



# **Funding and Financing Adaptation**

Jessica Grannis

**GEORGETOWN CLIMATE CENTER**  
A Leading Resource for State and Federal Policy

# GEORGETOWN CLIMATE CENTER

Convenes and serves as resource  
to states and localities on  
climate and energy issues

Brings together academics and  
policymakers to improve climate  
policy

Informs the development of:

Legislation

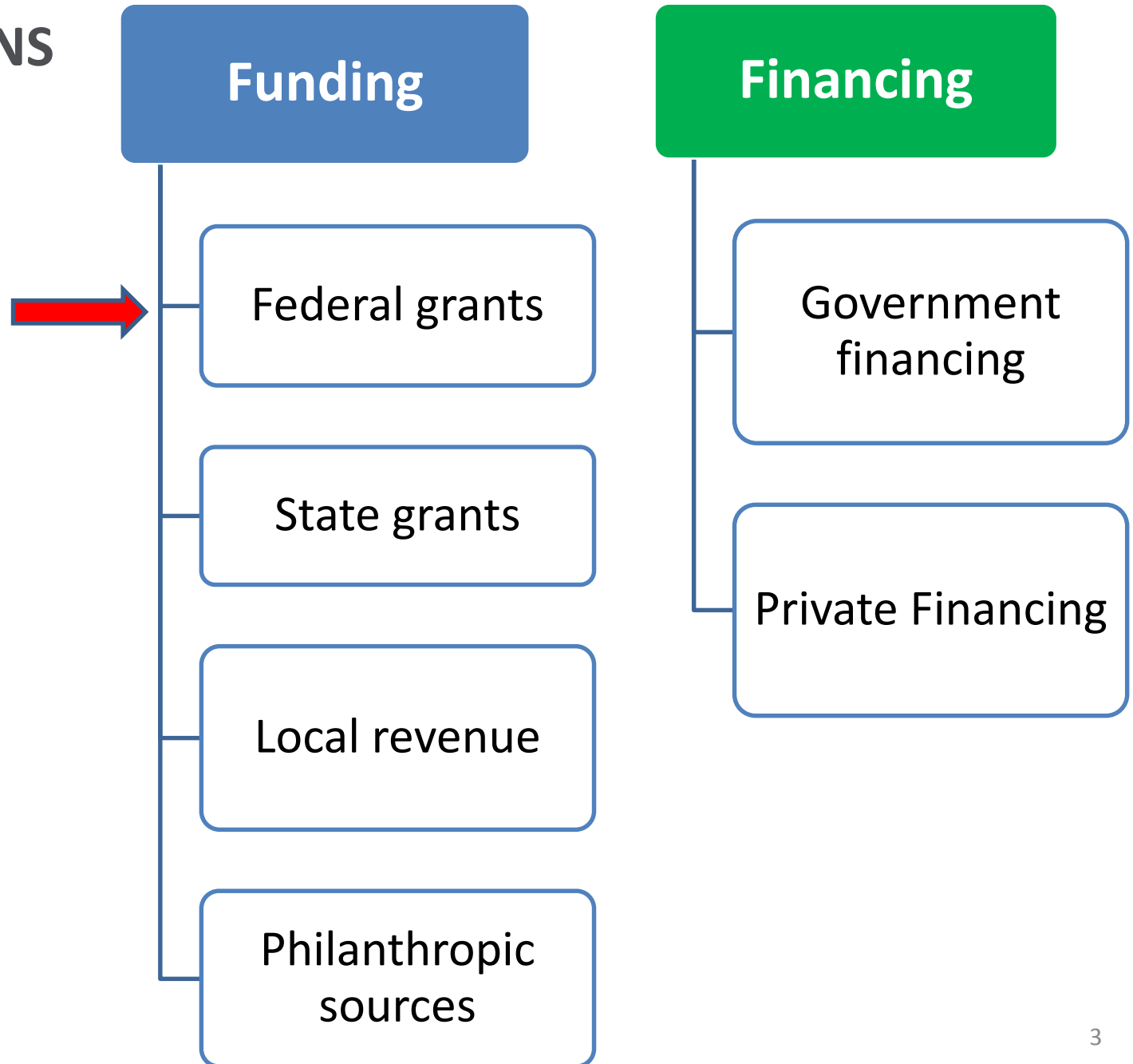
Regulation

Transportation policy

Adaptation policy



