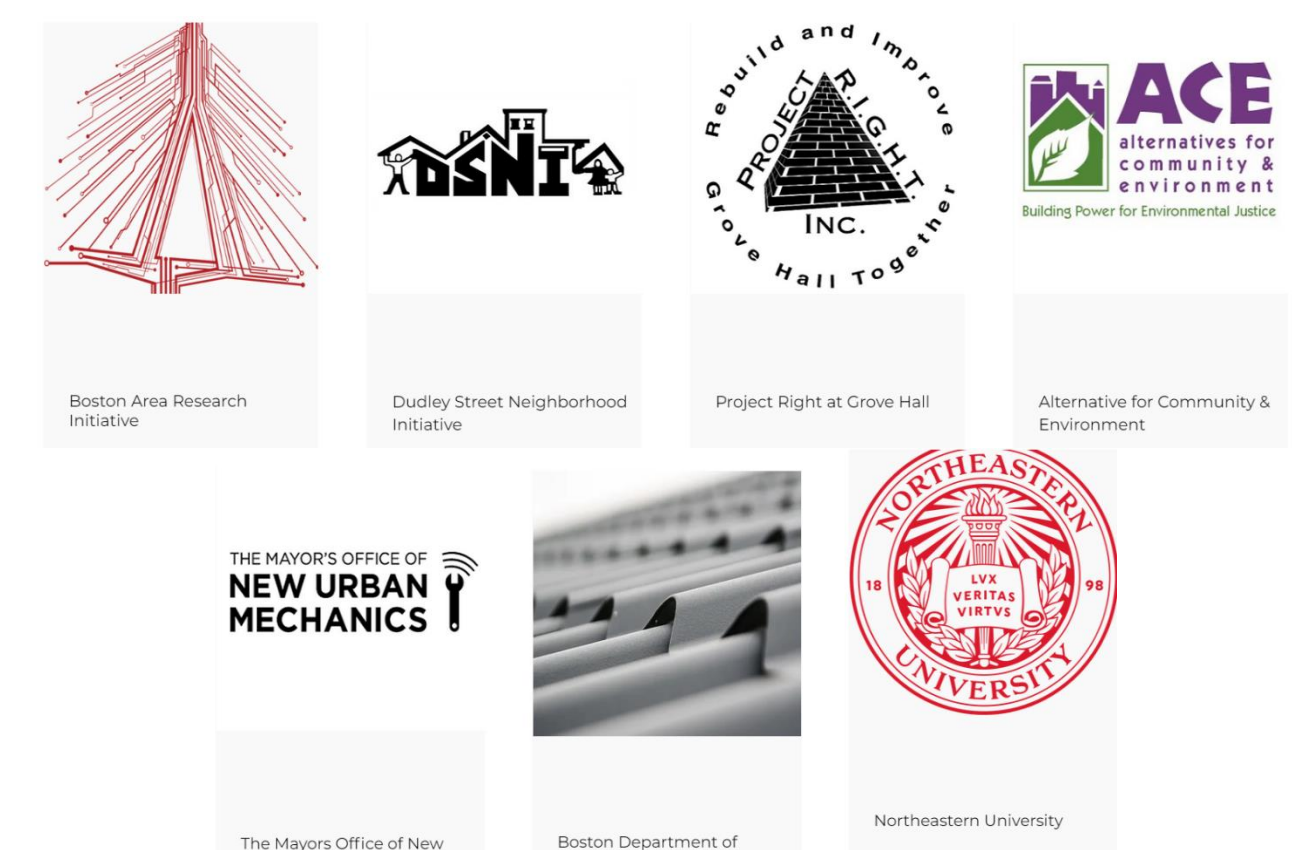


Common SENSES (Standards for ENacting Sensor networks for an Equitable Society)

PIs: Daniel O'Brien^{1,2}, Michelle Laboy¹, Amy Mueller¹, Nayeli Rodriguez³, Moira Zellner^{1,2}
¹-Northeastern University, ²-Boston Area Research Initiative, ³-City of Boston

