

The State of Public Sector Green Stormwater Infrastructure 2022



 the **green** infrastructure
leadership exchange

Advancing Equitable GI Implementation

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Key Messages

Green Stormwater Infrastructure (“green infrastructure”) is a water management approach that has the potential to help the public sector meet Clean Water Act regulations, reduce flood risk, support aging infrastructure, and deliver a host of co-benefits from reducing carbon to expanding nature in underserved communities. A variety of public sector organizations, from city and county departments to water and sewer authorities, bear responsibility for stormwater management. *For the purposes of this report, these local, public sector organizations as a group are referred to as “stormwater management organizations” or “SMOs.”* Nationwide, SMOs are overseeing the planning and delivery of green infrastructure, but there are no standardized ways of measuring and reporting these efforts. This research aims to achieve the following goals:

1. Better understand the state of local public sector green infrastructure implementation, including how much has been implemented and how well it is serving communities; and



2. Suggest a data-informed blueprint for SMOs and those groups seeking to support them in implementing more green infrastructure that better serves communities.

The Green Infrastructure Leadership Exchange (Exchange), a peer learning network of public sector practitioners, undertook the research presented here in order to better understand the state of public sector green infrastructure development. Through a survey, a supplemental literature search, and community interviews, the Exchange found the following:

- 1. Regulation is the primary driver of green infrastructure implementation.** Regulation in the form of Consent Decrees and MS4 Permits through the National Pollutant Discharge Elimination System (NPDES) Program is the number one driver for SMO survey respondents across the country. In fact, nearly 9 out of 10 respondents described it as a “very important” driver, demonstrating how the water sector increasingly views green infrastructure as an appropriate and practical method of compliance. While regulation is clearly the primary driver for most SMOs, secondary drivers such as flood resilience, community quality of life, and equity are also influencing SMOs’ approaches to green infrastructure implementation.
- 2. Financial, legal, and regulatory barriers continue to hinder the ability of SMOs to implement green infrastructure at scale, but progress is being made.** The US Water Alliance identified key barriers to green infrastructure in their 2011 study, *Barriers and Gateways to Green Infrastructure*.

These barriers include:

- **“Technical and Physical”** barriers such as: a lack of understanding of green infrastructure and its benefits; insufficient demonstrative data and case studies for applying rigorous quantification approaches on benefits, costs, and performance; insufficient technical knowledge and experience; and lack of design standards in codes and ordinances.
- **“Community and Institutional”** barriers such as: insufficient or inaccessible information about the benefits of green infrastructure for political leaders, agency staff, developers, technical consultants, and the general public to better demonstrate the “return on investment”; undervaluing the aesthetics and characteristics of green infrastructure by communities and institutions; and a lack of cooperation between agencies and communities.

A broad literature review undertaken for this report found that those same financial, legal, and regulatory barriers continue to persist. However, there is evidence that investments by public, nonprofit, and philanthropic sectors have made headway in reducing these barriers. These stakeholders should continue to broadly share lessons learned and bright spots to support SMOs across the country in overcoming these barriers. A selection of these bright spots are shared in this report.

3. Supportive elected decision makers, strong senior management champions, and interdepartmental coordination are the most essential levers for scaling green infrastructure.

This group of levers stood out above the rest as being used—and described as effective—by nearly all respondents. Taken together, this group of levers is a prerequisite for nearly any successful government program: buy-in from, and engagement with, elected officials, senior SMO staff, other departments/agencies, and the public. Once this foundational support is in place, SMOs are able to use additional levers that require more alignment of funding and local policy approaches, including classifying green infrastructure as a capital investment, funding/supporting maintenance, requiring green infrastructure on new development, enforcing green infrastructure regulations, and investing in education and training. Finally, a smaller subset of respondents are using “emerging” levers to push beyond early adoption and support green infrastructure implementation at scale. These include standardizing green infrastructure design, using asset management systems, diversifying funding for green infrastructure, investing in workforce development, and managing incentive programs to encourage voluntary retrofits on private properties.

4. SMOs are using a diverse array of procurement approaches for green infrastructure planning, design, construction, and maintenance activities, which may reflect the experimentation that is happening nationwide.

Topping the list in these findings was internal management of green infrastructure programs, combined with outsourced design and construction services. This traditional approach to infrastructure management and procurement was seen as highly effective by all respondents who use it. However, many SMOs are deploying alternative delivery models like design-build contracts, public private partnerships, and grant/incentive programs. These approaches may bundle planning, design, construction, and maintenance activities or work more closely with the private sector to source and fund projects on private property.

5. Gathering apples-to-apples SMO green infrastructure spending data remains a challenge, however preliminary findings suggest that investment in green infrastructure, while highly variable, is increasing overall.

Survey results indicate that nationwide, green infrastructure accounts for 10% of stormwater-related capital expenditures. In the most recently completed fiscal year,

annual green infrastructure capital expenditures ranged from \$0 to \$90,414,000 with a median of \$280,000. Annual spending on green infrastructure operations and maintenance ranged from \$0 to \$5,300,000, with a median of \$100,000 (see [The State of Implementation](#) Section for population comparisons for these expenditures). The vast majority of respondents have increased their green infrastructure spending over the last five years, and will continue to over the next five years.

Likewise, the cost per unit of green infrastructure varies widely and some jurisdictions use gallons, and others use acres to quantify the amount of green infrastructure built, further clouding our ability to compare expenditures across jurisdictions. The range of reported cost per gallon was from \$0 to \$45.67 (national median was \$1.07) and cost per acre managed ranged from \$0 to \$930,000 (national median was \$38,168).

6. The majority of green infrastructure built to date by SMOs has been on public property.

The majority of green infrastructure to date (62% of gallons managed) has been built in the right of way and on publicly-owned parcels. While SMOs anticipate increasing investment in green infrastructure across both public and private property over the next five years, private parcel retrofits and public right-of-way retrofits stood out as having a large proportion of respondents planning to increase investment in these project types, relative to the previous five years.

7. Nearly half of respondents were unable to estimate the portion of their cumulative green infrastructure funding directed to projects in disadvantaged, socially vulnerable, and/or environmentally vulnerable communities. SMOs are in need of more support to be able to incorporate equity into the planning, siting, and monitoring of their green infrastructure programs to better understand the impact on vulnerable communities in their service areas.

8. More work needs to be done for SMOs to align on a shared set of high impact standards
According to green infrastructure industry leaders, high impact green infrastructure:

- Centers community,
- Is designed for multi-benefits,
- Emphasizes vegetative practices where feasible,
- Is maintained for the long-term,
- Is regularly inspected for performance, and
- Is evaluated for impact.

These six characteristics were elevated by industry leaders who made up the State of Public Sector Green Stormwater Infrastructure Advisory Committee and were shared with survey respondents. The majority of respondents prioritize most factors at least sometimes, however there is significant work needed to prioritize all of these factors as a new standard. Greater than 50% of respondents prioritize Maintenance (74%), Multiple Benefits (72%), Vegetative Practices (65%), and Regularly Inspected (59%) “most of the time” or “always.” However, 71% of respondents assess green infrastructure for impact only “sometimes” or “never.” Additionally, 52% of respondents center community (the central recommendation of the [Equity Guide for Green Infrastructure Practitioners](#)) only “about half the time” or “sometimes.” Maintenance is left out of the equation at least half the time for 25% of respondents.

Introduction

Why was the report developed?

From 2022-2023, the Exchange worked with partners to develop this inaugural “State of Public Sector Green Stormwater Infrastructure Report.” This report aims to:

- Create a shared blueprint¹ for local public sector implementers and groups seeking to support them to plan, design, build, and maintain green infrastructure that better serves communities. This is accomplished by illuminating the most successful drivers and levers for green infrastructure and sharing bright spots.
- Establish a baseline to better understand the current state of local public sector green infrastructure implementation, including how much has been implemented, where it has been implemented, how much it costs, and how well it is serving communities. The methodology was also developed to measure progress over time.
- Move in the direction of industry consensus around a shared standard for green infrastructure that is inclusive of equity, community engagement, co-benefits, and long term maintenance, and fits within the national One Water framework.

How is green infrastructure defined?

This report focuses on green stormwater infrastructure (also referred to as green infrastructure or GSI), defined for the purposes of this national study as “the range of measures that use plant or soil systems, permeable pavement or other permeable surfaces or substrates, stormwater harvest and reuse, or landscaping to store, infiltrate, or evapotranspire stormwater and reduce flows to sewer systems or to surface waters” (USEPA, 2015).

While the term “Green Infrastructure” is often also used to describe a much broader set of large interconnected naturalized areas that provide a range of ecosystem services, this report and the data within it refer to the narrower definition presented above.



¹ Some attempts have already begun to create a shared information database, like the International Stormwater BMP database. The ASCE Journal paper, A Call to Record Stormwater Control Functions and to Share Network Data, explores the isolated management of inventory data, improving the communication, decision making, and evaluation of stormwater management across cities.

What is contained in this report?

This report is broken into a number of sections that address different parts of the green infrastructure lifecycle. Each section includes:

- A brief introduction to the section topic
- Public sector green infrastructure survey results, complemented by findings from relevant external reports, research, and community interviews that support, refute, or expand further on the survey results
- A selection of “bright spots” celebrating good practices of SMOs across the United States
- Recommendations for all report audiences based on findings
- A brief section that looks ahead and proposes next steps and further research
- An Excel-based data dashboard allowing users to explore and filter baseline data

How can the report be used?

This report has been designed to support public sector green infrastructure’s ecosystems of influence, the group of actors who must come together to make green infrastructure thrive in a city. That includes local public sector implementers, the catalytic organizations that support them, and local community leaders.

