]	2.0 [1.6 to 2.5]	2.1 [1.7 to 2.6]	2.4 [1.9 to 3.0]
Long term, 2081–2100	1.4 [1.0 to 1.8]	1.8 [1.3 to 2.4]	2.7 [2.1 to 3.5]	3.6 [2.8 to 4.6]	4.4 [3.3 to 5.7]
1.5°C	2025–2044 [2013–2032 to n.c.]	2023–2042 [2012–2031 to n.c.]	2021–2040 [2012–2031 to 2037–2056]	2021–2040 [2013–2032 to 2033–2052]	2018–2037 [2011–2030 to 2029–2048]
2°C	n.c.	n.c. [2031–2050 to n.c.]	2043–2062 [2028–2047 to 2075–2094]	2037–2056 [2026–2045 to 2053–2072]	2032–2051 [2023–2042 to 2044–2063]

	SSP1-1.9	SSP1-2.6	SSP2-4.5	SSP3-7.0	SSP5-8.5
3°C	n.c.	n.c.	n.c. [2061–2080 to n.c.]	2066–2085 [2050–2069 to n.c.]	2055–2074 [2042–2061 to 2074–2093]
4°C	n.c.	n.c.	n.c.	n.c. [2070–2089 to n.c.]	2075–2094 [2058–2077 to n.c.]

(An entry n.c. means that the global warming level is not crossed during the period 2021–2100)

Which climate projection data should we present?

10.29 It is not practical to present all the climate projection data available through the Met Office. For the ease of communication with stakeholders, it was proposed to present the following relevant sub-set of this data.

Key Variable	Associated Climate Variable
Temperature	Annual Average Temperature Change
Temperature	Summer Average Temperature Change
Temperature	Summer Maximum Temperature Change
Temperature	Winter Average Temperature Change
Temperature	Winter Minimum Temperature Change
Temperature	Annual Count of Extreme Summer Days
Temperature	Annual Count of Hot Summer Days
Temperature	Annual Count of Summer Days
Temperature	Annual Heating Degree Days
Temperature	Annual Count of Tropical Nights
Temperature	Annual Cooling Degree Days
Temperature	Annual Growing Degree Days
Temperature	Annual Count of Frost Days
Temperature	Annual Count of Icing Days
Precipitation	Summer Precipitation Change
Precipitation	Winter Precipitation Change
Temperature & Precipitation	Drought Severity Index

10.30 It was further proposed that, within this subset of projection data, maps are presented for the 2.0°C change scenario and the remaining data is presented in a table or graph format. The presentation of the data will link GWLs to timescales through the SSP3 – 7.0 pathway:

- 2021 – 2040 1.5°C change
- 2037 – 2056 2°C change
- 2066 – 2085 3°C change
- 2052 – 2071 2.5°C change
- 2100 and beyond 4°C change

Appendix 2: Coventry climate change risk list

Table 26: Climate change risks for Coventry included in this assessment

Risk Type	Risk No	Coventry Risk or Opportunity Descriptor
Business and Industry	B01	Risks to businesses from flooding
	B03	Risks to business from water scarcity
	B04	Risks to finance, investment and insurance including access to capital for businesses
	B05	Risks to business from reduced employee productivity due to infrastructure disruption and higher temperatures in working environments
	B06	Risks to business from disruption to supply chains and distribution networks
	B07	Opportunities for business from changes in demand for goods and services
Health, Communities and the Built Environment	H01	Risks to health and wellbeing from high temperatures
	H02	Opportunities for health and wellbeing from higher temperatures
	H03	Risks to people, communities and buildings from flooding
	H05	Risks to building fabric
	H06	Risks and opportunities from summer and winter household energy demand
	H07	Risks to health and wellbeing from changes in air quality
	H08	Risks to health from vector-borne disease
	H09	Risks to food safety and food security
	H10	Risks to water quality and household water supplies
	H11	Risks to cultural heritage
	H12	Risks to health and social care delivery
	H13	Risks to education and care home services
Infrastructure	I01	Risks to infrastructure networks (water, energy, transport, ICT) from cascading failures
	I02	Risks to infrastructure services from river, surface water and groundwater flooding
	I04	Risks to bridges and pipelines from flooding and erosion
	I05	Risks to transport networks from slope and embankment failure
	I06	Risks to hydroelectric generation from low or high river flows
	I07	Risks to subterranean and surface infrastructure from subsidence

