Integrating Green Infrastructure and Hazard Mitigation Planning

October 17, 2018

Green Infrastructure & Low Impact Development

GI = Management that protects, restores, or mimics the natural water cycle

LID = Practices that minimize disturbance of natural vegetation and drainage, mimic pre-development patterns

Regional/Municipal **Neighborhood/Community** **On-Site**

CSO Control, Brooklyn, NY

Bioretention, P.S. 261, Brooklyn, NY

Green Roof, Brooklyn Navy Yard

Image Source: EPA Case Studies Analyzing the Economic Benefits of Low Impact Development and Green Infrastructure Programs, EPA 2013

GI Practices

- Bioretention
  - Rain Gardens
  - Bioswales
- Green roofs
- Permeable Pavement
- Downspout Disconnection/Rainwater Harvesting
- Urban trees & land conservation


Plant on the Roof? Why?

Hazard Mitigation Plans: Overview

- FEMA directs that each state have a Hazard Mitigation Plan (HMP) to be eligible for FEMA funding
- The state's Hazard Mitigation Office (SHMO) is the HMP custodian
- Each jurisdiction in the state also has an HMP
- Projects must be consistent with the HMP to get funding
- These plans address all hazards, including natural hazards

Opportunities and Needs

EPA and FEMA: MOU in place since 2010 for promoting collaboration on mitigation planning including smart growth, sustainable communities, and green infrastructure.

States and Communities: Need more approaches to address non-point-source pollution, erosion, loss of habitat in order to comply with WQ standards and build desirable places to live. The approaches need to be “default”, have multiple benefits, and be worth the cost to the community. Recognition of the hazard mitigation potential in addition to resource protection can help.

Flood risk professionals (ASFPM, ASCE, etc.) have called for more solutions that are natural and nature-based to reduce risk while protecting the environment.

Opportunities and Needs

FEMA:

2015 “State Mitigation Plan Review Guide” encourages comprehensive planning, promoting resilience, making connections with economy, natural resources, and considering future conditions.

2013 Policy allows for the first time inclusion of Environmental Benefits in the BCA for acquisition projects, under certain conditions.

Increasing CRS credits for LID/GI and watershed/stormwater

2016 “Climate Resilient Mitigation Activities for HMA” promotes restoration of streams and floodplains, and green infrastructure and more.

EPA and FEMA Objectives

United States Environmental Protection Agency

- Water quality
- Ecosystem health
- Endangered species protection
- Nonpoint source pollution
- TMDLs CSO control and MS4 permit

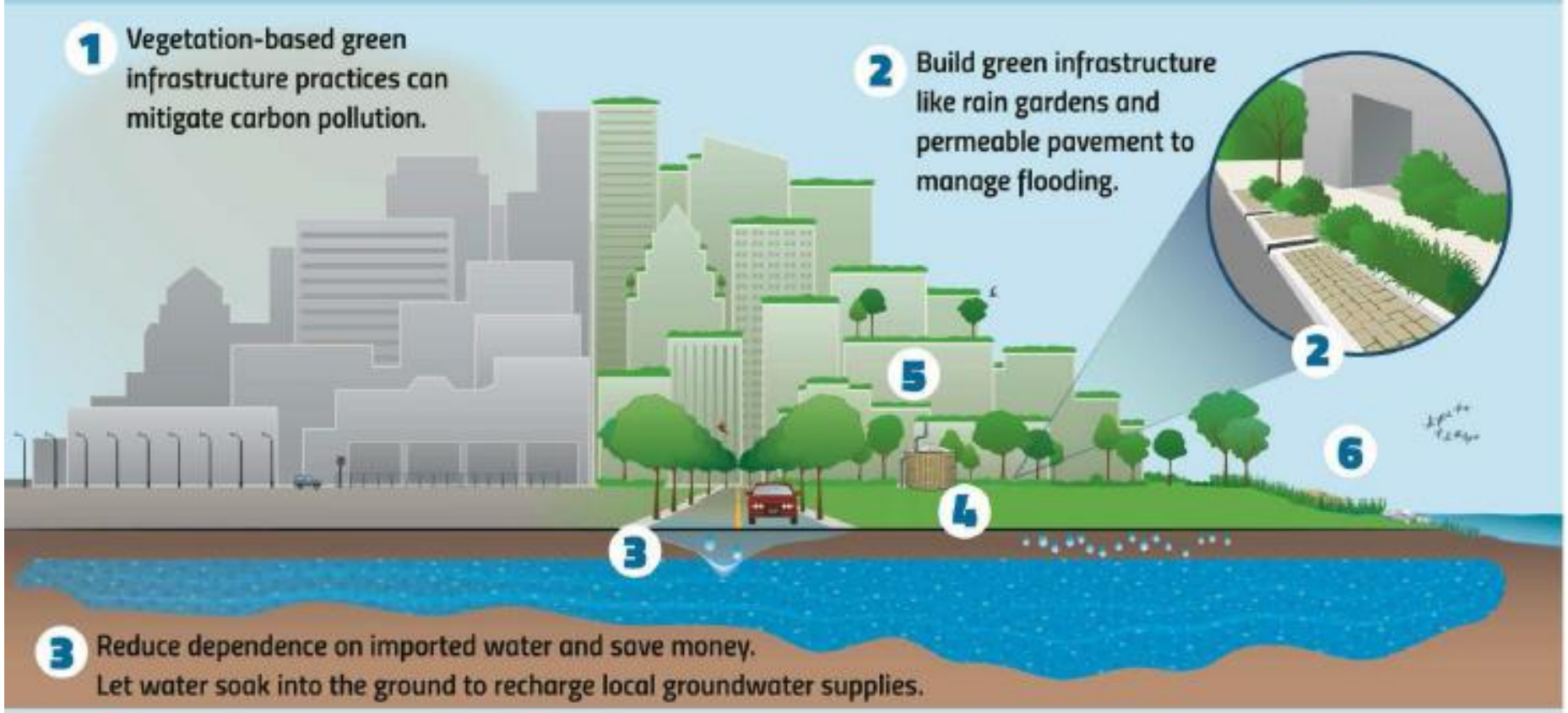
Green Infrastructure and Low Impact Development