- **Local public sector implementers:** This report, and more specifically, the accompanying dashboard, helps local public sector implementers understand how their work benchmarks against general implementation trends. It also provides a blueprint to help catalyze more green infrastructure implementation by local governments that better serves communities.
- **National and regional catalysts:** This report also serves groups collaborating across boundaries to support local, regional, and national scaling of green infrastructure through policy, advocacy, communication, funding, research, innovation, and peer exchange. These groups include federal and state governments, national and multi-site non-profits such as the Exchange and US Water Alliance, regional networks, philanthropy, and private sector organizations. This report provides information about the state of implementation and recommendations for where and how these audiences should invest their time and resources to help catalyze more community-centered green infrastructure.
- **Local community leaders:** Finally, this report serves communities, community-based organizations (CBOs), and other grassroots, social justice, and health equity organizations looking for a common language with which to talk with municipal officials and others around the possibility for green infrastructure to support equitable development in their neighborhoods. It can also serve as another entry point for making inroads towards more equitable processes and outcomes.

How was the report developed and what are its limitations?

While many entities (public, private, federal, and state) implement green infrastructure across the United States, the primary source data used to develop this report came from a survey targeting **public sector entities at the municipal, county or regional level with primary or significant responsibility within their jurisdictions for stormwater management.** This report is intended to be a baseline starting point to build on lessons learned in future iterations.

To select survey recipients, the research team took the following approach:

- Issued surveys to the Exchange's existing 59 public sector member entities in the United States and reached out directly to another 150+ public sector entities. The additional entities were chosen by starting with the list of the top 200 largest United States cities/municipalities and, from that list, selecting at least two stormwater management public sector entities per state to receive the survey.
- To learn about the experiences of different sized jurisdictions as well as to hear from as many states as possible, the research team added cities/towns to the list so all regions in the United States were represented in survey outreach. These additional cities/towns were selected at random, the only criteria being that the team could find direct contact information.
- Requested that only one survey be completed per public entity, and that the respondent should be the person considered to be best positioned within that entity to answer the questions.
- Shared the survey link via partners and social media to encourage public sector entities that were not part of direct survey targets to also share their experiences.

An initial set of questions screened out organizations that were not in the survey's target audience.

Prior to distribution, the survey questions were peer reviewed by Exchange staff, Exchange Members, and external partners. The complete survey was tested by seven (7) Exchange members before being issued. The research team considered carefully how to phrase questions to ensure they would be commonly understood, including providing definitions where needed.

The team used Likert scales for many of the questions to track changes in attitudes or opinions over time (for future report purposes). Also, in asking for the respondent's opinion/perspective, the team hoped to increase the respondent's level of comfort in answering a survey on behalf of their entity.

After the initial communication inviting public sector contacts to participate in the survey, the team sent at least three follow up reminder messages over the 70-day survey period.

Survey respondents were able to specify whether their data needed to remain anonymous. Survey takers' names, job titles, email addresses, organization names, and state names were requested but not required. The exception to this is where an organization chose to share a case study in response to a survey question. In that case, the research team asked for advance permission to attribute the case study to the entity.



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The Exchange would also like to thank a number of individuals and organizations that have made contributions either directly to the production of this report, or to informing the thinking around this report, noting that their contributions do not necessarily imply endorsement from themselves or their organizations of any report conclusions and recommendations:

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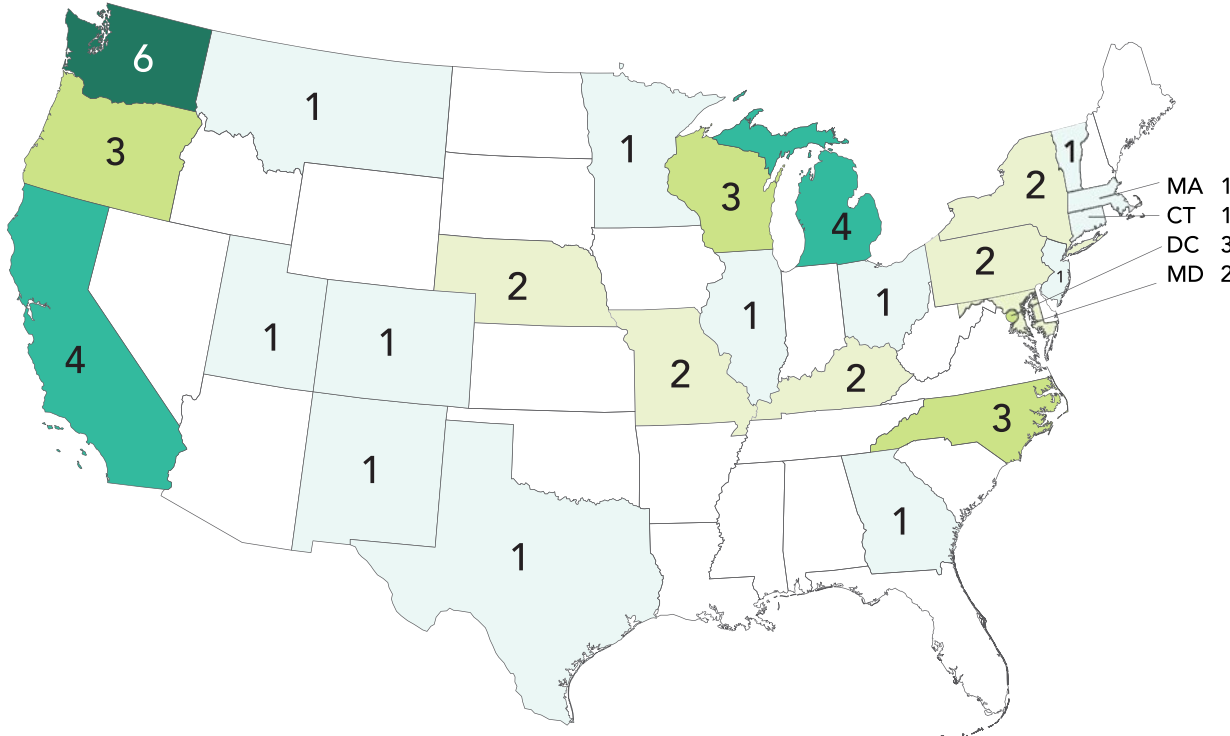
Whose Story does this Report Tell?

While recognizing that many entities (public, private, non-profit, and community) implement green infrastructure across the United States, **this report primarily captures the green infrastructure-related perspectives of public sector entities at the municipal, city, county, or regional level** who hold primary or significant responsibility within their jurisdictions for stormwater management, be that through policy development, regulatory/reporting accountability, implementation, and/or monitoring. This report focused on this group because their stormwater accountabilities mean they are undertaking the majority of green infrastructure implementation across the country. That said, it is important to clearly acknowledge that scaling green infrastructure is not solely the responsibility of—nor uniquely within the control of—local level government entities. State and federal governments, particularly their environmental protection agencies, have substantial influence on water entity priorities and timelines, requiring enhanced coordination and collaboration between different levels of government in order for strong outcomes to be achieved from green infrastructure efforts.

Community stakeholders play a critical role in bringing their local knowledge, goals, and vision to green infrastructure development. The Exchange commissioned a paper with Catalyst Collaboratives to support both this *State of Public Sector Green Stormwater Infrastructure* report and the previous [State of Equity Practice Report](#) (2021) in order to better elevate the voice and perspective of community members, especially those living in low-wealth neighborhoods and historic communities of color and cultures, which bear a disproportionately larger burden of flooding, infrastructure failure, and other climate change impacts than wealthier, whiter communities ([Community Voices Report](#), 2022). Throughout this report, six different community voices have been elevated in call-out boxes sharing a representative snapshot of sentiments to underscore the importance of stakeholder participation in shared problem definition and solution-making to guide the industry toward green infrastructure that better serves communities.

A total of 52 public sector entities, serving 14% of the United States population, participated in the inaugural “State of Public Sector Green Stormwater Infrastructure” survey issued in September 2022. The majority of the data contained within this report comes from the results of this survey. An estimated 75% of survey respondents are members of the Exchange, meaning that they are already using green infrastructure within their jurisdictions. Additionally, Exchange members have explicitly committed to mainstreaming green infrastructure within their stormwater management work. As such, survey results are likely skewed towards an optimistic version of the current state of the field. But that also means that valuable lessons have already been learned, which can pave the way for future adoption of green infrastructure for those only starting their journeys.

These 52 organizations serve approximately 44.5 million people across all regions of the United States. They operate in 27 different states (see map inset).



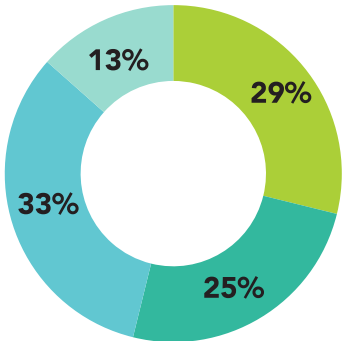
They have different assets that support their ability to deliver green infrastructure. For example:

They serve a mix of population sizes.

They operate different types of stormwater systems.

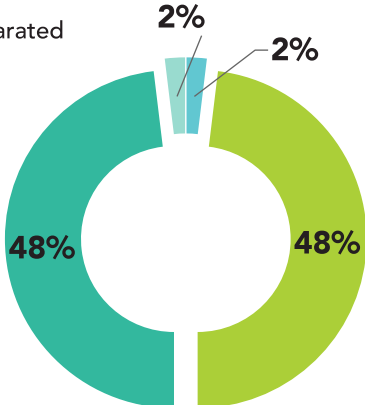
Population size of jurisdiction served

- Very Large (Over one million)
- Large (500,000-999,999)
- Medium (100,000-499,000)
- Small (20,000-99,000)



Sewer type of jurisdiction

- Combined
- Combined & Separated
- Separated
- Other



2

2 All graph labels throughout the report are rounded and may see a margin of error up to +/- 2

Years of Experience: They have been planning and developing green infrastructure for different lengths of time.

Total years of GSI planning & development



Size of Team: The total number of full-time equivalent (FTE) staff and contractors focused on planning, delivering, and maintaining green infrastructure ranged from 0 to 100. The median number of green infrastructure FTEs was 8 and the mean was 13.

Dedicated Funding Resources: The majority (66%) have a stormwater fee or are in the process of developing one.

