Achieving Equity in Stormwater Management: Green Infrastructure Spatial Planning in US Cities

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HIGHLIGHTS

We screened over 260 planning documents from 20 cities, identifying a diverse set of plans (n = 120) referring to "green infrastructure" (GI). Within these plans we coded the rationale, criteria, and data utilized for siting and prioritizing GI.

Hypothesis: while cities have established goals and a strong intent for GI siting that includes social, economic, ecological, and community benefits, many cities lack explicit and clear steps to achieving these goals, and will have limited use of transparent metrics, data, and methods for siting GI facilities.[1,2,3,4]

Preliminary Results:

- Despite a diverse set of stated rationales and criteria, stormwater related services and functions are the primary drivers of locating GI.
- Limited data or methods are referenced within siting processes
- A majority of cities do not acknowledge or recognize potential disservices

BACKGROUND

Faced with the threat of climate change and other environmental challenges, cities are increasingly focused on planning for sustainability. GI, or urban ecosystems and engineered elements (e.g. rain gardens, bioswales, green roofs, etc.) is one increasingly popular strategy that cities use to achieve multiple sustainability benefits, or ecosystem services.[5,6,7]

Building off of work that examines the diversity of ways that cities define GI, our research project seeks to better understand if the stated rationales for using GI align with procedures for prioritizing and siting GI. Through this work, we hope to uncover what functions and benefits GI is supposed to provide to communities, how decisions are made about which designs to use and where to locate them within the city, and the equity of the process and outcomes of GI siting.

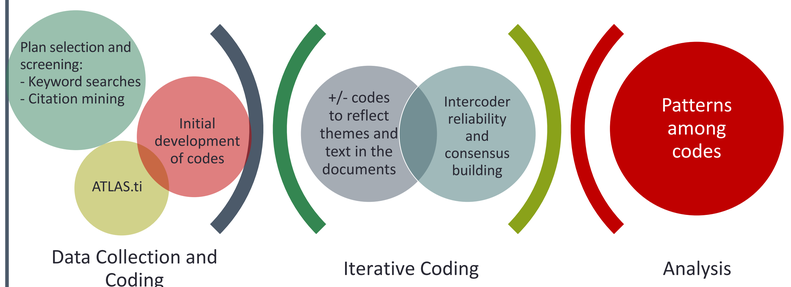
Figure 1. Map of study sites and their resident biomes

Figure 2. Examples of green infrastructure

METHODS

PROCESS

- 20 cities across the continental US & Puerto Rico
- 120 city GI planning documents, from 260 screened plans
- Codes focused on the criteria and rationale cities used to site green infrastructure, mirroring the benefits and functions that cities seek to provide through GI to surrounding communities
- Iterative coding allows for consolidation of emergent themes [8]
- Intercoder reliability refers to the overlap/level of agreement on the coding done for this project between 2 or more coders



CODEBOOK (siting criteria)

Code	Comment
a. SITING CRITERIA	text explaining specific criteria, data, or metrics used in the siting, data selection, or evaluation of placing GI
a. SITING CRITERIA: aesthetic	text explaining how aesthetics or beautification concerns are used to site GI
a. SITING CRITERIA: air quality	text explaining how air quality is used to site GI
a. SITING CRITERIA: cost	text explaining how cost concerns are used to site GI
a. SITING CRITERIA: cso	text explaining how combined sewer system locations or issues are used to site GI
a. SITING CRITERIA: exclude	text stating what areas should be excluded from GI siting
a. SITING CRITERIA: feasibility	text explaining how feasibility, or ease of implementation is used to site GI
a. SITING CRITERIA: flooding	text explaining how flooding is used to site GI
a. SITING CRITERIA: green space	text explaining how needs for more green space are used to site GI
a. SITING CRITERIA: habitat	text explaining how wildlife habitat is used to site GI
a. SITING CRITERIA: heat	text explaining how heat issues are used to site GI
a. SITING CRITERIA: other	Text explaining a factor used to site GI not included in the list Add a note stating what the "other" is
a. SITING CRITERIA: recreation	text explaining how recreation aims are used to site GI
a. SITING CRITERIA: redevelopment	text explaining how redevelopment aims are used to site GI (e.g. goal is to redevelop brownfield or blighted sites)
a. SITING CRITERIA: water quality	text explaining how water quality concerns are used to site GI
a. SITING CRITERIA: stormwater management	Text explaining how stormwater management indicators or needs are used to site GI
a. SITING CRITERIA: soil erosion	Text explaining how soil erosion, or soil management indicators or needs are used to site GI
a. SITING CRITERIA: infiltration	Text explaining how infiltration (into soil, or other mediums) indicators or needs are used to site GI
a. SITING CRITERIA runoff:	Text explaining how runoff management (reduction, redirection) indicators or needs are used to site GI
a. SITING CRITERIA Economic Development	Text explaining criteria detailing ways city will measure jobs/unemployment, increases in property value or business investments, or other non-cost related benefits.
a. SITING CRITERIA Environmental Justice	Text explaining how cities measure if GI is contributing to environmental equity, sociodemographic data commonly associated with EJ communities or other data.
a. SITING CRITERIA Multifunctionality	Text explaining how GI is generally being measured to evaluate siting based on ecosystem services, co-benefits, or sustainability metrics.

PRELIMINARY RESULTS

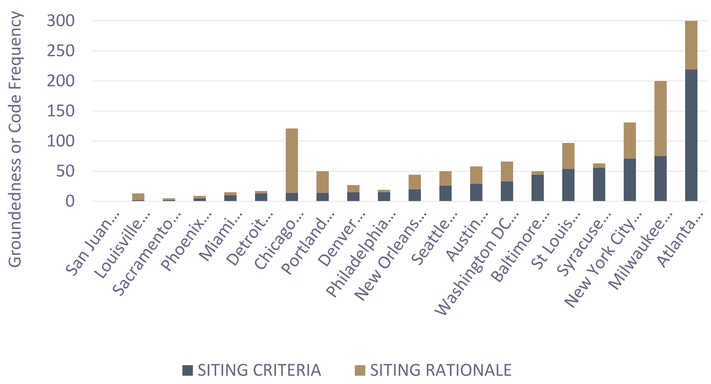


Figure 3. Number of quotes providing rationale vs. siting criteria across all 20 cities

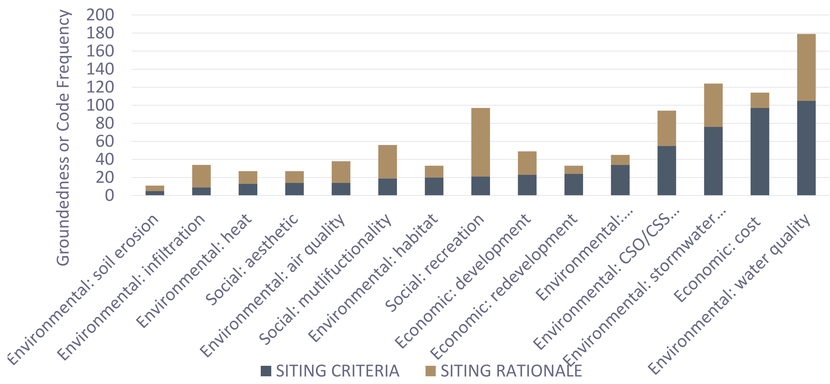


Figure 4. Distribution of rationale vs siting criterion for different themes

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