FEMA

- Pre-disaster risk reduction
- Reduce hazard exposure to people and property
- New projects designed to increase ecosystem service benefits

Image Source: USGS – UO Community Service Center

Green Infrastructure Builds Resiliency



4 Keep water local. Capture runoff in cisterns and rain barrels to reduce municipal water use.

5 Plant trees and green roofs to mitigate the urban heat island effect.

6 Use living shorelines, buffers, dunes and marsh restoration to reduce the impact of storm surges.

EPA
United States Environmental Protection Agency

For more information on green infrastructure, see:
www.epa.gov/greeninfrastructure

Economic Co-benefits

Hazard Mitigation Saves!

"[S]ociety saves $6 for every $1 spent through mitigation grants funded through select federal agencies . . ."

The National Institute of Building Sciences, Multihazard Mitigation Council

Source: Natural Hazard Mitigation Saves - 2017 Interim Report

EPA Cost-Benefit GI/LID Case Studies

- Utilizing economic analysis of GI/LID can address public concerns and gain stakeholder support
- GI/LID can cost less than grey infrastructure alone
- GI/LID approaches result in multiple benefits
- LID/GI approaches can be successfully integrated into Capital Improvement Programs

Rory M. Shaw Wetlands Park, Sun Valley Watershed

Source: EPA Case Studies Analyzing the Economic Benefits of Low Impact Development and Green Infrastructure Programs, EPA 2013

How This May Benefit States & Communities

- FEMA funds might be more likely to be available for GI/LID if FEMA criteria are met.
- Integrated planning may identify multiple benefits and improve overall planning outcomes
  - watershed planning for water quality (i.e. EPA's 319/TMDLs/Stormwater Permits)
  - comprehensive planning and
  - hazard mitigation planning
- The element of "hazard mitigation" may help engage community in environmental protection efforts.
- Natural and nature-based elements in a subdivision, city, region, or state improve quality of life and enhance property values.
- Improved risk management may result if a broader range of tools for land management are made available.

Benefits

Benefit	Reduces Stormwater Runoff											Improves Community Livability						
	Reduces Water Treatment Needs	Improves Water Quality	Reduces Grey Infrastructure Needs	Reduces Flooding	Increases Available Water Supply	Increases Groundwater Recharge	Reduces Salt Use	Reduces Energy Use	Improves Air Quality	Reduces Atmospheric CO_2	Reduces Urban Heat Island	Improves Aesthetics	Increases Recreational Opportunity	Reduces Noise Pollution	Improves Community Cohesion	Urban Agriculture	Improves Habitat	Cultivates Public Education Opportunities
Practice										CO_2								
Green Roofs	●	●	●	●	○	○	○	●	●	●	●	●	◒	●	◒	◒	●	●
Tree Planting	●	●	●	●	○	◒	○	●	●	●	●	●	●	●	●	◒	●	●
Bioretention & Infiltration	●	●	●	●	◒	◒	○	○	●	●	●	●	●	◒	◒	○	●	●
Permeable Pavement	●	●	●	●	○	◒	●	◒	●	●	●	○	○	●	○	○	○	●
Water Harvesting	●	●	●	●	●	◒	○	◒	◒	◒	○	○	○	○	○	○	○	●

