IGS Policy Brief

Cooling through Roofs and Trees: A New Framework to Help Cities Target Extreme Heat Interventions

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A new framework helps decision makers identify neighborhoods where cool roofs and trees are likely to have the greatest benefit on the health of vulnerable populations through reductions in ambient temperature.

The model uses spatial dimensions, cost, and vulnerability to quantify how tree canopy and cool roof solutions can maximize heat exposure reduction. The analysis could be extended to estimate number of deaths or emergency department visits averted.

KEY TAKEAWAYS applying the model to Boston

- **Tree canopy expansion and cool roofs are both effective strategies** for reducing air temperatures in Boston.
- Accounting for Boston's current landscape, the city could support **20,000 additional cool roofs** and about **230,000 additional trees.**
- **80,000 Boston residents could have access to cooling benefits** within a budget constraint of $34M. This includes 2,976 buildings converted to cool roofs at a cost of $28.9M and 247,671 square meters of land converted to tree canopy (2,477 trees) at a cost of $5.0M.
- **In East Boston,** the neighborhood with the highest vulnerability to extreme heat, 0.1 square kilometers of roof area could be converted to cool roofs at an estimated cost of $6.8M and 0.01 square kilometers of land could be converted to tree canopy at an estimated cost of $0.3M.
- **Space availability is critical in choosing interventions** for implementation in densely populated areas. Tree canopy expansion in Boston reduces temperatures by 35% more than cool roofs. But there is nearly twice as much area for cool roofs than tree canopy expansion.
- **To protect public health on hot days,** the most effective cooling interventions should target areas of high population density, high heat conditions, and high vulnerability to the adverse health impacts of heat.

RESEARCH METHODS OVERVIEW

These findings are based on a statistical model to downscale coarse resolution estimates of air temperature and estimate marginal impacts of tree canopy and cool roof solutions across southern New England during 2021-2022. The model overcomes computational limitations associated with numerical modeling simulations and is applied to municipal cost estimations.

Read the journal article
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