Title

Urban heat vulnerability mapping: working with a London Borough to translate research outputs

Context

Anthropogenic climate change is expected to increase the frequency, duration and magnitude of heatwaves and warm weather in the UK. Developing methods to predict and quantify heat exposure risk is, therefore, of fundamental importance in order to identify appropriate risk mitigation pathways. In cities, the urban heat island effect increases external ambient temperatures compared to rural areas. In addition, it is estimated that people in the UK spend 90% of their time indoors, the majority of which is at home, and building fabric characteristics have a significant modifying effect on heat exposure risk. Certain population groups are more severely affected by heat exposure, in particular the elderly and the chronically ill. It is widely recognised that collaborations between academics, public health professionals, policymakers and the public are a necessary step towards translating academic research on urban heat risk into policy and action.

Rationale

Research carried out at the Institute for Environmental Design and Engineering at the Bartlett, University College London (UCL) in collaboration with the London School of Hygiene and Tropical Medicine (LSHTM) has quantified variations in vulnerability to heat exposure and associated adverse health effects in relation to housing characteristics, urban heat island and population age (the ‘Triple Heat Jeopardy’ framework). However, opportunities remained to convert these research outputs into policy and practice. This case study presents a project between academics and one of London’s 33 Local Authorities, the London Borough of Hounslow, in close collaboration with Public Health England (PHE) and the Greater London Authority (GLA). The project was funded by the Adaptation and Resilience in the Context of Change (ARCC) network.

The collaboration was initiated by way of a formal placement of UCL academics at the Hounslow London Borough Council. The overarching goal of the project was to accelerate impact and enable effective engagement in issues pertaining to the future heat resilience of the Borough between researchers, policymakers, and local community stakeholders. More specifically, the project aimed to create a platform for knowledge and expertise exchange with regard to the heat vulnerability of the Hounslow population and housing stock based on research project outputs. It was envisaged that this will form the foundations of a computer-based framework that will facilitate the evaluation of heat related health risks and identification of overheating prone dwellings at the local level by local government.

The project objectives are outlined below:

1. To closely collaborate with the Hounslow Borough to evaluate the potential of the three datasets underpinning the Triple Heat Jeopardy framework (building characteristics, population age and urban heat island data) and assess the feasibility for their integration into the Borough's systems,
2. to format existing UCL building stock datasets to the specific data needs of the Borough, e.g. to facilitate their future integration into existing emergency management systems so as to help identify vulnerable groups of residents and overheating prone dwellings,
3. to establish a working relationship between academics, the Borough and other key stakeholders, such as the Mayor of London and PHE, for future translational work on the climate change adaptation of heat vulnerable communities in London in line with the Mayor of London's Environment Strategy.

Description

A meeting was organised to outline the scope of the project, which was an opportunity for our team to engage with representatives of the public health, adult social care, housing, emergency planning and information team of the Borough.

The indoor overheating risk for individual residential addresses across Hounslow was estimated for a range of external air temperatures using UCL's housing stock simulation model. Two different building stock datasets were used as a basis to represent building fabric characteristics:

1. a dataset of relative modelled overheating risk estimates that can be directly linked to buildings based on an Ordnance Survey Unique Property Reference Number using the Verisk Build Class dataset, and
2. a dataset containing more refined modelled estimates of overheating at individual dwelling address level using Hounslow Energy Performance Certificate (EPC) data, which could be linked with existing Borough datasets using a semi-automated matching procedure.

Following this, a series of overheating prediction and mapping tools were produced:

- 2D and 3D visualisations that illustrate the spatiotemporal variation in the urban heat island and indoor temperature distributions in the Borough's housing during periods of hot spells (Figure 1).
- Maps of population heat vulnerability, highlighting the location of care and nursing homes (Figure 2).
- A prototype tool that uses real time historical, current, and forecast weather data to predict dwelling overheating risk in Hounslow.