● Yes ◒ Maybe ○ No

A Unique EPA and FEMA Partnership

NHMP Process

Traditional approach:

Team:

- Emergency manager
- Public Works
- Fire
- Law Enforcement

Strategies:

- Culverts
- Levees
- Hardened Infrastructure

Pilot approach:

Team:

- Emergency manager
- Public Works
- Fire/Law Enforcement
- Community Planning
- Natural Resources Manager
- Floodplain manager
- Water quality specialist

Strategies:

- GI/LID
- Engineering with nature

Lessons Learned – Stakeholder Engagement

Issue	Challenge	Impact
Participation	Funding lag contributed to lack of local capacity and buy-in at project kickoff	Limited local buy in and participation
Participation	Challenge getting the "right" people in the room	Workshops not as affective as they could have been
Participation	Engineering feasibility of specific interventions questioned	Conversation about potential strategies got sidetracked at times
Participation	Engineering disciplines not well represented	It was hard to address specific questions about GI/LID project feasibility
Participation	Limited private sector involvement	Public sector reluctant to consider private sector interventions.
Language	Lack of common language between GI/LID and NHMP audiences	Level of information was at times basic for some and advanced for others. Challenging to see shared benefits at times.
Language	Discussing GI/LID economic benefits appeared to resonate better than social, environmental, or hazard risk reduction benefits	Conversation tended to focus on short-term costs and benefits

Lessons Learned – Process

Issue	Challenge	Impact
GIS Assessment Timing	GIS outputs not available until late in the project	Limited ability to incorporate GIS into GI/LID opportunity assessment prior to stakeholder engagement
Communication	Not enough focus on community benefits	Limited local buy-in
Local Champion	No clear champion or local leader until late in the project	Limited local buy-in
Marketing	Hard to identify language that resonated with professionals from across the spectrum.	Didn't always have the "right" people in the room
Marketing	Using the NHMP to solicit engagement didn't always resonate with stakeholders.	Didn't always have the "right" people in the room

Lessons Learned – Organizational Structure

Issue	Challenge	Impact
Jurisdictional boundaries	Hard to capture costs locally for benefits that occur regionally	Flood storage projects challenging to implement because most benefits are outside city
City Structure	Hard to align goals across departments and plans	Limited incentives for cross-disciplinary participation
Plan Topic and Scale	Some issues may have had a risk reduction benefit, but may not have been best addressed through he NHMP	Private property interventions were not seen as viable.

Key Observations for Cross Sector Collaboration

Need to engage multi-disciplinary teams

- Emergency management and water quality not seen as complimentary
- Require through grants, take message outside your discipline

Language and funding programs are a barrier

- HMA, PDM, 44 CFR 201.6, Risk, Vulnerability, Mitigation
- TMDL, CWSRF, 319 Funds, MS4 Permit, Bioswale

Programs need shared set of principles

- Resilience presents an overarching framework
- Alignment needs to occur at the top

Implementation Mechanisms

- Clean Water Act Regulatory Programs (MS4 Permits, CSO LTCPs)
  - Encourages the user of GI to meet regulatory requirements
- Clean Water State Revolving Fund
  - PR Environmental Quality Board is required to set aside 10% of SFR funds for green projects. These include green infrastructure, energy & water efficiency and environmentally innovative projects.
  - In FY 2017, over $2.7 million of SFR funds went to green infrastructure projects.
- DHS Categorical Exemption (CATEX) N4 – Federal Assistance for Actions Involving Stream Work and Modifications and Flooding
  - Non-bio-engineering practices, such as using riprap for bank hardening, is not covered by the CATEX and requires an environmental impact statement be developed
- Federal Register Notice HUD Community Development Block Grant Program
  - The FR outlines appropriation specific requirements. Section VI.A.b.2.a.(9) states that grantees are to use GI to the maximum extent possible.
- Supplemental Environmental Projects (via enforcement actions)

Flood Resilience Checklist

How prepared is your community for a possible flood?

- Checklist developed in 2014, provides the basis for Building Blocks technical assistance
- Helps communities prepare for flooding and plan for disaster resilience by assessing local plans, policies, and development regulations.