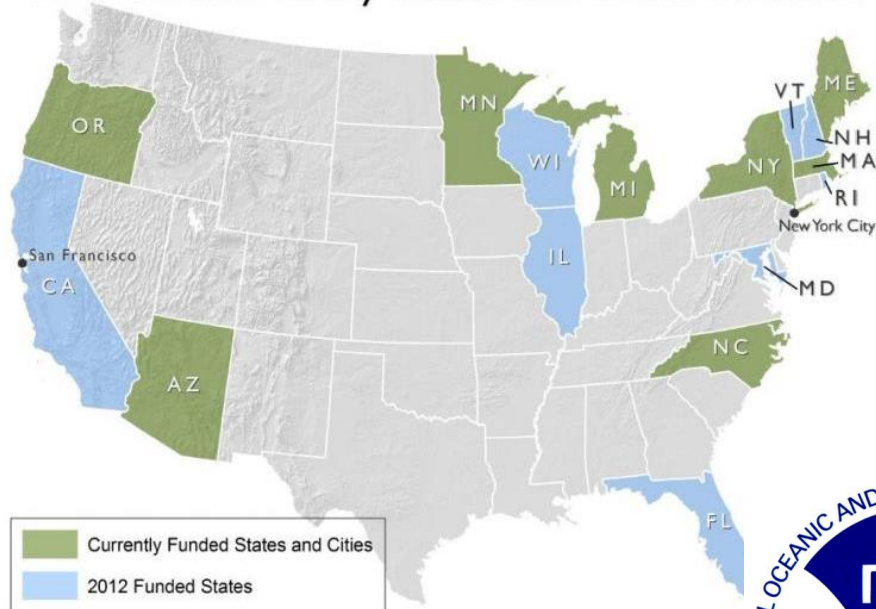
# DEFINITIONS



# FEDERAL GRANT PROGRAMS

Funding

## CDC Climate Ready States and Cities Initiative



# CHALLENGES

## Funding

- No dedicated adaptation program
- Siloed and piecemeal
- Competitively allocated
- Often require state or local match
- Sources over allocated and declining

## Financing

- Can't finance all adaptation work (like planning)
- Technically difficult to leverage
- Must find source for repayment

