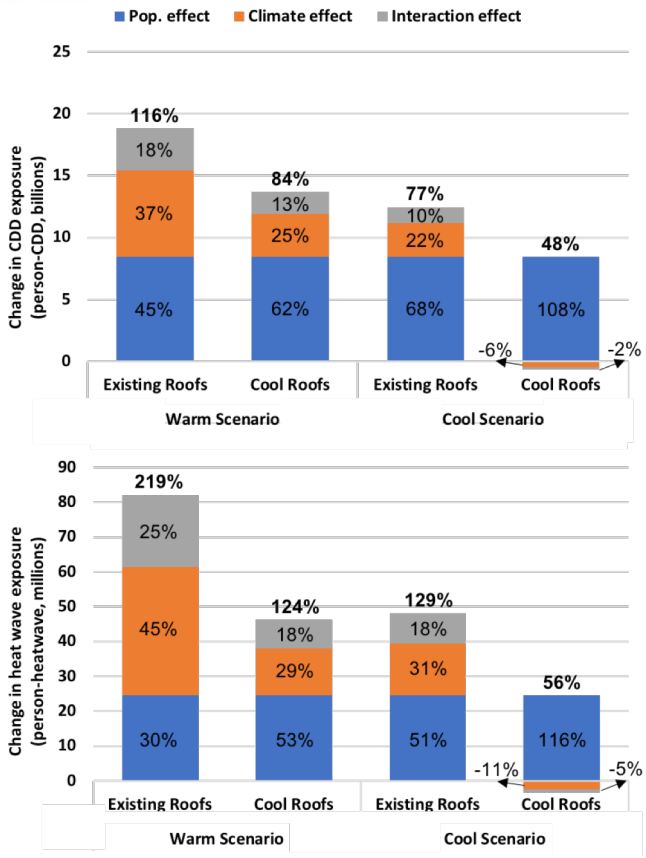
Urban Micro-climate Modeling Predicts Future Exposure to Heat Extremes at Neighborhood Scale



Simulated state-level change in annual urban population exposure to cooling degree-days (CDD) and heat waves due to population growth (blue), climate change (orange), and their interaction effect (gray).

Vahmani, P., A. D., Jones, C. M., Patricola, (2019), Interacting implications of climate change, population dynamics, and urban heat mitigation for future exposure to heat extremes, Environ. Res. Lett. https://doi.org/10.1088/1748-9326/ab28b0

Scientific Achievement

High-resolution regional climate simulations coupled with a satellite-driven urban canopy model are used to investigate the interacting effects of climate change, population growth, and urban heat mitigation measures on exposure to extreme heat events and associated energy demands.

Significance and Impact

This study sheds light on the relative importance of climate change and population dynamics in driving the evolution of extreme heat risks and associated energy demands by the mid-century in the cities across California, as well as the potential for heat mitigation measures to push them back.

Research Details

- Used 1.5 km spatial resolution to account for urban micro-climates
- Used dynamical downscaling of GCMs to account for the response of regional climate dynamics to large scale climate change
- Used an urban canopy model (UCM) to account for urban processes such as urban heat islands and cool roofs.
- Used a spatially explicit population density and projections to account for population distribution within cites
- Included a variety of metrices including extreme heat days, heatwave characteristics, and cooling degree days (CDD)

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