FLOOD RESILIENCE CHECKLIST

Overall Strategies to Enhance Flood Resilience
(Learn more in Section 2, pp. 9-11 of *Planning for Flood Recovery and Long-Term Resilience in Vermont*)

1. Does the community's comprehensive plan have a hazard element or flood planning section?	☐ Yes	☐ No
a. Does the comprehensive plan cross-reference the local Hazard Mitigation Plan and any disaster recovery plans?	☐ Yes	☐ No
b. Does the comprehensive plan identify flood- and erosion-prone areas, including river corridor and fluvial erosion hazard areas, if applicable?	☐ Yes	☐ No
c. Did the local government emergency response personnel, flood plain manager, and department of public works participate in developing/updating the comprehensive plan?	☐ Yes	☐ No
2. Does the community have a local Hazard Mitigation Plan approved by the Federal Emergency Management Agency (FEMA) and the state emergency management agency?	☐ Yes	☐ No
a. Does the Hazard Mitigation Plan cross-reference the local comprehensive plan?	☐ Yes	☐ No
b. Was the local government planner or zoning administrator involved in developing/updating the Hazard Mitigation Plan?	☐ Yes	☐ No
c. Were groups such as local businesses, schools, hospitals/medical facilities, agricultural landowners, and others who could be affected by floods involved in the Hazard Mitigation Plan drafting process?	☐ Yes	☐ No
d. Were other local governments in the watershed involved to	☐ Yes	☐ No

Stormwater Calculator

- Desktop application to estimate post-construction urban stormwater runoff discharges
- Screening-level stormwater runoff reduction and cost analyses of various green infrastructure/low impact development (LID) practices, including:

Disconnection
Rain Harvesting
Porous Pavement
Green roofs
Street Planters
Rain gardens
Infiltration basins

- Allow non-technical professionals to conduct screening level stormwater runoff for small to medium sized (less than 1 - 12 acres) sites
- Utilizes soil conditions, topography, land cover, historic rainfall records and evaporation rates
- Includes a Climate Change component
- Includes a Cost Estimation Module
- User Guide and Mobile Web App Application Available

http://www2.epa.gov/water-research/national-stormwater-calculator

Resources

- **National Stormwater Calculator with Climate Scenarios:** a desktop application designed to help users meet a desired stormwater retention target with and without the use of green infrastructure. The SWC estimates runoff at a site anywhere in the United States (including Puerto Rico). http://www2.epa.gov/water-research/national-stormwater-calculator
- **Flood Resilience Checklist**: the first step in assessing how well a community is positioned to avoid or reduce flood damage and recover from floods. The checklist has options to conserve land and discourage development in river corridors; to protect people, businesses, and facilities in vulnerable settlements; to direct development to safer areas; and to implement and coordinate stormwater management practices throughout the entire watershed https://www.epa.gov/smartgrowth/flood-resilience-checklist
- **The Value of Green Infrastructure: A Guide to Recognizing Its Economic, Environmental, and Social Benefits:** describes the steps to quantifying and valuing many of the environmental, social, and public health benefits of green infrastructure. It includes simple, illustrative examples to assist decision-makers, planners, and communities in performing their own calculations. http://www.cnt.org/sites/default/files/publications/CNT_Value-of-Green-Infrastructure.pdf

Resources

- **Living Shorelines Academy:** **literature, videos, training modules, a directory of experts, and a forum for discussion opportunities all to advance the effective use of living shorelines.**
  https://livingshorelinesacademy.org/
- **Green Infrastructure for Climate Resiliency:** **browse the site for links to additional information on green infrastructure and climate adaptation; flooding, drought, urban heat, reducing building energy demands, spending less energy managing stormwater, and protecting coastal areas.**
  https://www.epa.gov/green-infrastructure/green-infrastructure-climate-resiliency

FY 2018 Grants for Pre-Disaster Mitigation and Flood Mitigation Assistance

A total of $395.2M in funding is available for these competitive grant programs.

PDM
$235.2M

FMA
$160M

Application Period:
October 1, 2018 → January 31, 2019

Who is eligible for PDM and FMA funding?

FEMA

Visit Grants.gov for more information

Assessment

- Do you understand what practices can be considered ‘green infrastructure’ (GI)?
- Do you have an improved understand of the FEMA Hazard Mitigation Planning (HMP) process?
- Can you identify three benefits of including GI in HMPs?
- Do you know where to look for additional information?

Questions?
Contact

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