**Early engagement notice – Heat risks to the urban environment and health**

**A Pre-Procurement Notice from the Climate Change Committee**

**Background**

The Climate Change Committee (CCC) is an independent, statutory body established under the 2008 Climate Change Act. It is tasked with:

* Providing independent advice to the Government on risks and opportunities to the UK from climate change, in part through the UK Climate Change Risk Assessment, and reporting to Parliament on progress in adapting to climate change.
* Providing independent advice to Government on setting and meeting carbon budgets in line with the UK’s longer-term target to reduce greenhouse gas (GHG) emissions to net zero by 2050 and reporting to Parliament on the progress made.

To do this, we conduct independent analysis into climate science, economics and policy, and engage with a wide range of organisations and individuals to share evidence and analysis. Our past reports are available [here](http://www.theccc.org.uk/publications/).

The UK Climate Change Act 2008 requires that every five years, the UK government must publish a Climate Change Risk Assessment (CCRA). The CCRA seeks to provide an authoritative and up-to-date assessment of the risks and opportunities facing the UK from climate change and the adaptation actions that need to be put in place across society to ensure that the UK is well-placed to manage these risks. The Fourth UK Climate Change Risk Assessment (CCRA4) Government Report is due to be published in January 2027. As with CCRA2 and CCRA3 it will be based on an Independent Assessment that the CCC has been commissioned by Defra to lead; this will be published in mid-2026.

As part of CCRA4, the CCC will be developing a new output to complement the Technical Report as produced in previous CCRAs. This output – to be known as the ‘Well-adapted UK report’ (WA report) – will focus on the potential for key aspects of the UK adaptation challenge to reduce the climate risks threatening the achievement of key UK policy and societal outcomes and hence set out a vision for aspects of a well-adapted UK. The WA report aims to provide a policy-relevant evidence base on effective systemic adaptation scenarios, their costs and benefits (and how these are distributed across society). It aims to use this information to establish a resilience standard against the risks modelled for key societal systems and establish the investment requirements to meet this standard.

The report will be tailored to best inform the development of effective actions in the next set of national adaptation programmes from governments across the UK (covering the late 2020s and early 2030s). It also seeks to provide a more spatial and quantitative representation of UK climate risks and adaptation, an improved understanding of the potential for cascading climate risks, and their interactions with other key policy priorities such as delivering Net Zero.

This WA report will be informed by a set of commissioned, bespoke analysis projects, in-house CCC analysis and wider external evidence. The analysis will need to be developed collaboratively with decision makers and consider both risk and adaptation interventions as systemically as possible, while focusing on delivering social and economic analysis and evidence at appropriate spatial scales.

One of these commissioned projects will focus on **heat risks to the urban environment and health**. Urban environments and their occupants are likely to be at particular risk of future heat impacts. Urbanisation exacerbates the risk of overheating hazards through the urban heat islands effect, and increases exposure, due to increases in population densities and numbers of built environment assets.

There is limited existing research on the cost-benefit and effectiveness of physical built environment interventions for managing urban heat risks in the UK’s urban environment and the subsequent risks to health. The analysis will answer the following questions:

* What are the scale and costs of current and future impacts of extreme weather (primarily heat) on urban areas in the UK?
* What kind of physical adaptation interventions (for new and existing developments) are the most cost-effective for reducing the impacts of extreme heat in urban areas in the UK?
* What kind of building-level adaptation interventions (for new and existing buildings) are required to reduce the impacts of extreme indoor temperatures in urban areas in the UK?
* What might heat-resilient urban landscapes look like across the different parts of the UK?

**Potential project**

We are planning to advertise a tender for this research project in February 2024, with the intention that the research should commence in March 2024 and last for a duration of around 12 months.

At a high-level, the methodology for this analysis is expected to have three parts, covering the following central tasks. We are inviting feedback and comments on the methodology as a whole, in addition to the specific questions set out below.

Part 1 – urban adaptation options and outdoor temperatures

1. Archetype analysis of spatial built environment of UK towns and cities to produce a series of ‘street-scale’ archetypes found in UK urban areas.
2. Built environment adaptation action analysis and development of adaptive pathways.
3. Risk analysis of outdoor surface temperatures associated with CCRA4 scenarios and adaptation pathways.

Part 2 – building-level adaptation options and indoor temperatures

1. Building-level adaptation action analysis and development of complementary adaptive pathways.
2. Risk analysis of indoor temperatures in residential and non-residential buildings using outdoor temperature data outputs (number 3) and buildings adaptation pathways (number 4).

Part 3 – scaling the analysis to city and national level

1. Upscale risk analysis to assess city-scale impacts of overheating in urban areas and costs and benefits of adaptation pathways.
2. Upscale risk analysis to assess national-scale impacts of urban areas and costs and benefits of adaptation pathways.

**Summary of potential methodological approach**

The following section contains a brief summary of what we envisage to be the key methodological components of the tasks described above. We are open to feedback from potential suppliers on alternative suitable approaches.

Archetype analysis of spatial built environment of UK towns and cities

The supplier should carry out a review of UK built environment areas to produce a number of common street-scale archetypes, to represent the range of urban environments seen in the UK. Archetypes should be based on spatial built characteristics which may influence the level of heat risk in that environment. This may cover topology, building age and configuration and width of streets. Archetypes attributes should be able to be used as inputs to a spatial model for risk assessment. Suppliers should provide a robust and justified method for archetype identification and selection.