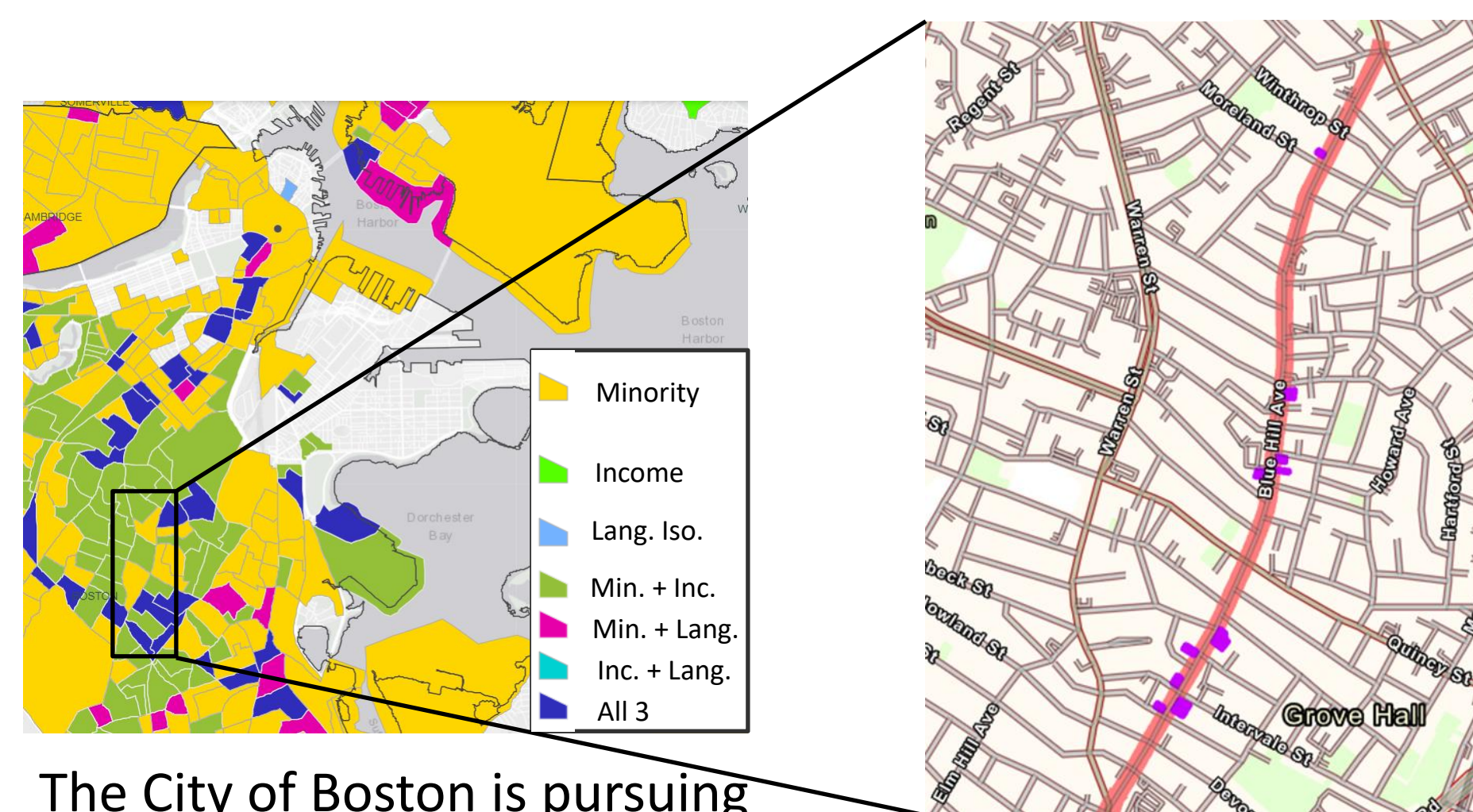
Partnering Orgs.

Supported by the National Science Foundation's Smart & Connected Communities Program (IRG-1, 2022; Award #2230036)



Science-Driven, Community-Led Planning that Advances Environmental Justice on Blue Hill Ave.