Risk Type	Risk No	Coventry Risk or Opportunity Descriptor
	I08	Risks to public water supplies from reduced water availability
	I09	Risks to energy generation from reduced water availability
	I10	Risks to energy from high and low temperatures, high winds, lightning
	I12	Risks to transport from high and low temperatures, high winds, lightning
	I13	Risks to digital from high and low temperatures, high winds, lightning
Natural Environment and Assets	N01	Risks to terrestrial species and habitats from changing climatic conditions and extreme events, including temperature change, water scarcity, wildfire, flooding, wind, and altered hydrology (including water scarcity, flooding and saline intrusion).
	N02	Risks to terrestrial species and habitats from pests, pathogens and invasive species
	N03	Opportunities from new species colonisations in terrestrial habitats
	N04	Risk to soils from changing climatic conditions, including seasonal aridity and wetness.
	N05	Risks and opportunities for natural carbon stores, carbon sequestration from changing climatic conditions.
	N06	Risks to and opportunities for agricultural and forestry productivity from extreme events and changing climatic conditions (including temperature change, water scarcity, wildfire, flooding, coastal erosion, wind and saline intrustion).
	N08	Risks to forestry from pests, pathogens and invasive species
	N11	Risks to freshwater species and habitats from changing climatic conditions and extreme events.
	N12	Risks to freshwater species and habitats from pests, pathogens and invasive species
	N13	Opportunities to freshwater species and habitats from new species colonisations
	N18	Risks and opportunities from climate change to landscape character

Table 27: Risk from CCRA 3 excluded from this assessment

Code	Risk or Opportunity Descriptor
N07	Risks to agriculture from pests, pathogens and invasive species
N09	Opportunities for agricultural and forestry productivity from new/alternative species becoming suitable.
N10	Risks to aquifers and agricultural land from sea level rise, saltwater intrusion

N14	Risks to marine species, habitats and fisheries from changing climatic conditions, including ocean acidification and higher water temperatures.
N15	Opportunities to marine species, habitats and fisheries from changing climatic conditions
N16	Risks to marine species and habitats from pests, pathogens and invasive species
N17	Risks and opportunities to coastal species and habitats due to coastal flooding, erosion and climate factors
I03	Risks to infrastructure services from coastal flooding and erosion
I11	Risks to offshore infrastructure from storms and high waves
H04	Risks to people, communities and buildings from sea level rise
B02	Risks to business locations and infrastructure from coastal change from erosion, flooding and extreme weather events
ID1	Risks to UK food availability, safety, and quality from climate change overseas
ID2	Opportunities for UK food availability and exports from climate impacts overseas
ID3	Risks and opportunities to the UK from climate-related international human mobility
ID4	Risks to the UK from international violent conflict resulting from climate change on the UK
ID5	Risks to international law and governance from climate change overseas that will impact the UK
ID6	Opportunities from climate change (including arctic ice melt) on international trade routes
ID7	Risks from climate change on international trade routes
ID8	Risk to the UK finance sector from climate change overseas
ID9	Risk to UK public health from climate change overseas
ID10	Risk multiplication from the interactions and cascades of named risks across systems and geographies

Appendix 3: Stakeholder Interview Template

10.31 The answers you provide to these questions will allow CAG and SWM, in partnership with Coventry Council to develop a truly user-led climate change adaptation plan for the city. The aim of the plan will be to provide a series of actions that, if implemented, can help to ensure the city's infrastructure, people, environment, buildings and assets are protected from the impacts of climate change. Your thoughts on how the city is already dealing with extreme weather events, and what more it needs to do, will form a key part of the plan's content, and allow us to more accurately allocate actions to the right organisation.

10.32 The responses you provide will not be externally published and your details will only be used for the purposes of this project; full details can be found in the accompanying GDPR policy.

Name of interviewee	Job Title	Organisation/ Service Area

The current picture

1. Can you tell us in broad terms how extreme weather events have impacted your organisation/service over the past few years?

2. Do you quantitatively measure the impact extreme weather events have on your organisation/service in relation to any of the following:

Impact	Measured? (Y, N, n/a)	If yes, please give details as to how the impacts are measured
Financial/ economic		
People/ communities		
Other		

3. Can you tell us which organisations you have worked with when preparing for, or responding to, the impact of an extreme weather event?

4. Has your organisation/service already done anything to improve its resilience to extreme weather impacts, specifically in relation to the below:

Specific questions here depending on organisation being interviewed	

Adapting to climate change

5. Have you assessed the risks to climate change that your organisation/ service area faces?

6. What more do you feel your organisation/service needs to do to better respond to the impacts of extreme weather events, and what help do you need to do this?

7. Can you give us an overview of any strategies and action plans your organisation/ service area is developing that could influence or be influenced by climate adaptation action?

Final remarks

8. Do you have any further comments?

Appendix 4: Online Survey Template

Question	Answer
Your name	
Your organisation	
Your job title/ service area	
Can you tell us in broad terms how extreme weather events have impacted your organisation/service over the past few years? Consider minor impacts such as travel disruption for staff, up to major i...	
Do you quantitatively measure the financial or economic impact extreme weather events have on your organisation/service?	
If yes, please give details of the data you collect or monitor.	
Do you quantitatively measure the impact extreme weather events have in your community, e.g. health implications of an event?	
If yes, please give details of the data you collect or monitor.2	
Can you tell us which organisations you have worked with when preparing for, or responding to, the impact of an extreme weather event?	
Have you assessed the risks to climate change that your organisation/ service area faces? If yes, please provide details.	
Has your organisation/service already done anything to improve its resilience to extreme weather impacts? If so, please provide details. This could include modifying working patterns or health and...	
What more do you feel your organisation/service needs to do to better respond to the impacts of extreme weather events, and what help do you need to do this?	
Can you give us an overview of any strategies and action plans your organisation/ service area is developing that could influence or be influenced by climate adaptation action?	
Do you have any other comments?	
Are you happy if we keep you informed about the work on climate change adaptation going forwards?	