As part of the archetype analysis, we would like the supplier to consider how archetypes can be combined or nested within city-scale analysis – to identify the potential for urban heat island effects. This may involve selecting a number of ‘representative’ case study urban areas for further analysis or using scaling factors to determine how street-scale archetypes are distributed in cities.

Adaptation action analysis and development of adaptive pathways

Working with the CCC and key stakeholders, we will expect the supplier to identify and propose a range of adaptation actions, analyse the effectiveness of those actions in reducing urban heat risks and develop adaptive pathways for improving resilience. The analysis should focus on physical adaptation interventions in the built environment, rather than actions at the individual response level (e.g. emergency alerts).

We expect the supplier to identify and consider artificial and natural physical interventions in the built environment, as well as land use policies. This should cover interventions such as green/blue surfaces, green infrastructure, artificial surfaces and building configuration, as well as more innovative solutions. Evidence from existing literature and case studies – including from outside the UK – should be considered to select adaptation packages. The supplier will be expected to develop and cost packages of adaptation interventions, starting with the lowest regret, ‘win-win’ measures.

We also expect the supplier to identify a series of separate packages for building-level adaptation interventions, such as air conditioning, glazing and shutters. These packages will be applied in the second phase of the analysis, to address the adaptation deficit remaining after street-scale cooling interventions.

Risk assessment for heat impacts and adaptation cost-benefits

We require suppliers to assess the impacts of extreme heat and the effects of adaptation on these impacts at the archetype scale using bespoke modelling. Risk assessment should be carried out using the CCRA4 agreed climate scenarios for baseline urban street tiles (e.g. within a grid cell model) and for tiles with the different adaptation packages included at specified time periods. We are advocating for a process-based modelling approach which describes the relationships between heat hazards and cooling measures using mechanisms and processes to determine behaviour (i.e. not just statistical relationships).

We envisage the modelling should first address outdoor surface temperatures and built environment scale adaptation interventions. These outputs should inform the next stage of analysis, addressing the impacts of indoor temperatures resulting from climate and building-level adaptation scenarios.

Modelling should ideally assess these impacts of periods of extreme heat under different scenarios in terms of:

* Mortality (measured in QALYS) and morbidity (measured via metric agreed with CCC and stakeholders).
* Damages (in £) to built environment assets (residential and non-residential buildings and infrastructure) from heat-related impacts, such as cracking.
* Cost (in £) of response and recovery.
* Costs (in £) of disruption and losses in productivity.

Suppliers should set out clear criteria for the cost impacts of response, disruption and productivity to be assessed, consistent with the CCRA4 WA report methodology guidance.

The supplier should analyse the effectiveness of adaptation actions by considering the following based on bespoke modelling of: (1) the cooling effect of the interventions during periods of future heat extremes; (2) the avoidance of associated economic costs after adaptation and the investment costs need to deploy the adaptation options; (3) wider co-benefits, including benefits for health, nature, and carbon emissions. The costs and benefits of applying adaptation measures should be produced as an output.

Scale analysis at the city and national scales

We require archetype-scale modelling to be extrapolated or scaled to the city level, capturing the impacts of more spatially distributed adaptation interventions on the micro-climate at the city scale. We are seeking feedback as to whether this would be possible using scaling relationships based on values from existing literature.

We will also require suppliers to output the adaptation investment need for the built environment sector at the national scale. The supplier should work with the CCC to decide on suitable assumptions for this analysis. Scale analysis should output the investment need to bridge the adaptation gap at national scale and cost-benefit rationale for built environment interventions to manage urban heat.

**Questions for suppliers**

We are inviting feedback on the idea outlined above to gauge the feasibility of undertaking credible and robust analysis within the timelines described. In particular, we are interested in understanding:

* **Which process-based (or other) modelling approaches could be used to model the impacts of urban heat and the effectiveness of different adaptation options, accounting for future climate change and urban development scenarios?**
* **Whether it’s feasible to conduct analysis of adaptation options using street-scale archetypes, as suggested.**
* **Whether it’s possible to conduct analysis at the city-scale using appropriate scaling relationships from the literature.**
* **Which data and methods could be used to model damages to the built environment from heat risks (and rainfall) such as cracking from drying/wetting.**
* **How challenging it would be to extend this analysis beyond heat to consider other climate impacts (e.g. surface water flooding)?**
* **How credible it is to represent different adaptation options for regulating outdoor and indoor temperatures to produce overall impacts on building occupants, such as health and productivity? This includes considering different types of residential and non-residential building stock.**
* **Which modelling approaches and data would be required to conduct building-scale risk and adaptation analysis and could these be credibly linked to urban development models?**
* **Which data, methods and assumptions would be required for assessing mortality – and particularly morbidity – from the outdoor and indoor heat impacts?**
* **Which data and methods could be used to estimate the economic cost of urban heat in terms of disruption, productivity and response?**
* **Whether adaptation actions outside of those listed above should be modelled to assess urban-scale resilience to heat, and how the effectiveness of these actions could be modelled.**
* **Data and methods which could be used to up-scale cost-benefit analysis, to carry out a national-scale assessment of the built environment sector investment need for UK-wide adaptation to future urban heat risk.**
* **What kinds of input data suppliers envisage needing and whether there are any concerns with accessing some of these data or known data gaps?**

We are inviting interested suppliers who have ideas on how to refine the project scope or who want further information to get in touch with Olivia Shears (olivia.shears@theccc.org.uk) by 7th February 2024.