# EXAMPLES

# GOVERNMENT FINANCING | CONNECTICUT SHORE UP PROGRAM



# PRIVATE FINANCING | NYMTA CATASTROPHE BOND

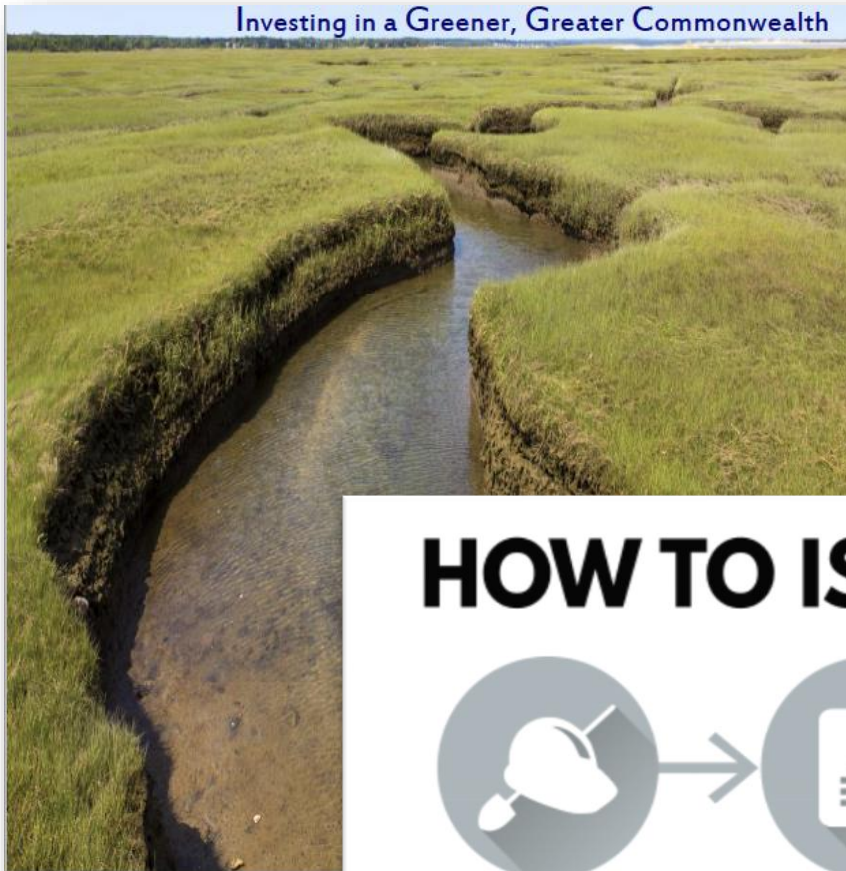


**Catastrophe**  
Investors lose  
principal and  
money helps with  
rebuilding

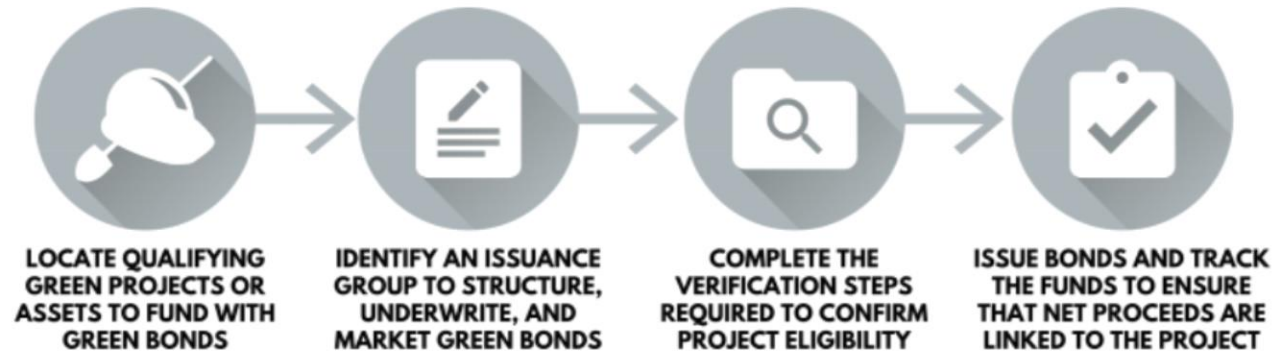
**No Catastrophe**  
Between agreed  
upon date (3  
years), principal  
returns to  
investor with  
interest