Within the report, survey findings are complemented by findings from other publicly available studies or reports that shed light on different aspects of green infrastructure implementation, as well as findings from a parallel community collaboration report. On some aspects, there is strong alignment between the different sources, while on others there is significant divergence.

Stormwater fee

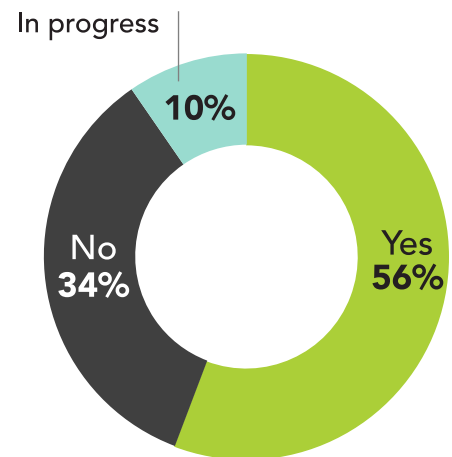


Image source: Jim Sparber, Greenprint Partners.

Green Infrastructure: Advancing an Equitable National Standard

The Exchange is committed to supporting its members' efforts to move toward a shared standard for green infrastructure that better serves communities: one that's inclusive of equity, community engagement, co-benefits, and long term maintenance and fits within the national One Water framework.

Since 2020, the Exchange has supported SMO peer collaboration to: define equity and the types of equity that green infrastructure can seek to advance ([Equity Statement of Purpose](#), 2020); evaluate and gather community input on opportunities and barriers to advancing equity in green infrastructure ([State of Equity Practice Report](#), 2021; [Community Voices Report](#), 2022); actualize recommendations from the *State of Equity Practice Report* ([Equity Guide for Green Infrastructure Practitioners](#), 2022); and provide a shared vision for investments needed to accelerate equitable green infrastructure implementation (this *State of Public Sector Green Stormwater Infrastructure* report, 2023). This thoughtful progression from definition to assessment to implementation is represented in the graphic below.

Overview: resource development history

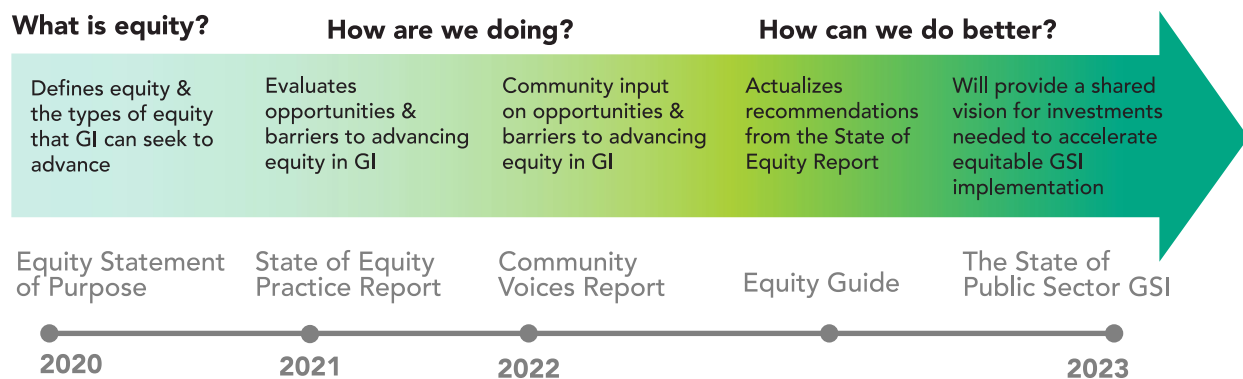


Image courtesy of Barbara Hopkins, Executive Director, Green Infrastructure Leadership Exchange

In order for green infrastructure to advance equity by better serving communities' needs, members of the *State of Public Sector Green Stormwater Infrastructure* Advisory Committee (a group of 18 leaders representing federal and local governments, community-based organizations, national nonprofits, consultants, and philanthropy) elevated criteria that they believed should become the "new standard of green infrastructure." To meet this new standard, the public sector and their policies, programs, and projects would strive to implement equity best practices documented in the [Equity Guide for Green](#)

[Infrastructure Practitioners](#), and individual green infrastructure installations would:

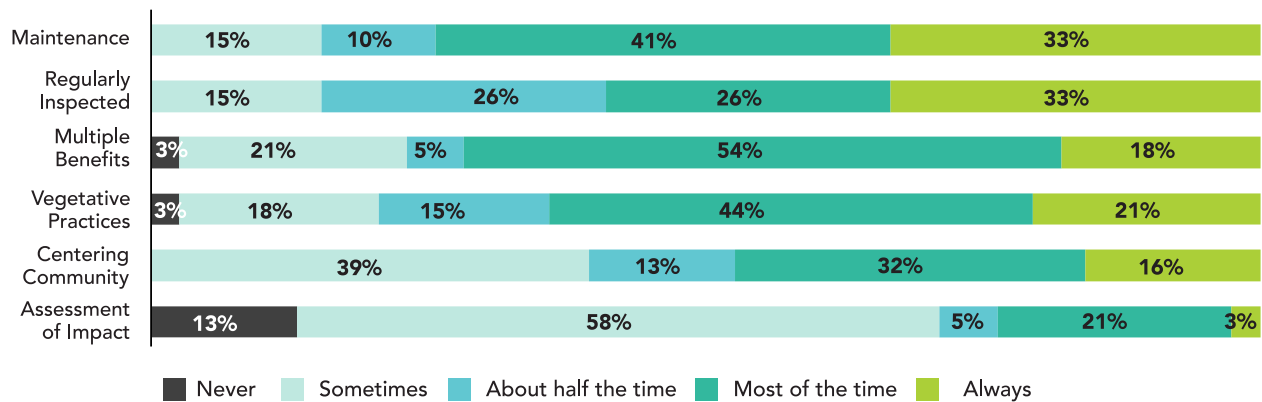
1. **Center community**
2. **Be designed to achieve multiple benefits**
3. **Prioritize vegetative practices**
4. **Be assessed for impact**
5. **Be maintained for the long-term**
6. **Be regularly inspected for performance**

“Green infrastructure is needed most in underserved and under-resourced neighborhoods. Those are the low-lying places that the water remembers as lagoons and marshes. The water always remembers where home is. **The water always comes back.**”

– Antoine (New Orleans, LA)

To understand the current state of public sector green infrastructure relative to these criteria, the survey asked SMOs how often they currently prioritize these six factors when they develop green infrastructure. The majority of respondents reported prioritizing most of these factors at least sometimes and more than half of respondents reported prioritizing the following criteria “most of the time” or “always”: Maintenance (74%), Multiple Benefits (72%), Vegetative Practices (65%), and Regularly Inspected (59%). However, responses also painted a clear picture that there is *significant* work ahead to prioritize all of these factors as a new standard. For example, 71% of respondents assess green infrastructure for impact only “sometimes” or “never” and 52% of respondents center community (the central recommendation of the [Equity Guide for Green Stormwater Infrastructure Practitioners](#)) only “about half the time” or “sometimes.” And even the most frequently prioritized criteria—maintenance—is left out of the equation at least half the time for a quarter of respondents.

Prioritization frequency



The following sections of the report dig deeper into the current state of public sector green infrastructure in the United States, with a close examination of the current states of equity, drivers, barriers, levers, and implementation, all of which culminate in a set of data-driven recommendations for the next steps on our shared journey to scale green infrastructure that better serves communities.

“We can work in partnership with residents to create holistic solutions to the many-intersecting challenges that communities like ours face. When residents are involved in identifying the problems and the solutions, we can develop strategies that can address many of the concerns we have, in addition to flooding.” – Vaughn (Washington, DC)



Image source: Green Infrastructure Leadership Exchange.

The State of Equity

The Exchange's 2021 [State of Equity Practice in Public Sector Green Stormwater Infrastructure](#), the precursor to this broader *State of Public Sector Green Stormwater Infrastructure* report, sought to answer critical questions about the extent to which green infrastructure leaders in the public sector are incorporating equity best practices into their work. The present report should be seen as complementary to the *State of Equity Practice* report and read in companionship. The headline findings of that report, which were developed through a survey of SMOs and a supplemental literature search, are:

1. Many public sector water entities are investing in building internal equity focused capacity.

This is happening through building staff equity awareness and knowledge, increasing funding allocations for equity targeted activities, and creating equity-enabling policies, plans, and evaluation systems. Concerted effort and an authentic desire to more deeply understand how equity does and can manifest within green infrastructure work is clearly evident.

2. There is still much work to be done and multiple barriers exist to achieving the full equity potential of green infrastructure.

When public sector entities were asked to rank the biggest challenges they face to centering equity and communities within green infrastructure efforts, the number one response was time. Resolving process and operations challenges, insufficient funding, and finding the acceptable balance between meeting regulatory mandates and addressing more socially driven accountabilities were also notable in the ranking order.

3. Unless these barriers are overcome, the public sector is likely to miss this opportunity.

A study by the New School Urban Systems Lab of the green infrastructure plans of 20 United States cities found that only 12% of plans recognized that some people are more vulnerable to health disparities, to environmental injustice, or to suffering from structural racism than others (2020). Without an explicit naming of this reality, and a deliberate decision to explore how green infrastructure can help reduce some of those vulnerabilities, it is unlikely that green infrastructure will fulfill its potential to deliver equity outcomes.

4. There is a clear path forward to ensure that the full equity benefits of green infrastructure are achieved. The State of Equity Practice

presented findings related to seven areas where SMOs have agency to advance more equitable green infrastructure: internal readiness; policy, planning, evaluating and reporting; centering community; siting and investment; preventing displacement; benefits-driven project development; and economic stability. The findings helped drive content for the resulting [Equity Guide for Green Stormwater Infrastructure Practitioners](#), developed in collaboration with the Exchange's public sector practitioner members. The *Equity Guide* is an action and evaluation roadmap that defines the green infrastructure industry's shared long-term equity goals, documents best practices, recommends metrics that help track progress toward those goals over time, and supports practitioners with tools to help implement recommendations.

