Finding Green Infrastructure Solutions Under a Changing Climate

A PhD Dissertation in Architecture by Nastaran Tebyanian

Climate change and urbanization has led to unprecedented urban flooding. The urban drainage systems response to these changes are uncertain.

Cites worldwide increasingly use green infrastructure to address their stormwater challenges.

Overland flooding in Pittsburgh
Source: https://www.pgh2o.com/your-water/stormwater/flood-preparedness

Green infrastructure
Source: https://www.epa.gov/system/files/documents/2021-11/bmp-bioretention-rain-gardens.pdf

Where should we invest in new green infrastructure and how large should it be?

We evaluate multiple sources of climate and cost uncertainty

- Scenarios of rainfall
- Installation cost
- Operation and maintenance cost
- Lifetime of GI
- GI efficacy and benefits (what percent of

We consider multiple objectives for GI planning

- Minimizing runoff volume
- Minimizing cost
- Maximizing co-benefits
- Maximizing implementation in areas that the community prefers

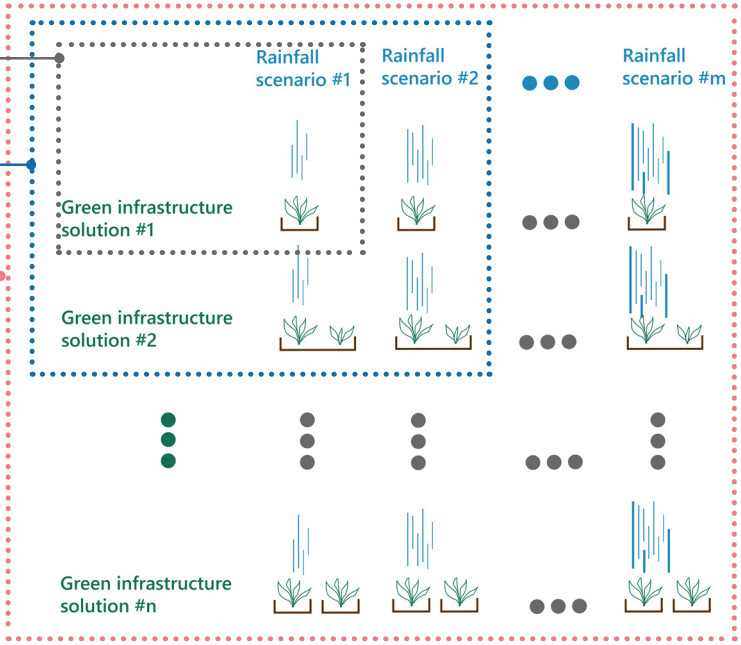
Our approach for finding robust GI solutions

Current planning practices: usually design one solution for the world we know from the past

Existing research studies: usually compare very few design alternatives in prespecified scenarios

Many Objective Robust Decision Making (MORDM): searches and samples planning alternatives and scenarios

This dissertation uses MORDM to evaluate multiple objectives of GI and stress-test the performance of GI solutions in all objectives over multiple scenarios of future to find robust GI solutions.



For more resources visit: https://psirc.psu.edu/resources.html

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