# PRIVATE FINANCING | MA GREEN BOND



## HOW TO ISSUE GREEN BONDS



# PUBLIC PRIVATE PARTNERSHIPS | PG COUNTY, MD



Micro-bioretentation adjacent to a building



Micro-bioretentation in a parking lot



Bioswale in an open space



Bioswale adjacent to a parking lot

# STATE GRANTS | HAWAII HOTEL TAX



6:00



**ROCKY POINT**  
NORTH SHORE

# LOCAL REVENUES | CHARLOTTE, NC



Credit: Nancy Pierce; PlanCharlotte, UNC

# LOCAL REVENUES | WASHINGTON DC



# LOCAL PLANNING | MEMPHIS, TN

## Scenario 1: 20-Year General Obligation Bonds



## Scenario 2: Property Taxes



## Scenario 3: Sales Taxes (1/8 of 1 cent)



MID-SOUTH REGIONAL  
**GREENPRINT**

*Federal Funding Sources*

| Program   | Organization                                   | Description   |
|---|--|---|
| Civil Works Programs  | US Army Corps of Engineers                     | Assistance with planning, construction, operations, and maintenance of a range of water projects  |
| Transportation Alternatives Program (TAP)                             | US Department of Transportation                | Funds for construction, planning, and design of on-road and off-road trail facilities, infrastructure-related projects and systems providing safe routes for non-drivers, and rail-to-trail conversions |
| Recreational Trails Program Grant (TAP program)                       | US Department of Transportation                | Funds for maintenance, development, acquisition, and construction of new and existing trail facilities  |
| Congestion Mitigation and Air Quality Program (CMAQ)                  | US Department of Transportation                | Funds for transportation projects that improve air quality, lower auto emissions, and reduce congestion (such as bike and pedestrian trail construction)  |
| Transportation Investment Generating Economic Recovery (TIGER) Grants | US Department of Transportation                | Grants for road, rail, transit, and port projects that are multimodal, multi-jurisdictional, or otherwise challenging to fund through existing programs   |
| Transportation Infrastructure Finance and Innovation Act (TIFIA)      | US Department of Transportation                | Federal credit assistance in the form of direct loans, loan guarantees, and standby lines of credit to finance surface transportation projects of national or regional significance                     |
| Community Development Block Grants (CDBG)                             | US Department of Housing and Urban Development | Grants for acquisition of real property, relocation and demolition, and construction of public facilities and improvements  |
| Choice Neighborhood Grants  | US Department of Housing and Urban Development | Grants to transform distressed neighborhoods and public and assisted projects into sustainable mixed-income neighborhoods by linking housing with services, transportation, and access to jobs          |

# RESOURCES

#### Resource

### A Resilient Power Capital Scan: How Foundations Could Use Grants and Investments to Advance Solar and Storage in Low-Income Communities

February 1, 2017

This report identifies market barriers to deploying solar and energy storage technologies in low-income markets, and proposes more than 50 grant and investment opportunities that socially-minded investors can use to target those barriers. Solar and energy storage can further climate adaptation by helping communities avoid power outages. The report includes a detailed analysis of the energy market and a matrix of interventions organized according to market participant, barriers, and difficulty.

**Related Organizations:** Clean Energy Group

**Authors:** Lew Milford, Robert Sanders

**Resource Category:** Solutions

SEE RESOURCE

#### Resource

### OMB Standards and Finance to Support Community Resilience

December 21, 2016

The White House has been coordinating efforts in partnership with insurance and finance leaders on strategic objectives to increase community resilience and insurability since 2014. From the White House Office of Management and Budget, *Standards and Finance to Support Community Resilience* is designed to identify opportunities for continued collaboration and help ensure that "future investments will be climate smart from the start, that damaged communities build back smarter, and that both public and private sectors are poised to seize new opportunities to achieve resilience."

**Related Organizations:** White House Office of Management and Budget

**Resource Category:** Planning

SEE RESOURCE

#### Resource

### Los Angeles County Safe, Clean Neighborhood Parks and Beaches Measure of 2016

November 8, 2016

The *Los Angeles County Safe, Clean Neighborhood Parks and Beaches Measure of 2016 (Measure A)* supports the protection, enhancement and maintenance of Los Angeles, California's neighborhood parks, open space, trails, beaches, natural habitat, rivers, streams, and the urban tree canopy - by implementing an annual parcel tax of 1.5 cents per square foot of development. Measure A is expected to generate approximately \$94 million per year for local parks, beaches, and open space areas, replacing expiring dedicated funding from Propositions A of 1992 and 1996.