Given the strong focus of the present *State of Public Sector Green Stormwater Infrastructure* report on developing an implementation baseline (i.e., the quantities, locations, and costs of green infrastructure built), the survey focused particular attention on digging deeper into the Siting and Investment findings within the original *State of Equity Practice* report.

EQUITABLE SITING + INVESTMENT

The *State of Equity Practice* report summarized findings on the degree to which project selection and investment approaches proactively consider their potential to advance equity. The report states that:

“...by embracing spatial equity considerations, green infrastructure leaders have the opportunity to gain a much deeper understanding of which communities within their jurisdictions have been or are currently suffering from a lack of investment. A spatial equity perspective can also lead to more proactive identification of those communities experiencing multiple forms of vulnerability and environmental injustice in the areas of housing, poverty, access to transportation, food, pollution and environmental burdens, etc. Green infrastructure can then be utilized as a tool to begin to make improvements in authentic partnership with affected communities.”

The original *State of Equity Practice* survey asked respondents: 1) the extent to which SMOs use demographic and/or environmental data to support more equitable siting or prioritization of future green infrastructure projects (56% affirmed they did); and 2) if they are not using such data/tools, what the main barriers/obstacles are to doing so (competing priorities, timelines, lack of political will, and regulatory limits were cited).

The *State of Public Sector Green Stormwater Infrastructure* survey probed deeper into these issues, asking SMOs to share details about their internal processes used to deploy equitable siting and investment practices, provide their definitions for “disadvantaged, socially vulnerable, and/or environmentally vulnerable communities,” and ultimately to estimate the percentage of their cumulative funding for green infrastructure capital projects that has been directed to projects in communities that are disadvantaged, socially vulnerable, and/or environmentally vulnerable, as they defined it.

.....

“Community engagement takes time and energy when done well, but the results are worth the energy because you’re maximizing the huge amount invested. Projects that involve residents from design through implementation are more customized to the needs of that particular neighborhood, and therefore are better maintained over time, even by residents. It’s harder to be a steward of a space I had no part in designing. Why spend all that money for a short-term, less effective product?” – Antoine (Milwaukee, WI)

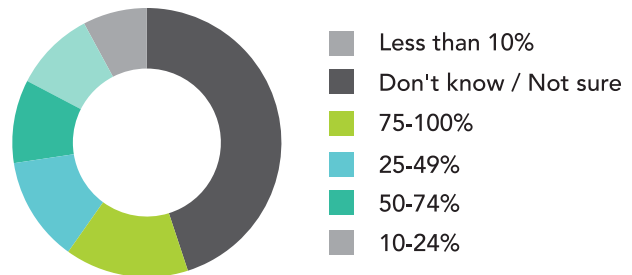
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KEY FINDING Despite the fact that only 18% of respondents to the *State of Equity Practice* survey indicated they are *not* using data to support more equitable siting and prioritization, the *State of Public Sector Green Stormwater Infrastructure* survey found that nearly half of respondents were unable to estimate the percentage of their cumulative funding for green infrastructure capital projects that has been directed to projects in communities that are disadvantaged, socially vulnerable, and/or environmentally vulnerable.

Defining Disadvantaged, Vulnerable Communities

The *State of Public Sector Green Stormwater Infrastructure* survey next invited respondents to “tell us about how your organization defines ‘disadvantaged, socially vulnerable and/or environmentally vulnerable.’” The wide ranging responses to this question illuminated the diverse approaches the public sector is currently taking to define such communities within their individual jurisdictions, apply tools to support data-driven analysis, and identify these communities geospatially.

What percent of your GSI funding is directed to high equity value communities?



When asked to “tell us about how your organization defines ‘disadvantaged, socially vulnerable and/or environmentally vulnerable,’” respondents’ answers varied from simple metrics, such as “*below median income,*” to multi-factor definitions like “*low-income, historically marginalized populations, communities of color,*” to highly nuanced definitions that elevated multi-faceted determinants of equity, like “*Populations...that have greater risk for poor health status, are underinsured, and lack healthcare access; experience significant disparities in life expectancy; are economically disadvantaged; racial and ethnic minorities; and low-income households with children or the elderly on free lunch assistance, and those that are homeless or have experienced homelessness in the last year*” and “*Communities that are Historically Underrepresented as groups who have been denied access and/or suffered past institutional discrimination in the United States. Examples include communities of color, veterans, people with disabilities, LGBTQ+, religious-based minorities, low-income communities, and more.*”

Respondents referenced the **use of a wide range of national, regional, and local tools to analyze and prioritize equity**, which included, but were not limited to: the CDC Social Vulnerability Index; USEPA’s EJScreen tool; Racial Equity and Social Justice (RESJ) tool; Trust for Public Land’s Urban Heat Island Index; a statewide “Environmental Justice Tracker”; a Countywide “Climate Change Risk Index”; and finally, municipal tools like a “Neighborhood Indicators Alliance Hardship Index.”

Some respondents also offered a glimpse at their specific **geospatial processes to prioritize equity**, such as the following:

- “We utilize planning level maps that combine various census level indices around socioeconomic disadvantage, race, English language learners, immigration, and health. Each of the maps show that there is a spatial relationship between race, socioeconomic status, and various measures of quality of life, and that the history of institutionalized discrimination continues to have impacts on residents of color and low-income residents today.”
- “Utilizing an environmental justice mapping tool to enhance understanding of environmental inequities and identify potential options for mitigation is an initiative laid out in our Fiscal Year 2021-2025 Strategic Plan. Initiative committee members are currently drafting a definition for Environmental Justice for the City as part of the work developing a mapping tool.”
- “We do our mapping prioritization based on race (prioritizing not-white) median income, life expectancy, and the city’s Neighborhood Indicators Alliance Hardship Index. We also consider language in our equity work and hope to expand on differently abled folks. We do consider car use/mobility and some health and planning related factors on top of the socioeconomic/racial equity factors.”

- “The Environmental Justice Communities Map (EJ Communities Map) describes areas that have higher pollution and are predominantly low-income. This map is based on a tool created by the state’s EPA branch & the state’s Office of Environmental Health Hazard Assessment that maps communities that are most affected by pollution and other health risks. This EJ Communities Map includes additional local data on pollution and demographics. The draft EJ Communities Map was released in December 2020. The map received public feedback for refinement, through a community engagement process, and is expected to be finalized in Fall 2022. Environmental Justice Communities are defined as the areas with the top 30% of cumulative environmental and socioeconomic vulnerability across the city.”

KEY FINDING Although the diversity of communities across the United States undoubtedly justifies variations in approach, it is clear that there is room for more industry training, guidance, and alignment around equitable siting and investment, and in particular, building the capacity of SMOs to track equitable siting metrics to foster accountability.

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“Government, know this: people in Black and Brown communities care about the issues of climate and resilience. We just can’t be at the table because working people are working– us not showing up at meetings doesn’t mean we don’t care. We care, because we have to! **We are the first and worst impacted by the effects of climate change and flooding, and we are consistently the last to recover.**” – Angela (New Orleans, LA)

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BRIGHT SPOT

Community-Led Equitable Green Infrastructure Projects in New Orleans, LA

Community Organizations + Foundation Collaboration

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The 7th and Upper 9th Wards and Tremé neighborhoods are some of the New Orleans communities most heavily impacted by flooding. With support from [The Kresge Foundation](#) and the [Institute for Sustainable Communities](#) (ISC), local community-based organizations have envisioned over 115 large-scale, nature-based solutions that will soon collect more than 6.5 million gallons of water ([Welch](#), 2021), and generate \$17 million of ecosystem service benefits annually. These community organizations include: Healthy Community Services in the 7th Ward, Bunny Friend Neighborhood Association in the Upper 9th Ward, and Greater Treme Consortium in the Treme neighborhood. Sonia Joshi, Director of U.S. Programs at the Institute for Sustainable Communities, says about the project, “The transformational work that the Water Wise Gulf Collective has been doing within various neighborhoods within New Orleans is creating local leaders who understand benefits of green infrastructure and climate resilience efforts to combat natural disasters. Additional investments are critical to ensure equitable and quicker flooding recovery.” Jeff Supak, co-founder of [Water Wise Gulf South](#), an organization that helped bring together

six Black- and women-led community organizations together in New Orleans around advancing nature-based solutions, said, “...our community-driven green infrastructure projects in New Orleans — and the associated economic benefits of creating resilient climate infrastructure — can serve as a playbook for government officials to help scale projects like ours nationwide utilizing more equitable community ownership models.” Lois R. DeBacker, Managing Director of The Kresge Foundation’s Environment Program, further celebrates this innovative project: “The community-based planning process led by the collective of Water Wise Gulf South organizations is a national model, which could be supported by philanthropy in other places. It lays the groundwork for government investment in green infrastructure that will serve often underinvested BIPOC communities well. Despite a lack of government funding, Black communities have designed an ingenious network of green infrastructure in New Orleans to solve for and mitigate flooding in their communities.”

Angela Chalk, Executive Director of Healthy Community Services — another Black-led community-based organization leading this effort — summarizes the need for equity in green infrastructure well: “We expect people — particularly Black and Brown communities — to be resilient following a natural disaster. What we really need is resilient green infrastructure to prevent flooding damage and help communities recover faster and more equitably. It’s time for the local, state and federal government to start listening to our communities and invest in solutions to build equitable and lasting green infrastructure that creates enormous economic opportunity.” These efforts appear to be making strides towards closing the equity gaps that the “[Is Green Infrastructure a Universal Good?](#)” project found in New Orleans: genuine inclusion of community groups in the full green infrastructure planning process, meaningful community engagement from policy makers and planners, and dedicated resources to support more inclusive and equitable practices through green infrastructure demonstration projects. (GI Equity, 2022).

“ When residents take matters into their own hands— for us, that means installing green infrastructure solutions where we know they are needed— the city government shouldn’t view that as ‘residents shaming them for failing to deliver’ on what they ‘should’ be doing for the people. We need to be reframing both the shared ownership of our challenges, and the co-creation of our solutions. ” —Angela (New Orleans, LA)



Angela Chalk, Executive Director for Healthy Community Services, discusses the selection of plants in the green infrastructure intervention with Ricky Ackerman, Climate Equity Director of the Detroit organization, Eastside Community Network. Both organizations are part of the Institute for Sustainable Communities’ Partnership for Resilient Communities, which supports Black- and Brown-led community-based organizations to become climate resilient.

