



arcc

Triple jeopardy mapping

The Mayor of London's Policy 5.9 in the London Plan – Overheating and Cooling – examines how to reduce the impact of the Urban Heat Island (UHI) effect in the city. It encourages the design of places and spaces to avoid overheating and excessive heat generation, and to take into account the impacts of climate change and the UHI effect on an area-wide basis. There is little research that estimates the vulnerability of people to heat based on a combination of population and environmental variables in the UK.

Buildings can act as important modifiers of exposure to high temperatures for vulnerable people. The 2005 UK Time Use Survey estimates that those over 65 years of age spend around 82% of their time in their own homes, compared to 70% for the whole population.

University College London developed building physics models describing indoor temperatures for the EPSRC-funded LUCID project (The Development of a Local Urban Climate Model and its Application to the Intelligent Design of Cities, EP/E016375/1). The model has since been used to produce “triple jeopardy” mapping, examining population age, building characteristics and the UHI to help identify people most at risk of mortality due to overheating. <http://bit.ly/2f0hDwl>. Research has focused on London and the West Midlands, and will expand to include other areas of England, and future climate and housing scenarios.

CONSIDER OVERHEATING RISK FOR A BUILDING'S LIFESPAN

Extreme heat events are expected to become more frequent in London as the climate changes, increasing the risk of heat-related mortality where, in the past, cold-related deaths have typically been the largest concern.

The Europe-wide heatwave in 2003 led to approximately 2,000 excess deaths in the UK and 70,000 across the continent. This level of heat is expected to be a typical summer by the 2040s, well within the building lifespan of anything currently under construction.

Heat-related mortality studies in Europe suggest that the most vulnerable individuals are:

- the elderly
- those with pre-existing health problems
- the socially isolated,
- those living in top-floor flats and with a lack of thermal insulation
- those living in care homes.

Other studies of indoor temperatures show a range of indoor overheating risks, supporting the epidemiological findings that housing characteristics and occupant behaviour play a role in the risk of mortality.

DWELLING TYPES AND BUILDING CHARACTERISTICS

A number of empirical studies indicate that UK dwelling types have varying overheating risks, with top-floor flats in multi-dwelling buildings particularly prone to high indoor temperatures.

Building characteristic characteristics that influence overheating risk of buildings include: built form, the level of retrofit of the building fabric, orientation, the availability and performance of ventilation and other building characteristics

Occupant behaviour and climate region can also influence the relative overheating risk within building types.

Current policies encouraging energy-efficient retrofit of existing dwellings and new, more stringent new-build energy efficiency requirements may result in an increased relative overheating risk, if suitable overheating adaptations are not implemented. As a result, the combination of a warmer climate with more frequent heatwaves and a housing stock adapted to conserve energy could lead to a greater risk of overheating.

TRIPLE JEOPARDY MODELLING

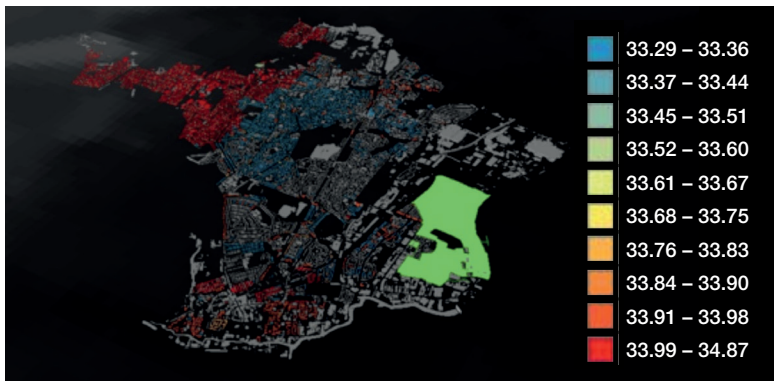
Researchers at UCL examined the spatial distribution of mortality risk from high temperatures in London. They combined monitored weather data, UHI temperatures and indoor temperatures for individual buildings for a specific time period and weather conditions for 2.65 million dwellings in a building stock database (Taylor et al. 2015).

The attributable number of heat-related deaths due to the three factors (age, UHI, and dwellings) was calculated at the ward level, and the results mapped using Geographical Information Systems (GIS).

Researchers at UCL are working with the ARCC network to explore the possibilities of producing a tool to enable local councils and government to evaluate health risks, and identify the dwellings and locations at higher risk of overheating. Partners include Public Health England, London Climate Change Partnership and Greater London Authority.

Modelled indoor air temperatures when external temperature is 30° Light green area is Barking Riverside.

Grey buildings commercial stock or unknown characteristics.



Please contact briony.turner@ukcip.org.uk if you are interested in the outcomes. More detail is available in the academic paper featured in our So what? Now what? guide.

EPSRC

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www.arcc-network.org.uk/triple