**Related Organizations:** City of Los Angeles, California

**Resource Category:** Funding

SEE RESOURCE

# Resources on Financing

<http://bit.ly/gcc-financing>

 **Adaptation Clearinghouse**  
POWERED BY THE GEORGETOWN CLIMATE CENTER AND USERS LIKE YOU

## Sectors

This page allows you to explore the resources in the Adaptation Clearinghouse by sector. Each page includes curated lists of resources on adaptation efforts in specific sectors.

Sectors covered include agriculture and food, business, coastal, ecosystems, emergency preparedness, energy, land use, public health, transportation, water, and more.

These pages provide easy-to-navigate lists of resources to help policymakers assess vulnerabilities, develop plans, and respond to climate change impacts in that sector. These pages also allow users to see resources that are most popular among adaptation experts.



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Adaptation Program Manager at  
Georgetown Climate Center

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Transportation



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Urban



VIEW SECTOR



Water



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NOTIFICATIONS

## Water

This page includes resources to help policymakers understand, plan, and prepare for impacts of climate change to the water sector including plans, policies, and tools.

If you are interested in adaptation efforts in the water sector (including efforts to adapt to changes in water supply, water quality, and impacts to water infrastructure), please sign up for email updates to receive monthly notifications about all the latest water resources.

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## Water Resources

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COMMUNICATION](#)

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### Popular Water Resources

[\(edit\)](#)

The resources below are popular among Clearinghouse users. Users may influence this list by rating resources. Just click on a resource and assign it a 1 (low) to 5 (high) star rating. The highest ratings (4 and 5) should be granted to resources that you have found useful in your own work.

19 results are shown below.

[SORT BY ▾](#)

Resource

#### Hoboken, New Jersey Green Infrastructure Strategic Plan

October 2013

The City of Hoboken, New Jersey published its Green Infrastructure Strategic Plan in October 2013 to create a framework for city-wide green infrastructure investments as a mechanism for improving storm water management, controlling flooding, and preparing for future climate change.

Average Rating



## POPULAR RESOURCES

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Center



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(EDIT)

## Water Sector Funding Programs

(edit)

This tab includes funding programs that support adaptation in the water sector.

Resources are automatically presented by date. Apply additional filters to narrow by state, impact, region, or jurisdictional focus.

39 results are shown below.

### SEARCH BY KEYWORD

APPLY FILTER

APPLY ADDITIONAL FILTERS

SORT BY

Resource

### PG&E Better Together Resilient Communities Grant Program

March 1, 2017

Pacific Gas and Electric Company (PG&E) PG&E is offering a \$1 million Better Together Resilient Communities grant program to help California communities better prepare for, withstand, and recover from extreme weather events and other risks related to climate change. PG&E will invest \$1 million over five years – or \$200,000 per year – in shareholder-funded grants. PG&E will award two individual grants of \$100,000 in 2017 for wildfire preparedness and resiliency, and the first round of **applications are due by May 12, 2017**.

**Related Organizations:** Pacific Gas and Electric Company (PG&E)

**Resource Category:** Funding

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Resource

### EPA Climate Change Research Grants

The U.S. Environmental Protection Agency (EPA) funds climate change research grants to "improve knowledge of the health and environment effects of climate change, and provide sustainable solutions for communities to effectively manage and reduce the impacts of a changing climate."

**Related Organizations:** U.S. Environmental Protection Agency (EPA)

**Resource Category:** Funding

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#### TOOLS

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## Financing High-Performance Infrastructure

The U.S. Department of Housing and Urban Development (HUD) issued a fact sheet describing ways that state and local governments can finance climate resilience investments using green bonds and other innovative financing strategies. Green bonds can be used to finance investments in and retrofits to infrastructure to increase community resilience, including investments in renewable energy and grid resilience, clean transportation, drinking and wastewater infrastructure, and more. The fact sheet provides a high level summary of some financing options including green bonds, catastrophe bonds, resilience bonds, and social impact bonds.