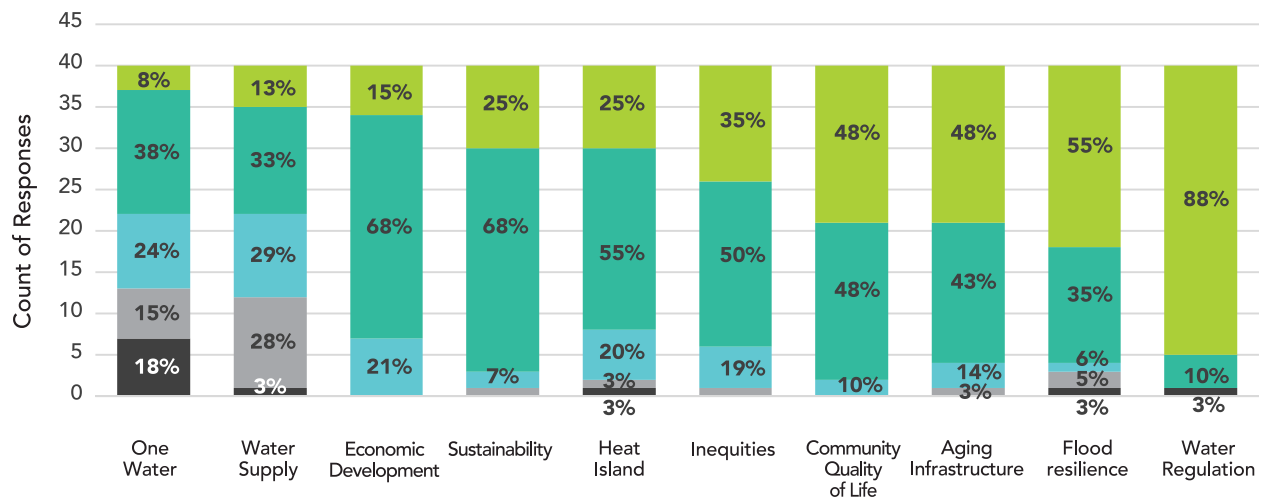
Photo Source: Institute for Sustainable Communities

The State of Drivers

A common refrain among public sector green infrastructure practitioners is the challenge of justifying green infrastructure in light of its real and perceived costs and risks, so the baseline *State of Public Sector Green Stormwater Infrastructure* survey asked local public sector organizations about the relative importance of a core list of drivers for green infrastructure in *making the case for green infrastructure locally*. The drivers range from regulatory drivers to flood resilience, to social and environmental co-benefits. The term “co-benefits” refers to the additive social and environmental benefits of green infrastructure that go beyond the primary intended benefit of water volume or quality management, such as community quality of life (e.g., active living, mental health, local pride and social cohesion, public safety, traffic calming) and sustainability (e.g., green space, pollinator habitat, energy efficiency, water reuse), many of which are associated with the addition of high quality green space in overpaved communities (Exchange, 2021). The survey presented 10 categories of drivers and asked respondents to rate them as “very important,” “somewhat important,” “not at all important,” “not applicable,” or indicate if they “don’t know” or are unsure.

KEY FINDING The 41 responses to this question in the baseline survey indicate that far and away, **regulation is currently the strongest driver for SMOs**, but co-benefits were not far behind. Flood resilience and supporting aging infrastructure are secondary drivers, and community quality of life and equity are tertiary drivers.

GSI support drivers



	One Water	Water Supply	Economic Development	Sustainability	Heat Island	Inequities	Community Quality of Life	Aging Infrastructure	Flood resilience	Water Regulation
Very Important	3	5	6	10	10	14	19	19	22	35
Somewhat important	15	13	27	27	22	20	19	17	14	4
Not at all important	9	10	7	2	6	5	2	3	1	0
Not applicable	6	11	0	1	1	1	0	1	2	0
Don't know / Not sure	7	1	0	0	1	0	0	0	1	1

- 1. Water quality regulatory requirements like Consent Decrees and NPDES Permits are a “very important” driver for green infrastructure for 88% of respondents.** This is a similar finding to the results of the WEF 2020 MS4 Needs Assessment Survey report, which found water quality as the second most important driver for planning and investment decisions, just behind aging infrastructure as the top most important driver within MS4 systems (2021). Notably, the use of green infrastructure to address conventional water management concerns such as regulation and aging infrastructure demonstrates increasing acceptance of green infrastructure as an appropriate and practical stormwater management solution. While not investigated directly in the 2022 survey, this success may be putting positive pressure on changing state and local regulations that have historically been barriers to adoption either because they expressly prohibit green infrastructure practices in favor of more traditional gray practices or because they fail to proactively articulate green infrastructure as a practice to be considered (WaterNow’s report, [Tap into Resilience: Pathways for Localized Water Infrastructure](#)). The importance of this driver in comparison to all other potential drivers indicates that the green infrastructure requirements established by regulation will largely define how green infrastructure is developed and funded. For example, if regulation is narrowly focused on managing water quality and quantity, green infrastructure standards will likely follow suit and de-emphasize the role of co-benefits. One respondent underscored this by adding a comment that “reducing combined sewer overflows” was a very important driver.
- 2. After regulation, respondents assigned the next highest ratings to flood resilience and pressure on aging drainage and wastewater systems.** More than half of respondents rated flood resilience as a “very important” driver for green infrastructure and another third rated it as “somewhat important,” demonstrating that green infrastructure is seen as a solution to create storage capacity for excess water during rain and snowmelt events when aging infrastructure cannot manage the volume of water and flood risk is elevated. Flood or hazard mitigation and resilience is often thought of as one of the key drivers to make the case for public sector investments in green infrastructure (Exchange, 2021). It is unsurprising to see the focus on flooding given its dominance in the news cycle in 2022, and the ways it can disproportionately affect lower income communities. A 2020 publication on [Flood exposure and social vulnerability in the United States](#) found that 19.4 million socially vulnerable people live in the highest risk areas for flooding, both in urban and rural regions of the United States (pg 446). Center for Neighborhood Technology (CNT) has led research into the relationship between green infrastructure and urban flooding, stating in [Increasing Funding and Financing Options for Sustainable Stormwater Management](#) that “The primary driver of urban flooding is an inflow restriction problem, meaning stormwater can’t enter the tunnel and pipe system fast enough during rain events and floods streets, yards, and buildings. A more effective solution is through a distributed, decentralized system of green stormwater infrastructure, which prioritizes infiltration and temporary on-site retention.”

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“In our community, which faces a whole lot of challenges, flooding still comes up as the highest priority for community members in areas with the most serious flooding because it affects daily life so profoundly.” – Meishka (Camden, NJ)

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BRIGHT SPOT

Advancing Flooding Resilience with Green Infrastructure in New York City, NY

NYC Department of Environmental Protection (NYCDEP)

New York City is increasingly focused on turning the city into a sponge through a comprehensive approach that adapts and builds upon the existing drainage and green infrastructure network to absorb, store, and transfer stormwater. After several unprecedented rainfall events in the early 2000s, the city began investigating the opportunities provided by innovative stormwater management solutions to help reduce combined sewer overflows to improve water quality, most notably using green infrastructure interventions to reduce the amount of stormwater that flows into the sewer system. More recent storms, such as Hurricane Henri and Ida in 2021 further demonstrated that the climate is changing and bringing more frequent, intense storms – often referred to as a “cloudburst” - that current stormwater infrastructure was never intended to manage ([Increasing Stormwater Resilience](#), 2022). The cloudburst management approach seeks to manage stormwater at the surface to minimize flooding caused by increased rain events due to climate change ([Rebuild By Design](#), 2021). The cloudburst program is going “green before gray” by prioritizing a handful of green solutions which are faster, less expensive, and less disruptive to implement than gray infrastructure, and that provides the multiple additional co-benefits for communities that gray infrastructure does not. Simply put, “Every drop of rain that can be captured and stored, or safely conveyed from where it falls, is one less drop that ends up in the streets, subways, and basements” ([Rebuild By Design](#), 2021).

3. After flood resilience and aging infrastructure, **the next two highest-rated drivers are increasing community quality of life** by supporting active living, mental health, local pride and social cohesion, public safety, and/or calm traffic), **and addressing inequities**. One survey taker underscored a driver embedded within community quality of life: “beautification in communities.

“ My neighbors are frustrated. I’m frustrated. They have regular flooding in their basements from combined sewer overflows, and there’s nowhere to turn to report issues or share what is happening. These issues are confusing and complex. My neighbors are rarely engaged by the local government or the utility. Many are renters and unsure how to navigate and advocate, compared to the white people in middle- and upper-class neighborhoods, and as a result their concerns seem to be deprioritized. **I see the City responding to other neighborhoods with higher quality amenities and more engaged representatives.** ” – Robin (Seattle, WA)

4. The next most influential drivers included **addressing urban heat; meeting other sustainability goals** related to green space, pollinator habitat, energy efficiency, air quality, and/or water reuse; and **economic development** including job creation and increasing local investment. One respondent noted that “climate resilience and framing green infrastructure in terms of climate resilience more broadly” was relatedly very important.