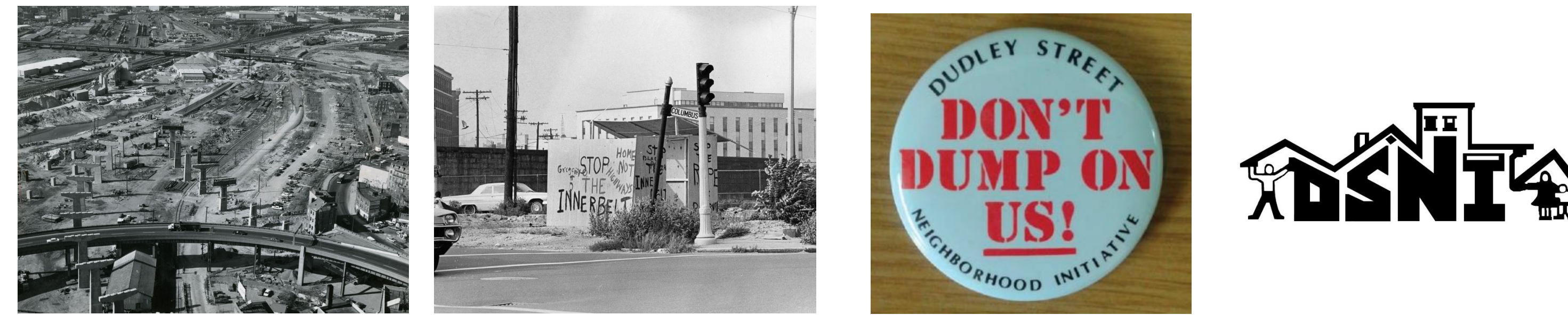
BLUE HILL AVENUE ACTION PLAN



The City of Boston is pursuing a "Housing Action Plan" along Blue Hill Ave.—the historic heart of Black Boston and home to many immigrant populations, especially Haitians and Cape Verdeans.

The City will develop vacant parcels (in purple) into multiuse buildings, with a focus on housing.

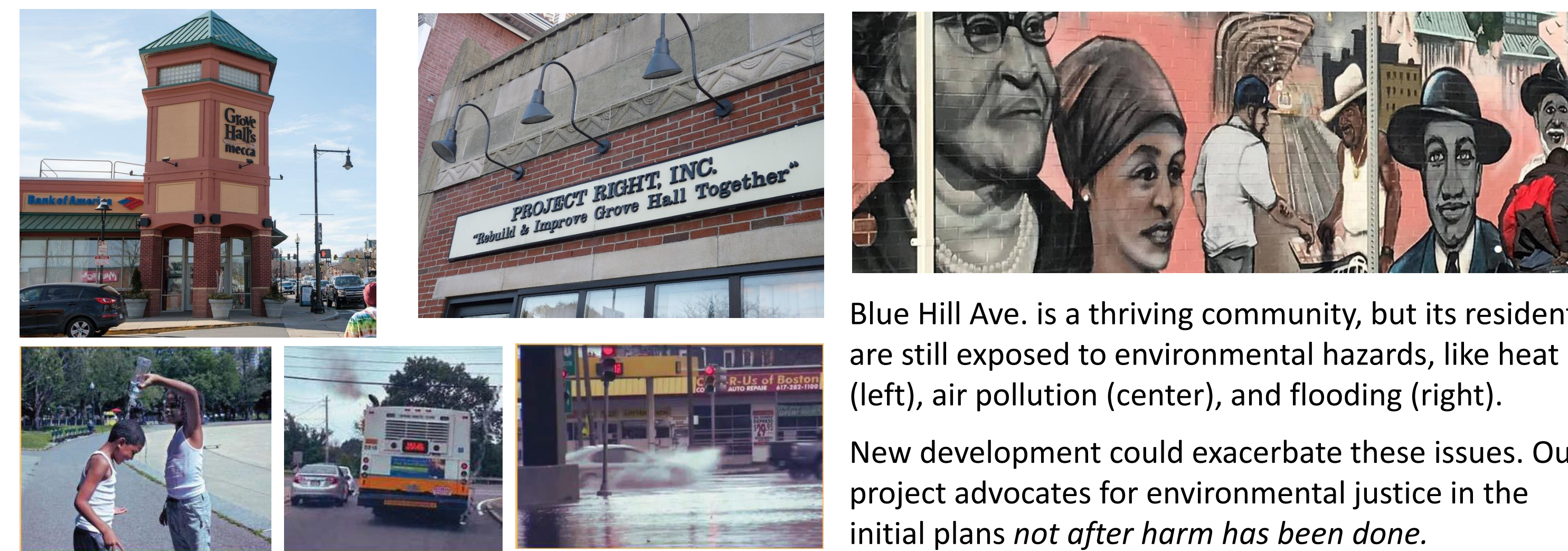
"WE'VE BEEN HERE BEFORE..."



