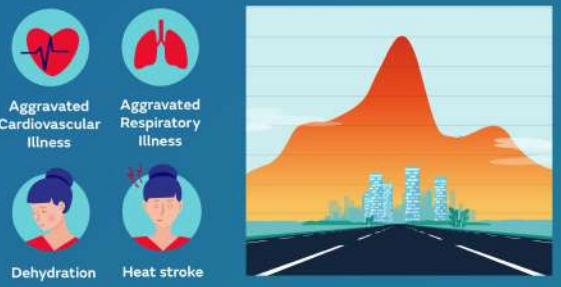
Improved quantification of future changes to UK city temperature extremes

Why is this work important?

Future rises in summer temperature will expose the UK population to greater **heat-stress and heat-related mortality**, particularly in **urban environments** due to the urban heat island effect.



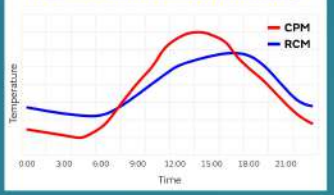
What is new?

New UKCP Local (2.2km) convection-permitting model (CPM) includes improved urban land surface representation allowing improved characterisation of extreme temperatures at the city-scale.

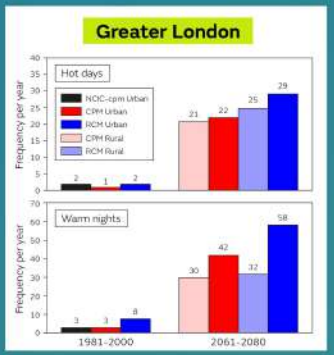
Key differences in the representation of hot days and warm nights over urban areas in the UKCP Local CPM

1. The effect of cities is represented differently compared to the UKCP Regional model (RCM).
2. Improved representation of daily temperature cycles results in a reduced urban heat island compared to the RCM.
3. Weaker urban heat island leads to reduced frequency of warm nights over urban areas compared to the RCM.
4. Larger future increase in frequency of hot days and warm nights over urban areas than rural areas in both models, but less urban influence in the UKCP Local.
5. Absolute future changes in daytime urban temperatures tend to be larger compared to the RCM (e.g. London).
6. However, night-time temperatures following a hot day are lower compared to the RCM, which allows greater capacity for urban inhabitants to recover from heat-stress.

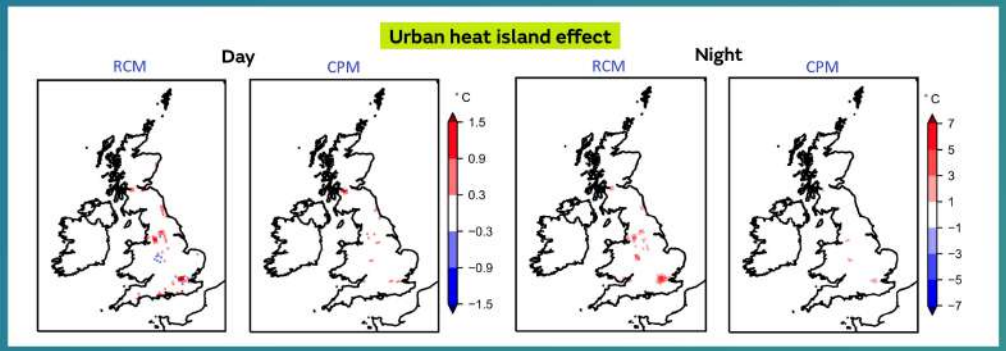
Future changes in urban diurnal cycles on hot days (London)



Greater London



Urban heat island effect



Implications

These results highlight that without considering the new UKCP Local (CPM) projections, future changes in urban hot day temperatures would be underestimated, but so too would the ability of urban inhabitants to recover from heat during the night.

This improved understanding of future changes to UK urban temperature extremes can aid decision-making on **effective adaptation responses in urban planning** to future heatwaves under climate change.

*UKCP18 projections (12km and 2.2km) for 2061-2080 based on RCP 8.5

Keat et al., 2021, Climate Change over UK Cities: The Urban Influence on Extreme Temperatures in the UK Climate Projections, Climate Dynamics