BRIGHT SPOT

Compelling Co-Benefits in San Francisco, CA

San Francisco Public Utilities Commission

The San Francisco Public Utilities Commission (SFPUC) launched its Green Infrastructure Grant Program in February 2019, making it the first stormwater grants program in the country to clearly require co-benefits as part of its program requirements. Sarah Bloom, a Senior Watershed Planner with the SFPUC, describes the program as, “the culmination of significant planning and extensive stakeholder outreach to build a meaningful tool for local property owners and the SFPUC as we work to reach our citywide stormwater management goals.” Building performance-based, multi-benefit green infrastructure is the first in its list of five key priorities to focus this program on sustainability and resiliency ([WaterNow](#), 2019). By establishing a minimum stormwater performance metric for all grant projects, the SFPUC was able to prioritize the application scoring on how projects best propose to deliver on their co-benefit requirements. This new scoring structure also incentivizes projects to put multi-benefit drivers at the front of the project, without sacrificing stormwater performance. The SFPUC defines these co-benefits as “community and environmental benefits” through a list of eight categories, two of which must be included in each project. These are: Environmental Justice, Public Access & Open Space, Community Engagement & Placemaking, Education and Watershed Stewardship, Green Infrastructure Job Training, Water Supply, Climate Resilience, and Biodiversity ([SFPUC](#), 2022). Perhaps more impactful than the upfront scoring, is that projects must maintain the impact of their selected co-benefits for 20 years, the same length required for maintenance of the stormwater management facilities.



Image Source: SFPUC

5. **Water scarcity/water supply**, and **One Water** are currently somewhat or very important for less than half of respondents. Only seven respondents (13% of the total) were from states in the southwest region with historic water scarcity issues and are more likely to be interested in these drivers. Findings related to One Water are consistent with findings in a [2022 State of One Water Survey](#) led by US Water Alliance, which found that only about 18% of respondents have “One Water” in their job title, job description, and/or part of their professional responsibilities; only about 15% of have state or local policies that require One Water or integrated planning efforts; and about 60% of respondents to the US Water Alliance “State of One Water” survey say they do not have a One Water Plan.

Other Drivers

Respondents were also invited to write in and rank any additional driver(s) important within their jurisdictions. Two write-in responses not captured above included; 1) policies that encourage or require “complete streets” of which green infrastructure is a common component; and 2) investors’ sustainability priorities when funding capital projects.



Image source: Green Infrastructure Leadership Exchange.

The State of Barriers

While the triple bottom line benefits of green infrastructure are widely acknowledged today, barriers to broad adoption persist. A 2011 US Water Alliance study, [Barriers and Gateways to Green Infrastructure](#), identified four main themes of barriers: technical and physical; legal and regulatory; financial; and community and institutional. These main themes continue to resonate over ten years later. Since the release of the 2011 study, we have seen reductions in technical and physical barriers as well as community and institutional barriers, while legal and regulatory barriers and funding and financing obstacles have remained pernicious. It should be highlighted that various institutions such as the Green Infrastructure Leadership Exchange, US Water Alliance, WaterNow Alliance, The JPB Foundation, Pisces Foundation, The Kresge Foundation, Spring Point Partners and other groups have strategically and successfully invested funding, resources, and time in lifting barriers in many respects. For example, the [Exchange's Green Infrastructure Library](#) (GI Library) now serves as a clearinghouse of information, performance data, design standards, best practices, and case studies related to green infrastructure to improve availability of these resources to the public and practitioners and move toward industry standardization.

A brief summary of common barriers found in the field today, founded on review of past surveys, reports, and analyses, is below. This section is intended to provide baseline context for the report and is not meant to be all-encompassing. While the barriers are broken out into categories and types, many barriers overlap.

PEOPLE BARRIERS

Lack of SMO Leadership

Lack of direction from top SMO officials that green infrastructure is a priority can lead to it being edged out by other traditional solutions viewed as “easier” or more efficient, particularly given this era of constrained public resources. Barriers preventing municipal and utility leaders and staff from investing substantially in green solutions include lack of understanding of the concept, competing political priorities, and general resistance to change and innovation.

Lack of Public Support and Understanding

Lack of public support and awareness—and a lack of effective and accessible messaging about green infrastructure and its benefits (both quantitative and qualitative)—continues to be a persistent barrier to securing sustainable local funding ([US Water Alliance](#), 2011).

One example showing how the field is making strides towards reducing this barrier is the rise in green infrastructure-specific leadership positions at SMOs and watershed organizations, which enable a stronger focus on using nature-based solutions. For example, in July of 2022, Boston established a new cabinet-level Director of Green Infrastructure position ([WEF](#)), which marks the first administrator of its kind to carry out green infrastructure policy for a major United States city.

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“GSI is a ‘nice to have’ that is by and large inaccessible to people living in [low-income, historically Black] communities like mine.” – Denzel (Baltimore, MD)

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Insufficient Workforce

There continues to be insufficient workforce to support green infrastructure, both within the water sector at large and specific to the construction and maintenance phases of green infrastructure implementation. While some cities have made progress toward effective green infrastructure and water workforce programs, these efforts have not yet risen to fully meet the need in this area. And underlying barriers, such as a lack of funding for maintenance overall and the seasonal nature of construction and maintenance work, continue to complicate efforts to create stable employment opportunities that offer a living wage ([Brown, S. and Sanneman, C.](#) 2017).

Local Resistance to Equitable Investments

The [State of Equity Practice in Public Sector Green Stormwater Infrastructure Baseline Report](#) by the Exchange in 2020 found that the biggest reported barrier to equitable investments in green infrastructure is a perceived lack of time, resources, and/or expertise by municipal or utility staff, which is often further stymied by a lack of political or leadership support. Recent federal initiatives, including the [Justice40 Initiative](#) which directs a goal of 40% of certain federal investments toward marginalized, underserved, and overburdened communities, could serve as motivation to overcome at least some of these barriers at the local level.

PROCESS BARRIERS

Lack of Green Infrastructure Standardization

One of the top barriers cited in the 2011 US Water Alliance study was a lack of standardization of green infrastructure, including a lack of national standards, lack of consistent ways to measure performance and quantify co-benefits, and lack of accepted evidence and data that enables clear standards. The report recommended a “central repository of best management practices, designs, and specifications,” which the Exchange has since advanced through its [GI Library](#). This report is also meant to be a meaningful step toward reducing the lack of standardization in this field. Other steps that have been taken includes a 2018 Water Research Foundation and ASCE report, [Recommended Operation and Maintenance Activity and Cost Reporting Parameters for Stormwater Best Management Practices Database](#), which created an initial list of O&M reporting parameters to work towards improved tracking of green infrastructure O&M activities and costs.

Silos and Limited Collaboration

Government structures that limit collaboration, inclusive of a lack of holistic planning that pairs green infrastructure with gray solutions and considers other community benefits, is often cited as a roadblock to scaling green infrastructure across the country. Given that green infrastructure comprises multiple disciplines, jurisdictions, and scales of management, developing these partnerships across all levels of government is critical to increasing uptake of green infrastructure ([Great Lakes Commission et al.](#) 2018).

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“No one in my community knows who to call when flooding is happening. Is it the city government? County government? Which department? **Stormwater knows no boundaries as it flows, and neither should our solutions.”** – Robin (Seattle, WA).

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Regulatory Obstacles

Barriers related to development regulations exist both for regulating bodies and those seeking to develop land. Regulating entities may have challenges to effectively creating, communicating, implementing, and enforcing green infrastructure regulations, particularly given constrained resources. On the flip side, developers often have limited knowledge of green infrastructure design and construction practices and face prolonged permitting processes, costing them valuable time and money ([Brown, S. and Sanneman, C., 2017](#)).

Obstacles to Procuring Green Infrastructure

There are various procurement methods available to support the planning, design, construction and maintenance of green infrastructure. Each method comes with tradeoffs between quality control, staff time required, and project cost. Selecting procurement methods that provide an acceptable balance between these three factors can be difficult when the project constituents involved with the implementation of green infrastructure do not agree on which factor is of primary importance. Many procurement processes also struggle to accommodate innovative approaches as well as smaller firms and CBOs, which may prevent cities and utilities from leapfrogging to smarter, more sustainable, and more resilient infrastructure solutions. See the [Procuring Resilience Toolkit](#) for more information.

Space Limitations for Implementation

Space limitations were cited as a major barrier in the US Water Alliance 2011 study, and continue to complicate attempts to implement green infrastructure on both public and private property. Setting aside the (often substantial) space needed for green infrastructure can compete with other goals, and there are multiple demands for space to balance both in the public right of way, including stormwater treatment, bicycle lanes, sidewalks, utilities, parking and traffic lanes, as well as on private property, including buildings, parking and loading facilities, accessory structures and uses, and landscaping requirements ([US Water Alliance, 2011](#)).

Lack of Effective Asset Management

Efficiently and effectively managing, tracking, and monitoring many green infrastructure assets with diverse ownership across a broad service area continues to be a common barrier in the green infrastructure field today. Asset management is an aspect of water infrastructure planning which is often underutilized, and incorporating green infrastructure, in particular, into asset management would lead to a better understanding of facility conditions as well as ongoing maintenance and resource allocation needs across the service area, which would aid in optimizing infrastructure performance ([Great Lakes Commission et al, 2018](#)).

FUNDING + FINANCING BARRIERS

Federal Funding Gap

Existing data suggest that as much as \$150 billion in investment will be required for communities to meet their stormwater management needs over the next 20 years ([Brown, S. and Sanneman, C., 2017](#)). Recent legislation has made strides toward meeting that need; the 2021 Bipartisan Infrastructure Law (“BIL”) alone allocates \$57.4 billion over five years to federal agencies, primarily US EPA, toward investments in the nation’s water infrastructure ([Brookings Metro, 2022](#)). While some federal agencies consider the use of nature-based solutions in prioritizing applications for funding, the extent to which BIL and other sizable investments in water infrastructure will accelerate the implementation of green infrastructure remains to be seen. Formula funding allocations also defer to state priorities and discretion for how funding should be distributed across jurisdictions, which, depending on state priorities, can create obstacles both to implementing green solutions as well as doing so equitably.