In 1969 the City razed 1,200 homes to build a highway. The project was canceled after opposition, but many parcels remain vacant—including some in the Housing Action Plan!

In 1986, the Dudley Street Neighborhood Initiative (one of our partners) led a campaign to end the dumping of toxic waste on vacant parcels in the neighborhood.

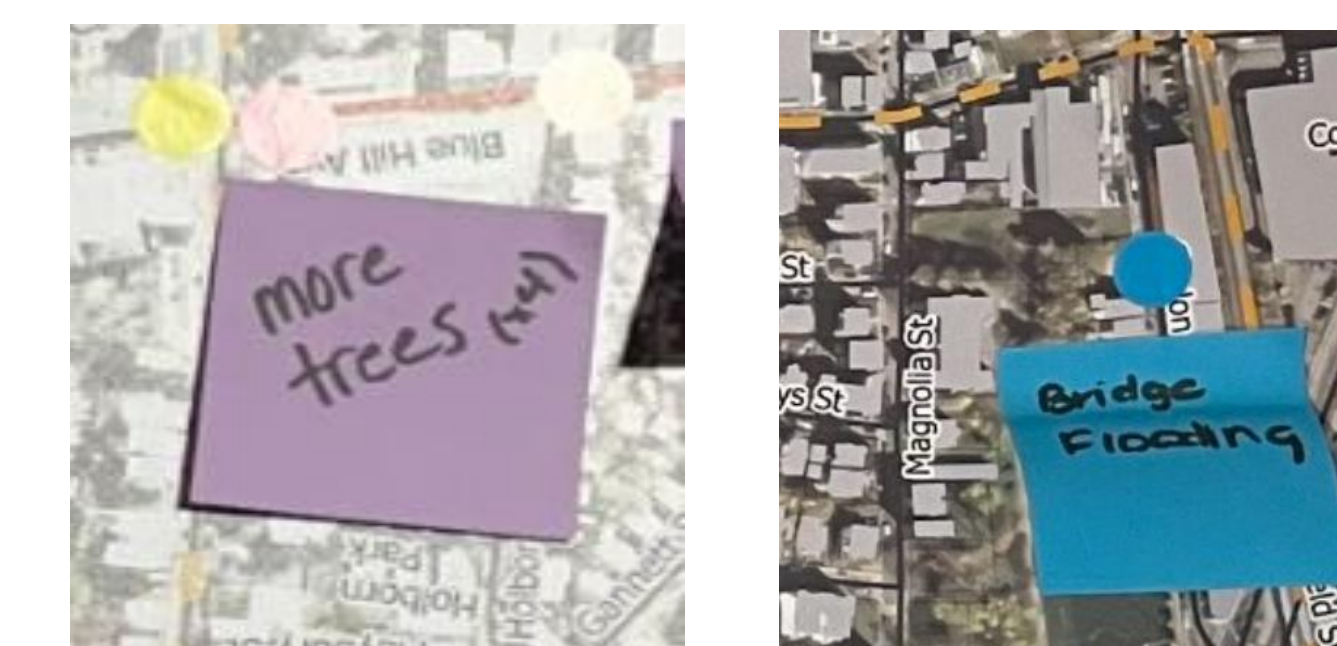
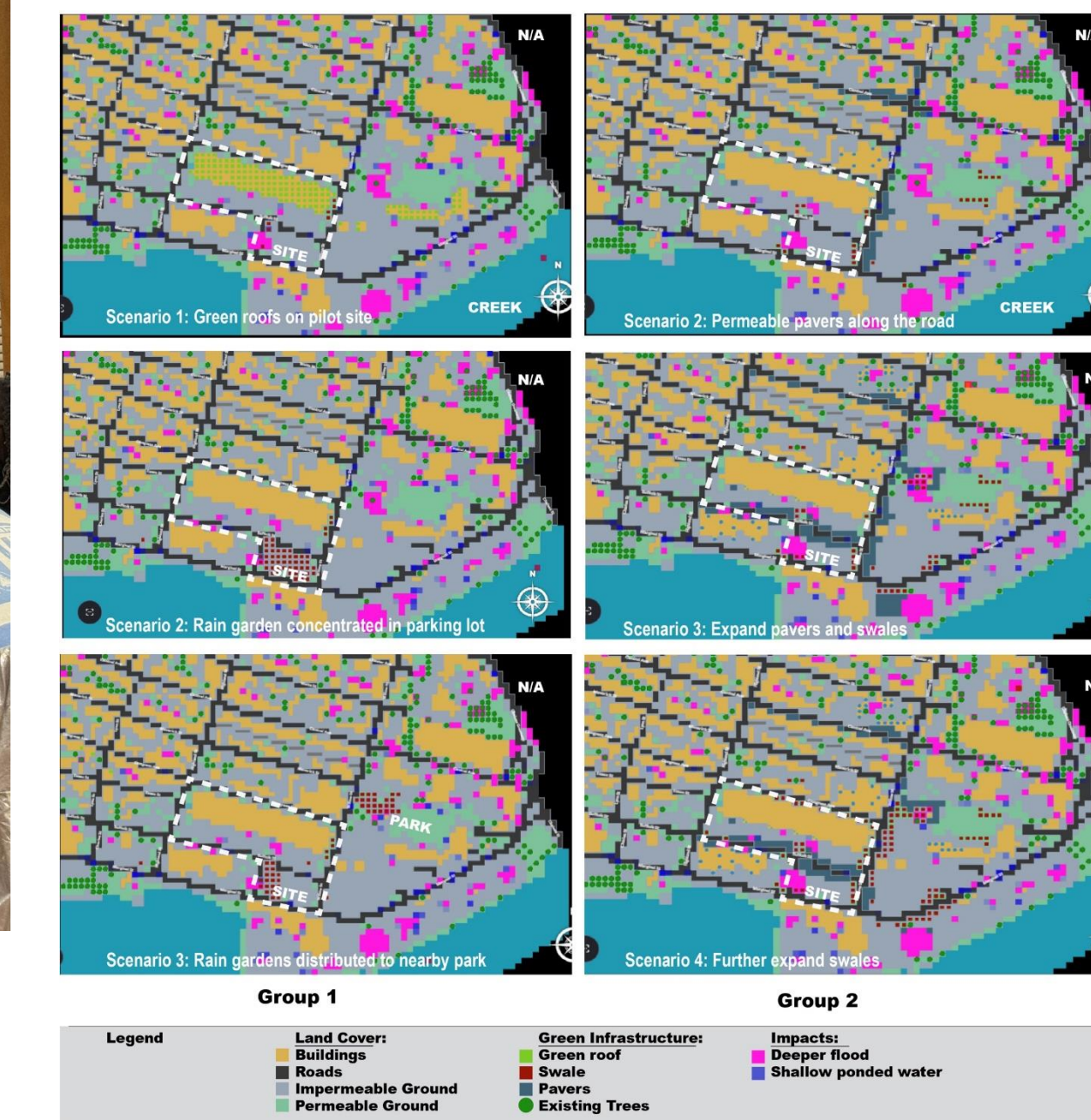
"LET'S DO IT BETTER THIS TIME!"



Blue Hill Ave. is a thriving community, but its residents are still exposed to environmental hazards, like heat (left), air pollution (center), and flooding (right).

New development could exacerbate these issues. Our project advocates for environmental justice in the initial plans *not after harm has been done*.

Progress in Year 1 Community Partnership & Participatory Modeling



Participatory mapping to identify hazards

Modeling of context, cross-model validation, and workshop with city planners to test the facilitation process with *fora.ai* before engaging the community.

Publication: Laboy, M.; Zellner, M.; Mueller, A.; O'Brien, D.; Massey, D. "Decentralizing infrastructure: expanding architectural practice towards equity and health." Proceedings of 112th ACSA Annual Meeting. (Accepted, forthcoming).