Appendix 5: Coventry Climate Change Projections Report

Provided separately

Appendix 6: Data Sources used for Geospatial Analysis

British Geological Survey. (n.d.). Groundwater Flooding Dataset. Retrieved from https://www.bgs.ac.uk/datasets/groundwater-flooding/

Coventry City Council. (2024). Air Quality Monitoring in Coventry. Retrieved from https://www.coventry.gov.uk/pollution-1/air-quality/3

Coventry City Council. (n.d.). Conservation Areas in Coventry. Retrieved from https://www.coventry.gov.uk/heritage-ecology-trees/conservation-areas/3

Coventry City Council. (2015). Groundwater Mapping. Retrieved from https://www.coventry.gov.uk/downloads/file/19127/appendix-g-groundwater-mapping

Google Earth Engine. (2003). YALE YCEO UHI Summer UHI Yearly Pixel v4. Retrieved from https://developers.google.com/earth-engine/datasets/catalog/YALE_YCEO_UHI_Summer_UHI_yearly_pixel_v4

National Grid. (n.d.). System and Network. Connected Data. Retrieved from https://connecteddata.nationalgrid.co.uk/group/system-and-network

Natural England. (2024). Ancient Woodland Inventory England. Natural England Open Data. Retrieved from https://naturalengland-defra.opendata.arcgis.com/datasets/b1d690ac6dd54c15bdd2d341b686ecd7_0/explore

Natural England. (2024). Living England Habitat Map (Phase 4). Natural England Open Data. Retrieved from https://naturalengland-defra.opendata.arcgis.com/datasets/Defra::living-england-habitat-map-phase-4/explore

Natural England. (2024.). Sites of Special Scientific Interest (SSSI) England. Natural England Open Data. Retrieved from https://naturalengland-defra.opendata.arcgis.com/datasets/Defra::sites-of-special-scientific-interest-england/about

Open Data Communities. (2024). Energy Performance Certificates (EPC) Data for England and Wales. Retrieved from https://epc.opendatacommunities.org/

Open Rail Data. (2024). Network Rail GIS Network Model. GitHub. Retrieved from https://github.com/openraildata/network-rail-gis/tree/main/network-model

OpenStreetMap. (2024. Coventry, UK Exported Map Data. Retrieved from https://www.openstreetmap.org/export#map=12/52.4145/-1.5192

UK Government. (2019). English Indices of Deprivation 2019. Retrieved from https://www.gov.uk/government/statistics/english-indices-of-deprivation-2019

UK Government. (n.d.). Flood Map for Planning (Rivers and Sea) - Flood Zone 3. Data.gov.uk. Retrieved from https://www.data.gov.uk/dataset/bed63fc1-dd26-4685-b143-2941088923b3/flood-map-for-planning-rivers-and-sea-flood-zone-3#

UK Government. (2024). Flood Map for Planning (Rivers and Sea) - Flood Zone 2. Data.gov.uk. Retrieved from https://www.data.gov.uk/dataset/cf494c44-05cd-4060-a029-35937970c9c6/flood-map-for-planning-rivers-and-sea-flood-zone-2#

UK Government. (2024). Risk of Flooding from Surface Water - 0.1% Annual Chance. Data.gov.uk. Retrieved from https://www.data.gov.uk/dataset/1f3d6e13-40f1-4d12-99de-77132bc19c47/risk-of-flooding-from-surface-water-extent-0-1-percent-annual-chance#

UK Government. (2024). Risk of Flooding from Surface Water - 1% Annual Chance. Data.gov.uk. Retrieved from https://www.data.gov.uk/dataset/8b82987d-3616-4e46-8edb-2973e8b82ad7/risk-of-flooding-from-surface-water-extent-1-percent-annual-chance#

UK Government. (2024). Risk of Flooding from Surface Water - 3.3% Annual Chance. Data.gov.uk. Retrieved from https://www.data.gov.uk/dataset/95ea1c96-f3dd-4f92-b41f-ef21603a2802/risk-of-flooding-from-surface-water-extent-3-3-percent-annual-chance#

CAG CONSULTANTS

Founded in 1983, CAG Consultants is an independent, employee-owned co-operative. We provide support, research and analysis, policy advice and training in a wide range of fields relating to sustainable development and climate change. We have practitioners in stakeholder & community involvement, regeneration, evaluation, economics and regulatory affairs. We deliver high quality, innovative and thoughtful work for our clients, who include government departments, local authorities, public agencies, the NHS and regeneration and community planning partnerships across the UK. We pride ourselves on our strong ethical approach and our commitment to social justice and improving and protecting the environment.

CAG Consultants' Quality Management System is approved to the Quality Guild standard.

For more information, see **www.cagconsultants.co.uk**