Insufficient Funding for Maintenance

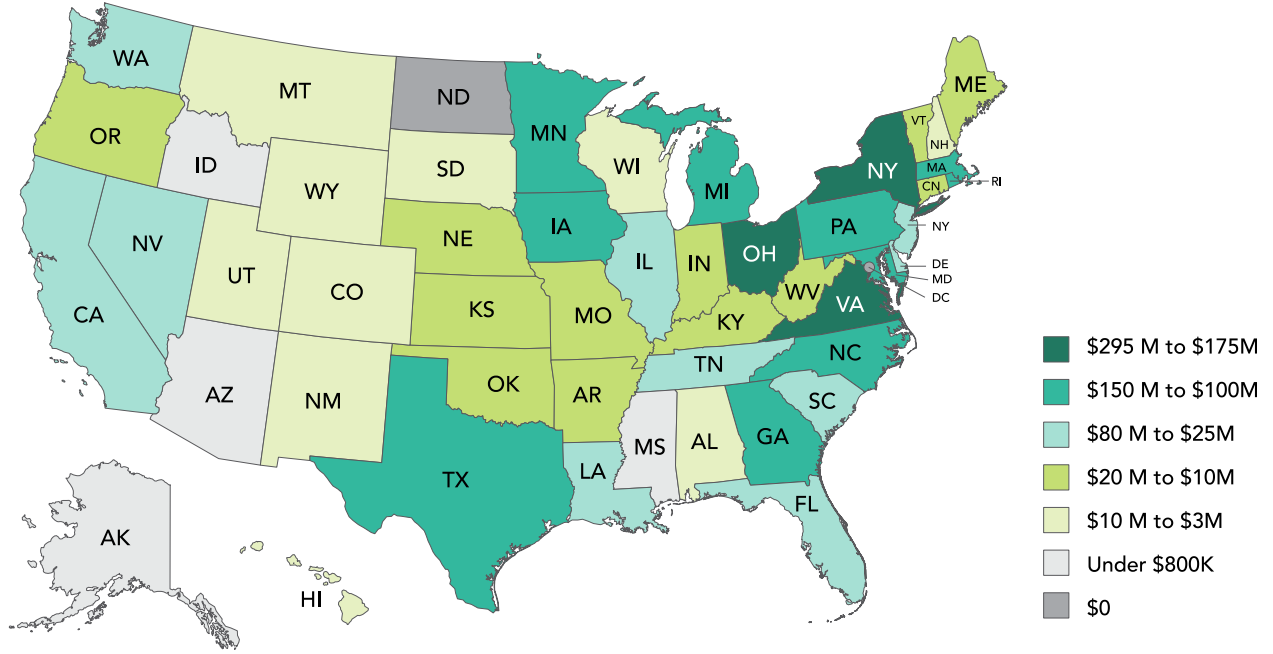
One of the most commonly reported barriers in the field today is that project owners often lack adequate resources to maintain green infrastructure performance over the life of the asset. Allowing funding available for green infrastructure design and construction to also be used for maintenance would greatly aid in reducing this barrier, ensuring that projects that are constructed function as designed, and fostering broader implementation of green infrastructure projects overall. In addition, the estimated cost of maintenance over the lifecycle of a green infrastructure project should be communicated to the project owner upfront to ensure that sufficient capacity and funding is available to steward their facility ([Great Lakes Commission et al, 2018](#)).

Financing

As a distributed form of stormwater management that can be located both on private and public properties with diverse ownership, a primary barrier to significant investment has been whether and to what extent SMOs can access their traditional capital financing tools – primarily tax-exempt municipal bonds – to scale up funding for green infrastructure programs. In 2017 the Governmental Accounting Standards Board, through the issuance of GASB62, clarified the accounting treatment of investments in distributed infrastructure and incentive/rebate programs, opening the door for leveraging traditional municipal financing tools to invest in large scale green infrastructure programs as part of long-term, comprehensive capital planning and budgeting process ([Earth Economics et al, 2018](#)).

In addition, the BIL will deliver \$11.7 billion over five years to EPA’s Clean Water State Revolving Fund (CWSRF), which will enable principal forgiveness loans and grants for 49% of funding (to be directed toward eligible types of projects and municipalities that meet affordability criteria) and low-interest loans providing low-cost financing for the remainder of funds. While green infrastructure projects have historically been awarded a very small percentage of CWSRF dollars, EPA’s emphasis on equitable distribution of projects and nature-based solutions may foreshadow greater opportunity for green infrastructure through SRF in the coming years.

**States Funding Green Infrastructure through the
Green Project Reserve, 2009-2022: \$2.5 Billion**

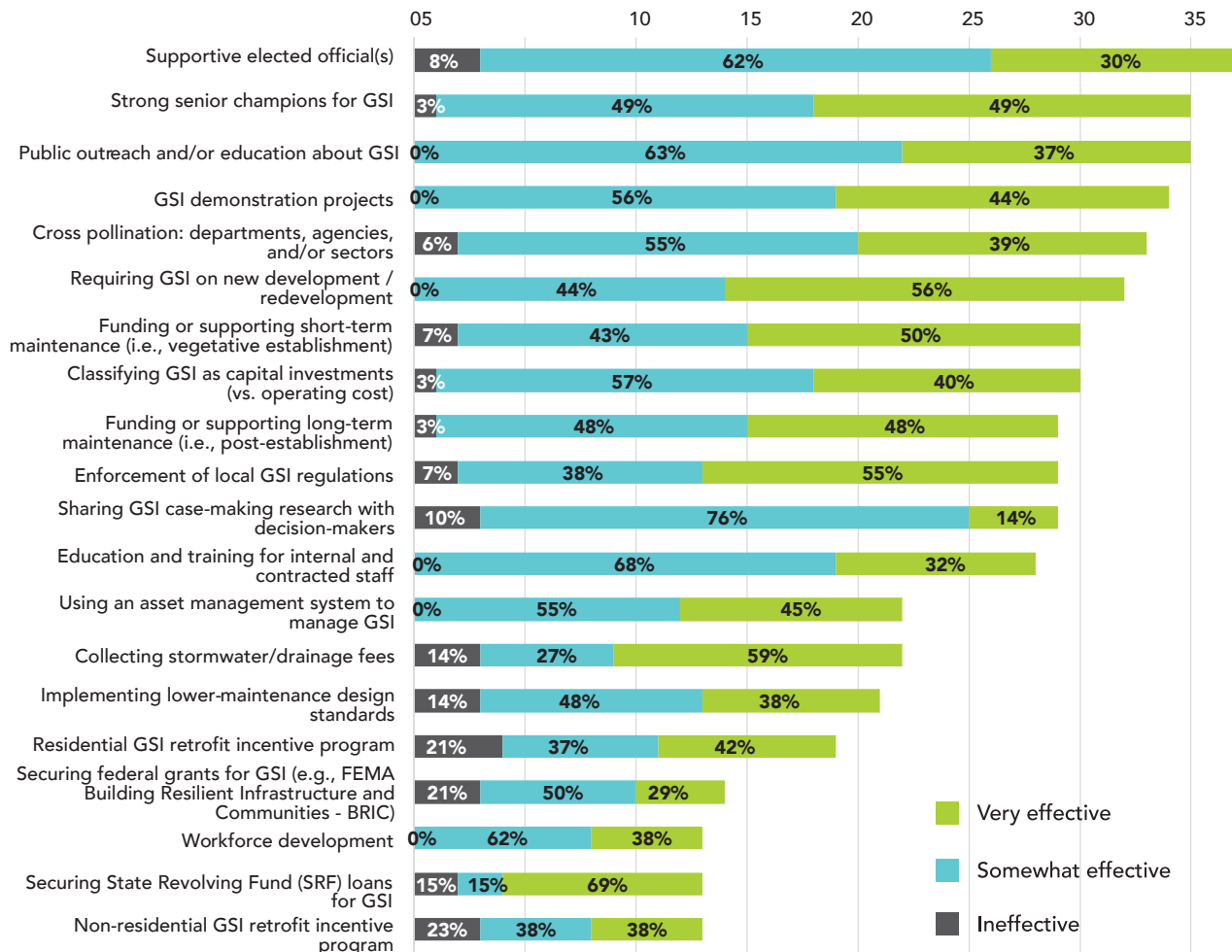


The State of Levers

Across the United States, forward thinking utilities, community leaders, social and environmental nonprofits, foundations, and others have developed a broad toolkit of levers to accelerate equitable, multi-benefit green infrastructure, but we do not have a shared, national perspective on where each lever is being pulled and how well it is working. In order to assess the effectiveness of levers, the Exchange collaborated with members, consultants, and advisors to develop a list of 20 common levers, and asked respondents to consider each. For each, respondents stated whether the lever is in use locally, and for those in use, they rated their effectiveness.

All graphical representations below show the full national data set. To view this data broken down by region, SMO size, and other filters, visit the data dashboard.

Effectiveness of used levers to scale GSI



KEY FINDINGS

- A key theme that emerges from the high level data above is that **the most used, and most effective, levers are those that are required for any successful government program: buy-in from, and engagement with, elected officials, senior SMO staff, other departments/agencies and the public.** Success in pulling these levers is a prerequisite to being able to advance more targeted levers that require funding allocations, policy change, and creative program and procurement structures.
- The next grouping includes **levers that require more funding and policy alignment. These include classifying green infrastructure as a capital investment, funding/supporting maintenance, requiring green infrastructure on new development, enforcing green infrastructure regulations, and investing in education and training for staff and contractors.** These also have relatively high uptake (roughly 70% of respondents reported using them) and they are considered effective.
- The bottom grouping has the lowest overall uptake (30-50% of respondents use them), however, the majority of those who use these levers find them successful. These **“emerging” levers include: standardizing green infrastructure design; using asset management systems; diversifying funding for green infrastructure through stormwater fees, federal grants, and/or SRF loans; investing in workforce development; and managing incentive programs to encourage voluntary retrofits on private properties.** These levers go beyond early adoption and seek to support green infrastructure at scale.

An in-depth look at each lever, including narrative descriptions from survey takers’ responses, is provided in [Appendix B](#). The levers have been divided into four categories.