Use-

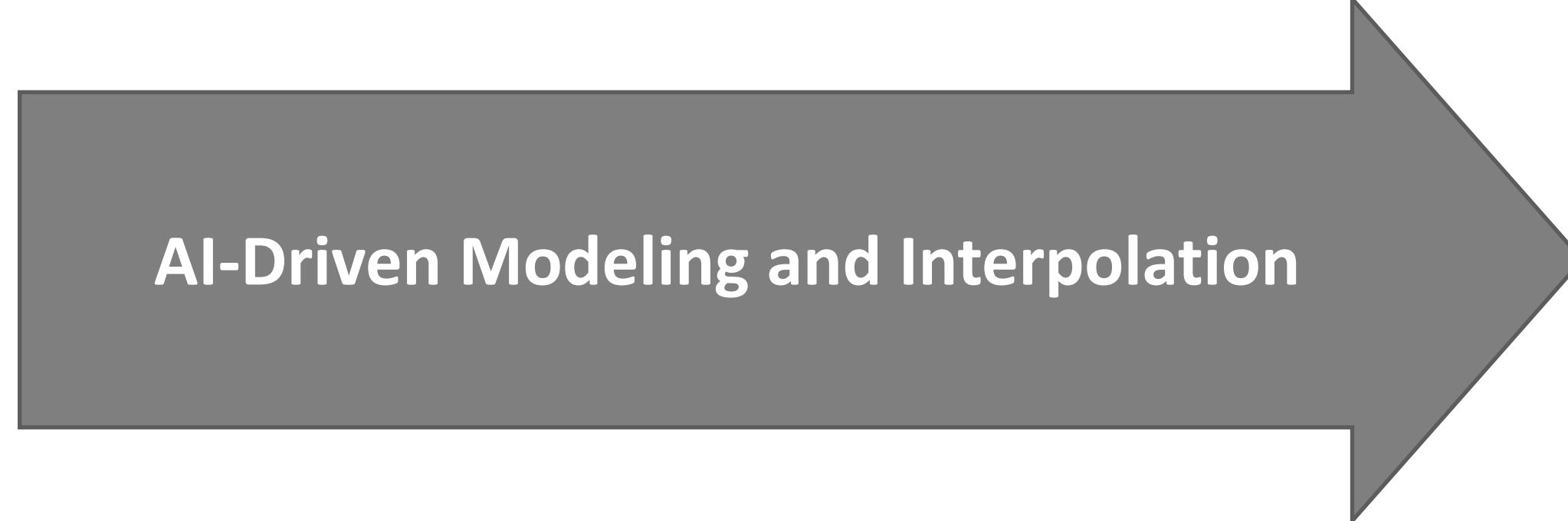
Inspired

A Replicable Model for Communities Worldwide

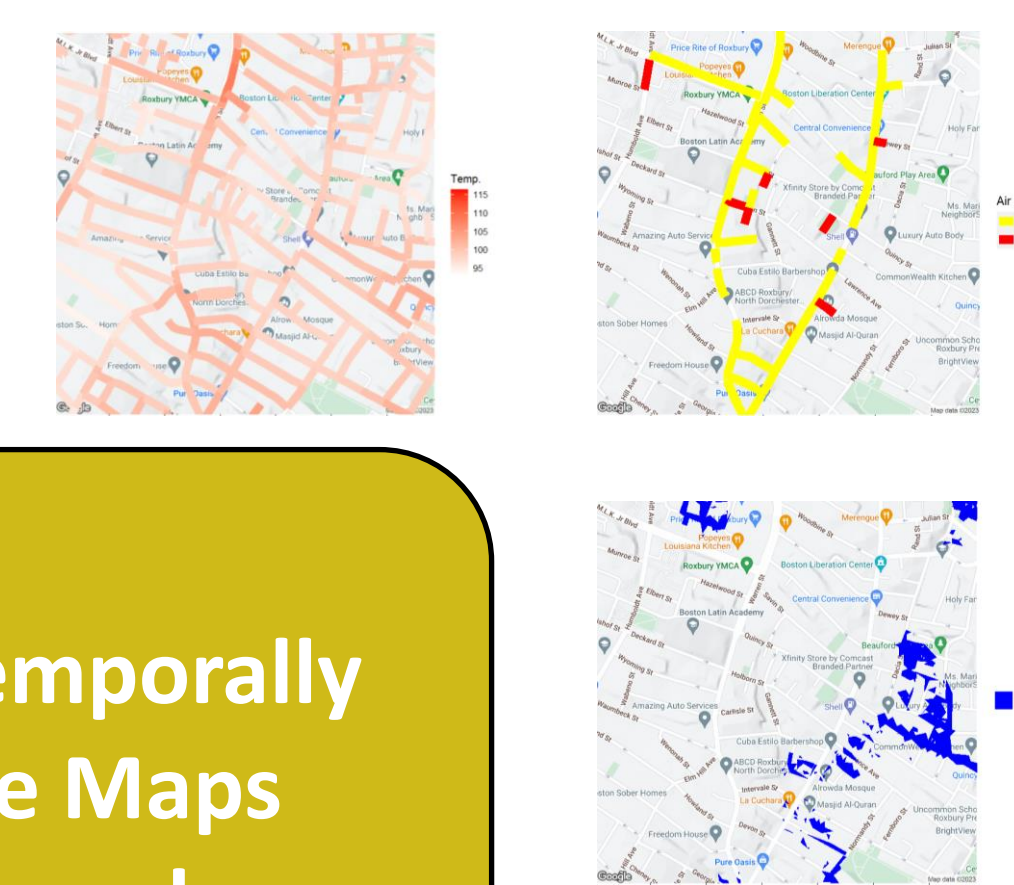


- Possible Elements
 - Heat
 - Humidity
 - Air pollution
 - Flooding
 - Noise
 - Lighting
- Priority Locations

Community Co-Designed Environmental Sensor Network



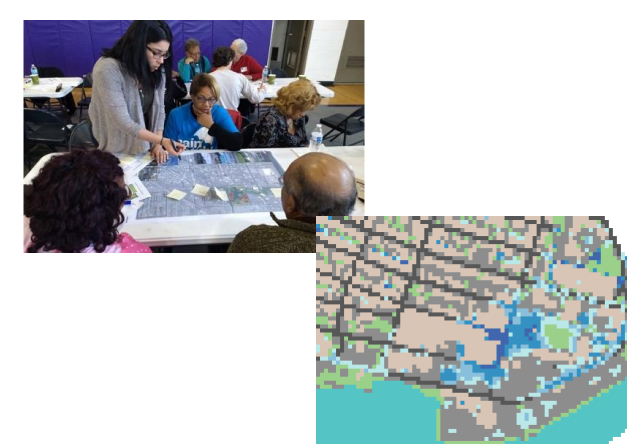
Spatiotemporally Precise Maps of Hazards



Physics-Informed Machine Learning

- Naïve interpolation
- Nearest-neighbor along street
- Incorporation of landscape features (e.g., building height)
- Support vector regression

- L-GRiD:** Parsimonious hazard models to enhance stakeholder access
- fora.ai:** Interactive platform for co-design, testing and deliberation of GI scenarios.



Framework for Microspatial Inequities

- Infrastructural Drivers
- Within-neighborhood disparities
- Localized consequences

Strategies for Mitigation and Adaptation

Participatory Modeling Tools and Workshops

Continued Evaluation of Environment and Interventions

Green Infrastructure (GI) for Hazard Mitigation



- Pocket parks
- Rain swales
- Green roofs
- Infrastructure adjustments (e.g., traffic redirection)