It also includes case studies of states and agencies that have used innovative financing strategies to support resilience investments:

- Massachusetts used green bonds to finance land acquisition, stream restoration, energy efficiency, and drinking water and wastewater resilience projects.
- Metropolitan Transit Authorities (MTA) issued a "climate bond" to finance upgrades to transit in the New York City metropolitan region. The Georgetown Climate Center also wrote a [case study](#) on how MTA used catastrophe bonds to rebuild infrastructure more resiliently after Hurricane Sandy.
- Iowa Finance Authorities used the [Clean Water Act State Revolving Funds](#) to issue green bonds to support local upgrades to drinking water and wastewater infrastructure.

## GREEN BOND CASE STUDIES



Green bond proceeds are helping the MA Dept. of Conservation and Recreation acquire and protect natural habitats, such as 70 acres of coastal property within the Great Marsh.



MTA's green bond proceeds are paying for continuing work on infrastructure renewal and projects that began during the MTA's 2010-2014 Capital Program.



Iowa's SRF green bond proceeds are being used to finance projects that adhere to the federal Clean Water Act and Safe Drinking Water Act, such as efforts to restore the Big Sioux River.

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## RE.invest - A Roadmap for Resilience: Investing in resilience, reinvesting in communities

This report summarizes the outcomes of RE.invest, an 18-month predevelopment process with eight U.S. cities and teams of leading private sector design, engineering, law, and finance experts. The RE.invest Initiative focuses on infrastructure predevelopment - all of the activities that go into designing and planning large-scale infrastructure projects prior to construction. The framework is used to reimagine civic infrastructure systems to create both public value and private investment opportunities, especially for vulnerable communities. The report provides an overview of the landscape for infrastructure investment in the U.S., and offers a compelling case for redesigning the predevelopment process to focus on resilience. This national effort was launched with the support of the Rockefeller Foundation.

RE.invest was developed to help cities move beyond stating needs to identifying investable public-interest projects through a rapid, structured design and delivery process. *A Roadmap for Resilience* makes the case for taking an integrated design and financing approach to resilience planning and reimagining the predevelopment process from a systems perspective - to create a template that can be applied to any city to first generate, then refine, and finally finance innovative resilience solutions.

The document is organized in five main sections. The first lays out the key challenges in urban infrastructure investment and makes the case for investing in resilience. The second presents a new guide for predevelopment using principles of design thinking and systems innovation to address the barriers to resilient infrastructure investment. The third section captures the RE.invest process and the fourth provides a thorough overview of all eight RE.invest partner city solutions. The final section provides recommendations for government officials, developers, financiers, and communities engaged in investing in resilience and reinvesting in communities.

This report is written for the wide audience of stakeholders involved in urban resilience. In particular:

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## green infrastructure toolkit

## Green Infrastructure Toolkit



Broadly called “green infrastructure,” this new set of strategies seeks to manage stormwater, reduce urban heat island effects, improve air quality, and promote economic development and other sustainability goals. Green infrastructure provides an attractive alternative to traditional concrete (or “gray”) infrastructure by making paved and hard surfaces vegetated or permeable. Permeable pavements and green roofs both capture rainfall and retain it on site, keeping it out of the stormwater system. Green infrastructure also provides wildlife habitat and greenhouse gas reduction benefits.

While vanguard communities are innovating, most others are struggling to know where to begin. And while the professional design community has explored a new generation of best design practices, municipal policy frameworks have not incorporated these practices appropriately. In addition, limited resources are available to help jurisdictions develop technical expertise and share best practices. This Green Infrastructure Toolkit was developed in collaboration with leading cities to help them identify and deploy green infrastructure approaches in their communities.

This toolkit is powered by the Georgetown Climate Center's Adaptation Clearinghouse. For a full list of resources on green infrastructure in the Adaptation Clearinghouse click [here](#).

