

Spatial planning of urban vegetation: A sensitivity analysis of prioritization indicators in Phoenix, Arizona

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Abstract

Cities worldwide have ambitious plans to invest in vegetation to mitigate heat and flood hazards and provide other benefits to surrounding communities. Numerous indicators and tools have been proposed to guide the strategic spatial planning of these vegetation investments, but how might the choice of indicator influence spatial patterns in urban greening? This study addresses these questions through a case study of Phoenix, Arizona, one of the hottest large cities in the United States. We compile and compare 17 potential indicators of four categories (heat hazard, flood hazard, social vulnerability and vegetation) for the spatial prioritization of census tracts in Phoenix for urban vegetation for heat or flood mitigation, including satellite-derived land surface temperatures and impervious surfaces, flood hazard areas from FEMA and Fathom, social vulnerability indices, and WRF-Urban model simulated thermal comfort index. We examine the sensitivity of spatial priorities to indicator selection using a variety of statistical tests as well as tradeoffs among indicators for vegetation planning. We find that spatial priorities differ significantly depending on the indicators used, suggesting that cities should carefully select prioritization data and tools according to specific needs. We also find some areas that are consistently high priority across the various indicators. In Phoenix, areas with high heat, high social vulnerability, and low vegetation stand out as strong targets for urban greening. The study demonstrates that indicator selection is a critical step in any strategic urban resilience planning process, and indicators should be aligned with goals to maximize the benefits of vegetation investments.

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