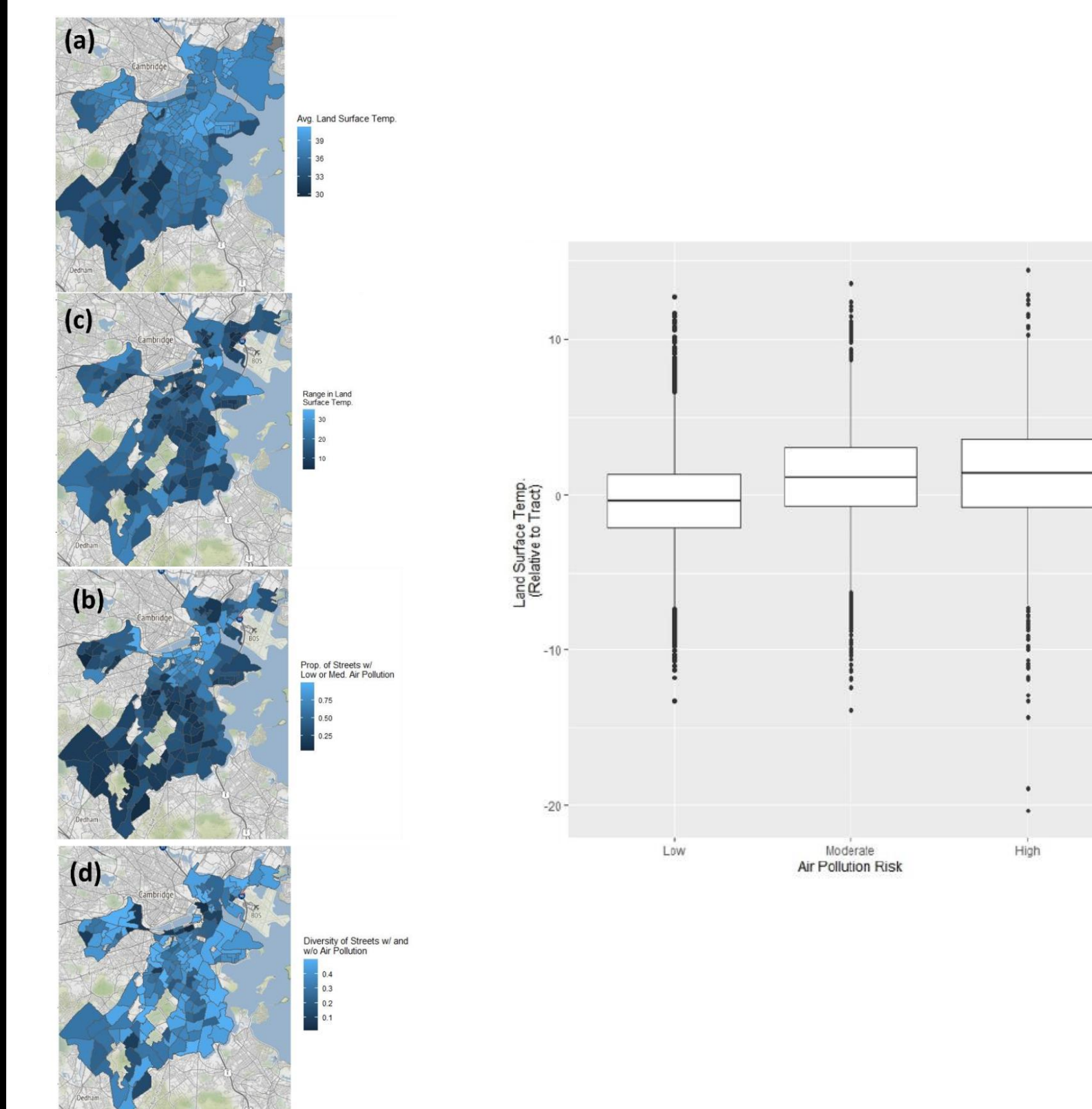
Research

Microspatial Inequities

Citywide analysis revealed:

- Extensive variation in heat and air pollution between *and* within communities (left).
- Low correlation between heat and air pollution across a neighborhood's streets (right).
- O'Brien, D.T. & Mueller, A.M. (2023). *Sustainability*.

Forthcoming book *The Pointillistic City* on theory and implications of microspatial inequities (O'Brien, 2024; MIT Press)



Green Infrastructure

Characterizing GI in the corridor to learn:

- What GI people care about?
- What data exists?
- What technical knowledge exists?
- What solutions are relevant?

Conducting literature review on metrics for relevant GI solutions, engaging in field surveys to catalog relevant built environment attributes and existing quantity and quality of GI, with the goal of adapting tools to stakeholder priorities and understanding the impacts of decentralizing GI around development parcels..