### Introduction

Local governments across the country face serious challenges in managing urban stormwater (surface water runoff resulting from rainfall or snowmelt). Aging infrastructure, changes in precipitation patterns, watershed deforestation, and impervious surfaces such as roadways and parking lots cause urban flooding that pollutes waterways. Climate change will exacerbate these flood risks in many places due to more intense storms that could overwhelm existing infrastructure systems. If we fail to adapt these systems, severe repetitive flooding will increasingly affect community health, safety, and welfare, and the consequences of flooding often impose a disproportionate toll on the most vulnerable and disadvantaged populations and communities.

Innovative local communities and regions are beginning to implement a wide array of new “green infrastructure” measures, which retain and treat stormwater where it falls instead of relying on traditional, concrete-based systems largely underground. In order to ensure effective implementation, this toolkit identifies the best green infrastructure practices from cities across the country to guide those still designing their programs.

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#### Getting Started: Pilot Projects

#### Scaling Up: Integrating Green Infrastructure into Existing Processes

#### How to Pay for Green Infrastructure: Funding and Financing

#### Communication Strategies for Green Infrastructure

#### Equity and Environmental Justice

### Printer-Friendly Toolkit



<http://bit.ly/gcc-gsitoolkit>

# How to Pay for Green Infrastructure: Funding and Financing

## Introduction

Communities are increasingly turning to green infrastructure as a vital tool to help manage stormwater and improve climate resilience. However, many local governments seeking to establish green infrastructure programs face budget constraints that may limit the scope or effectiveness of program implementation. Fortunately, local governments have the opportunity to draw upon a wide range of funding sources, revenue models, and financing strategies to support green infrastructure programs. This Funding and Financing Chapter provides strategic guidance on how to pay for green infrastructure.



Stormwater management is increasingly becoming a major expense for local governments addressing persistent flooding or responding to legal and regulatory mandates, such as combined sewer overflow (CSO) consent decrees,<sup>1</sup> total maximum daily load waste load allocations,<sup>2</sup> or municipal separate storm sewer system (MS4) permits.<sup>3</sup>

Investing in green infrastructure can cost-effectively help communities manage stormwater while also producing significant co-benefits. Examples of co-benefits include improvements in air quality and public health, increased climate resilience, opportunities for community recreation, and enhanced community aesthetics.<sup>4</sup> Designing green infrastructure programs to maximize co-benefits may open up funding sources that would otherwise not be available for stormwater management projects or programs. For example, communities can use funds for programs such as transportation and street design, open space and wildlife conservation, or disaster relief to pay for green infrastructure programs. Additionally, communities can implement innovative financing strategies to capture the economic value created by flood costs avoided, increased health benefits, or increased property values. Communities can aggregate multiple funding and revenue sources, or combine a funding

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Private Financing

Communication Strategies for Green Infrastructure

Equity and Environmental Justice

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## Related Resources

Sort Resources ▾

### EPA Financing Green Infrastructure: A Best Practices Guide for the Clean Water State Revolving Fund

In 2015 the U.S. Environmental Protection agency published a best practices guide for funding green infrastructure projects through states' Clean Water State Revolving Fund (CWSRF) programs. The Best Practices Guide highlights successful case studies from several states, and provides examples of ways in which state CWSRF programs can prioritize green infrastructure projects for program funding. The EPA suggests that states can increase CWSRF support for green infrastructure by implementing priority point systems, program set-asides, and marketing strategies for state programs.

[View Resource](#)

### Massachusetts Green Bonds

In 2014, the state of Massachusetts issued \$350 million in green bonds to fund water infrastructure projects, including stream bed restoration and open-space protection. Bond funds also covered the planting of new trees in the City of Worcester and surrounding areas, including several urban "orchards." These orchards are small plots within the city designed to accommodate fruit bearing trees, to help with access to healthy foods in these neighborhoods. Bond funding supported the Worcester Tree Initiative, which also engages and trains residents in care for the trees and the benefits of urban forestry.

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# Thank You!

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