

## Reducing Flooding: Green Stormwater Infrastructure



### Green City

#### Climate Issue: Urban Flooding

Cities worldwide are facing impacts from flooding as extreme weather events increase in frequency and intensity due to climate change.

- Urbanization results in more hard surfaces, which do not absorb water when it rains
- This leads to more water runoff, which is further intensified in heavy rainfall events
- Many cities have aging stormwater infrastructure that cannot handle increased water
- Flooding events lead to water pollution, disrupted natural ecosystems, infrastructure damage and health risks.

Cities require effective urban flooding solutions to protect their citizens and the environment.

#### Green Stormwater Infrastructure: A Useful Solution

Science shows that green stormwater infrastructure(GSI) helps reduce flood impacts. GSI is specifically designed to reduce stormwater during floods, using vegetation, soil and landscape features. Examples of GSI include:

- Green roofs
- Permeable pavements (e.g. gravel, plastic grids)
- Rain gardens
- Bio-infiltration basins (e.g. bioswales).

Due to its vast benefits, many cities now **require or encourage the use of GSI**

#### How does green stormwater infrastructure work?

- GSI limits the amount of stormwater directly flowing into stormwater drains
- It does this by catching, absorbing and slowing water flow that would normally overwhelm the drainage system
- Vegetation is used to filter out excess nutrients and pollutants, such as phosphorous and nitrogen
- This filtering process helps prevent pollution of nearby water sources and protect natural ecosystem cycles.



**In Baltimore**, 12 bio-infiltration basins were installed in a subwatershed. After 4 years, a study found a **50% reduction** in nitrogen and phosphorous in the basin's stormwater samples

#### IN A NUTSHELL

- Climate change, urbanization and aging infrastructure all contribute to urban flooding
- To combat urban flooding, cities can install green stormwater infrastructure (GSI)
- GSI reduces pressure on existing stormwater drainage systems, and filters out excess nutrients and pollution
- GSI helps protect citizens, infrastructure and the environment.

#### WHAT CAN YOUR CITY DO?

**IDENTIFY** areas at risk for future flooding and prioritize them for new GSI projects

**CREATE** regulatory requirements for GSI in new developments and construction via updated building codes

**ESTABLISH** design standards, created in consultation with community

**DEVELOP** and fund partnerships with local organizations dedicated to protecting local ecosystems

To find out more information on GSI, contact **Dr. Morgan Grove** at [morgan.grove@yale.edu](mailto:morgan.grove@yale.edu). Fact sheet based on Solins, J. P., et al.(2023). Regulatory requirements and voluntary interventions create contrasting distributions of green stormwater infrastructure in Baltimore, Maryland. Landscape and Urban Planning, 229, 104607. <https://doi.org/10.1016/j.landurbplan.2022.104607>