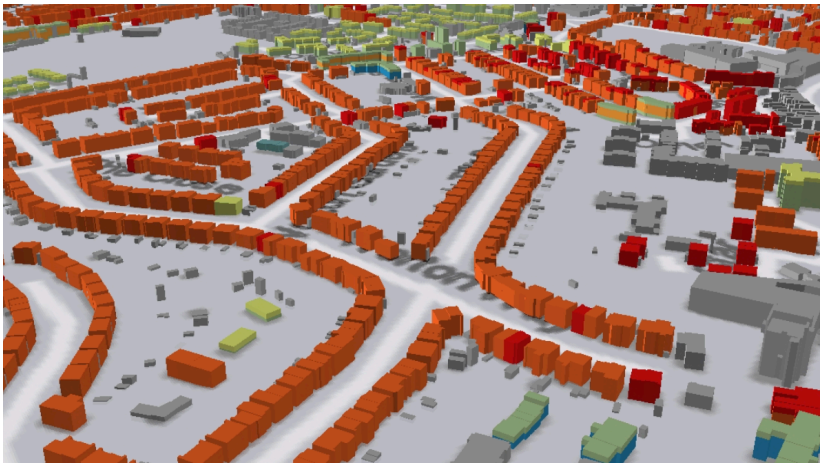

Figure 1. A 3D visualisation of an area of Hounslow, showing the overheating risk of dwellings around Worton Way, Hounslow, at an outdoor temperature of 28°C. Blue dwellings represent the coolest, while red are the hottest.

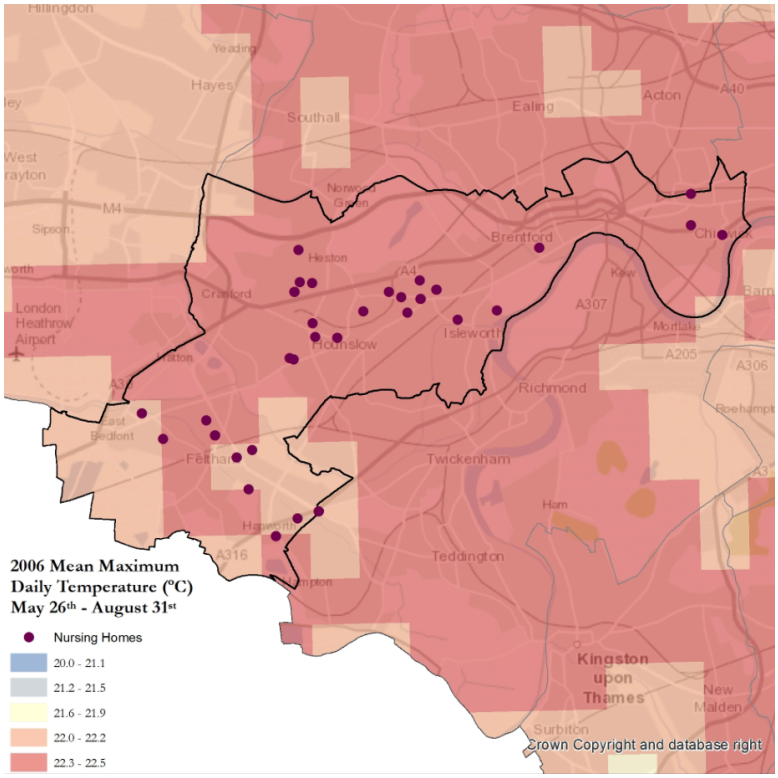

Figure 2. The LUCID modelled urban heat island mean maximum daily temperature for Hounslow Borough. The location of nursing homes is overlaid on top of the urban heat island data.

Achievements

The project was a valuable experience for all parties involved, and created an excellent basis for ongoing collaboration and two way communication between academics, policymakers, regional and local government.

The boundaries between research and policy were explored and the operationalisation of research outputs was accelerated. The academic team gained useful insights into the practical needs of the Borough and the way policies on housing and climate resilience are generated and delivered, which will help shape future research and increase its effectiveness in terms of aiding decision making in the context of creating heat resilient urban neighbourhoods. The Borough also gained access to the interdisciplinary expertise and state-of-the-art local urban climate and indoor environmental quality models of the research team.

A series of unanticipated outcomes that functioned as barriers for the project was the lack of resources within the team that led to delays in the delivery of communications and project outcomes, the fragmentation of datasets, and time pressures and competing priorities, in particular after the Grenfell Tower tragedy towards the end of the project.

A number of important lessons were learnt during the project:

1. It is vital to ensure all key stakeholders are involved from the early stages of the project.
2. Flexibility is needed to be able to work within the time and personnel resource constraints of the Borough.
3. Achieving a good understanding of existing datasets and planning tools held by the Borough should be prioritised.
4. Securing funding for key partners involved in future translational work is of fundamental importance.

The project outputs may be of interest to public health and health protection stakeholders, emergency planners, prevention and care management and emergency preparedness teams, and urban planners.

Conclusion

This project provided a unique opportunity to investigate in practice how modelled estimates of indoor overheating risk can be operationalised and tailored to the needs of emergency heat risk services of a London Borough. Ongoing work at UCL will further develop the overheating model, and potentially make it available to other Local Authorities in the context of similar knowledge exchange activities.