- People Levers
- Process Levers
- Financial Levers
- Procurement Levers

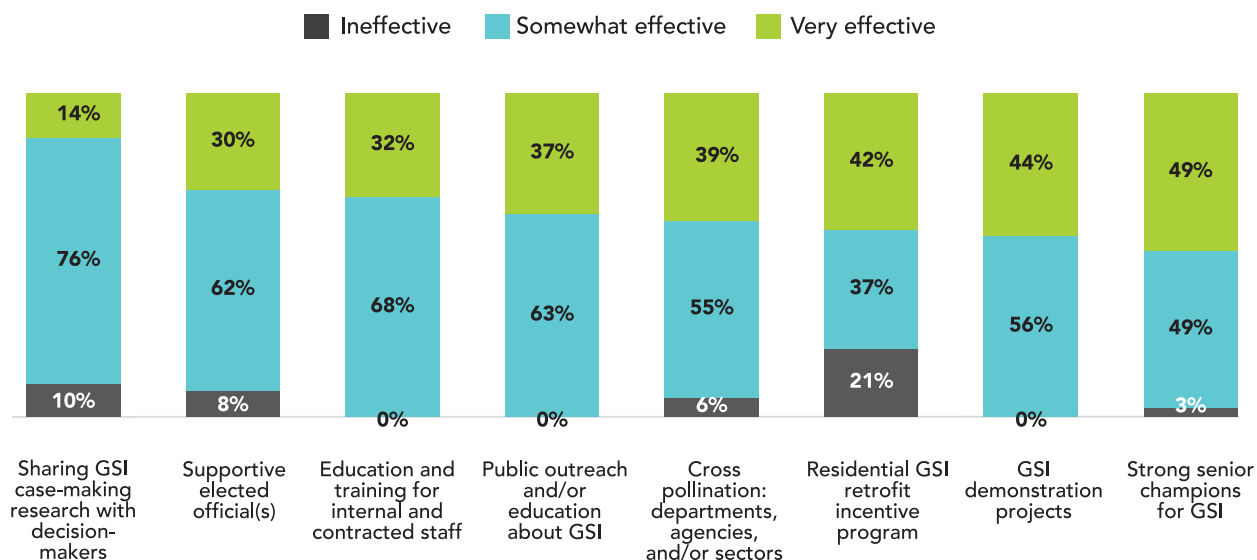
Within each category, the graphs are organized by the percentage of respondents who rated each lever as “highly effective” from highest (right) to lowest (left).

PEOPLE LEVERS

The first category focuses on levers that impact people’s awareness, acceptance, and support for green infrastructure. Many of these levers elicited strong, positive responses from survey takers; one stated, **“Strong champions** at the senior management and elected levels provide the *foundational* support it takes to underpin a green infrastructure program as well as move it forward.” Another focused on the importance of **collaboration across departments** like transportation and parks because, “we build more green infrastructure when everyone is working together to achieve the same goal.” Another theme that bubbled up was the value of **public education**. As one respondent put it, “Educating the public helps to reinforce or lead to supportive leadership, but it is also important for public acceptance of infrastructure that looks different and actions they can take to keep it performing well.” However, such responses were tempered by an acknowledgement that “staff turnover [creates] long arcs in establishing institutional knowledge and skills, which leads to things getting missed...Once things are built incorrectly or without proper oversight, our maintenance inherits additional problems, adding to our capacity challenges.” Another topic that hindered the success of people-related levers related to budget limits. For example, one respondent stated, “...Without funding options there is not much that can be done to reprioritize

limited funding where other infrastructure needs may dominate (i.e., roadway improvements, bike/pedestrian facilities, etc.).” Below is a graphical representation of the people levers’ use and effectiveness.

Effectiveness of levers to scale GSI - people levers



The table below offers a summary of the survey data related to People Levers. Full data and graphics are available in [Appendix B](#). The table is organized by the category of people including leaders, public sector staff, and the general public; within each category, the levers are organized by the greatest number of respondents who rated the lever as “highly effective.”

Category	Lever	Description	% Using	% Rated as Effective
LEADERS	<i>Strong senior champions for green infrastructure</i>	SMO senior staff (GM, CEO, Director of Public Works, etc.) and public leaders (Mayor, City Council President, etc.) can both advocate for, and prioritize, investments in green infrastructure.	90%	97%
	<i>Supportive elected officials</i>	Elected officials (City Council, Commissioners, etc.) that are aligned with staff in commitment to green infrastructure can direct funding and other resources (staff time, etc.) to green infrastructure programs. They also effectively communicate the benefits of green infrastructure to their constituents.	95%	92%
	<i>Sharing green infrastructure case-making research with decision-makers</i>	Research efforts to make the case and provide evidence to policymakers and decision makers can help “unstick” investments in green infrastructure. Examples can include official databases of BMPs and O&M procedures, and research into quantification of co-benefits.	74%	90%

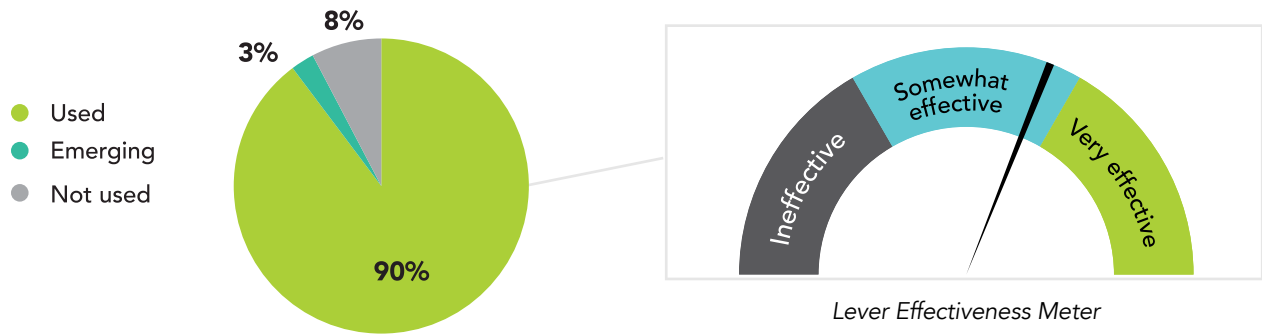
Category	Lever	Description	% Using	% Rated as Effective
STAFF	<i>Cross pollination between departments, agencies, and sectors</i>	Better coordination across public boundaries, as well as between public investments and private development, can drive higher impact solutions.	87%	94%
	<i>Education and training for internal and contracted staff</i>	Internal education and training efforts increase a department's comfort level with green infrastructure, with the goal of increasing internal adoption.	74%	100%
PUBLIC	<i>Public outreach and/or education about green infrastructure</i>	Communication and education campaigns seek to drive public understanding of, and demand for, investments in green infrastructure. This can include creating public awareness of the costs of unmanaged stormwater and flooding, and the multiple benefits of green infrastructure.	90%	100%
	<i>Green infrastructure demonstration projects</i>	Demonstration projects can test new approaches to green infrastructure planning, design, implementation and maintenance, as well as provide real world examples of the positive impacts of green infrastructure. The goals of demonstration projects may include, but are not limited to, reducing risk, testing out new approaches prior to making larger investments, and increasing both internal and public buy-in.	87%	100%
	<i>Residential green infrastructure retrofit incentive programs</i>	Residential green infrastructure incentive programs bring awareness and direct benefits to individual households. Although these programs do not result in as many gallons managed as other program models, they can make a difference within individual households to help address drainage issues, as well as drive public awareness and demand for broader investments in green infrastructure.	53%	79%

LEVER SPOTLIGHT. The people-related lever with the highest number of respondents who rated it “Very Effective” was **Strong senior champions for green infrastructure** because SMO senior staff and public leaders can both advocate for, and prioritize, investments in green infrastructure.

- 90% of respondents reported that they have strong senior champions for green infrastructure.
- Among respondents who use this lever:
 - 97% stated that it was somewhat or very effective.
 - Less than 3% responded that it was ineffective.
 - The most frequent responses were somewhat effective and very effective.

To access a similar analysis for each lever, see Appendix B.

Strong senior champions for GSI



BRIGHT SPOT

Breaking Down Silos in Seattle, WA

Seattle Public Utilities (SPU)

Seattle Public Utilities' (SPU) Green Stormwater Infrastructure (GSI) Program is a leader in fostering intersectional discussions across traditionally siloed city departments, and in partnerships with developers, as a strategy for expanding the city's GSI footprint. Developers are already required to design and construct GSI as part of minimum stormwater code requirements, but typically only to manage runoff that falls on the project parcel.

From a permitting perspective, a project's parcel and right-of-way requirements are often overseen by city staff in multiple departments, which presents challenges to realizing more innovative solutions that manage stormwater runoff beyond the parcel boundary. SPU's "Beyond Code" GSI Partnership Program offers incentives, technical assistance, and shared long-term maintenance for projects that construct additional GSI to manage surfaces that wouldn't otherwise be treated, often from surrounding roadway. Program staff act as the connective thread between developer design teams, permit review staff in the construction and inspections and transportation departments, and SPU engineering and operations and maintenance crews, coordinating design feedback across multiple permitting processes to ensure continuity and keep the project's overall schedule on track.

A recent example of this citywide collaboration is the [Northlake Commons](#) project situated on Lake Union, an important water body that supports migrating salmon and recreation alike. SPU worked closely with the developer and city partners to design a regional bioswale on the parcel to receive and treat right-of-way runoff routed from the surrounding roads before it discharges to the lake. Once completed in 2023, the project will treat almost two acres of runoff it would not otherwise have to treat through standard compliance with code. By bringing City staff and developers together to co-design and permit GSI that both meets and exceeds stormwater code requirements, SPU helps make space for solutions with benefits beyond the parcel that support the broader vision of a community-centered utility ([US Water Alliance, 2020](#)).



Image Source: [Northlake Commons | Weber Thompson](#)

PROCESS LEVERS

The second category focuses on levers that address some of the process-related challenges with scaling green infrastructure, such as maintaining living infrastructure, integrating it into building codes, and enforcing regulation.

Adoption of **development codes** that require green infrastructure generated the largest numbers of positive narrative comments. One respondent stated that, "Development regulations and enforcement of these regulations are effective because they create a standard for implementation that applies broadly and they are backed by private sector funding which is more accessible than public sector funding." Several respondents commented on the sheer volume of projects generated by this strategy and several stated that it drives the majority of green infrastructure development within their jurisdictions.

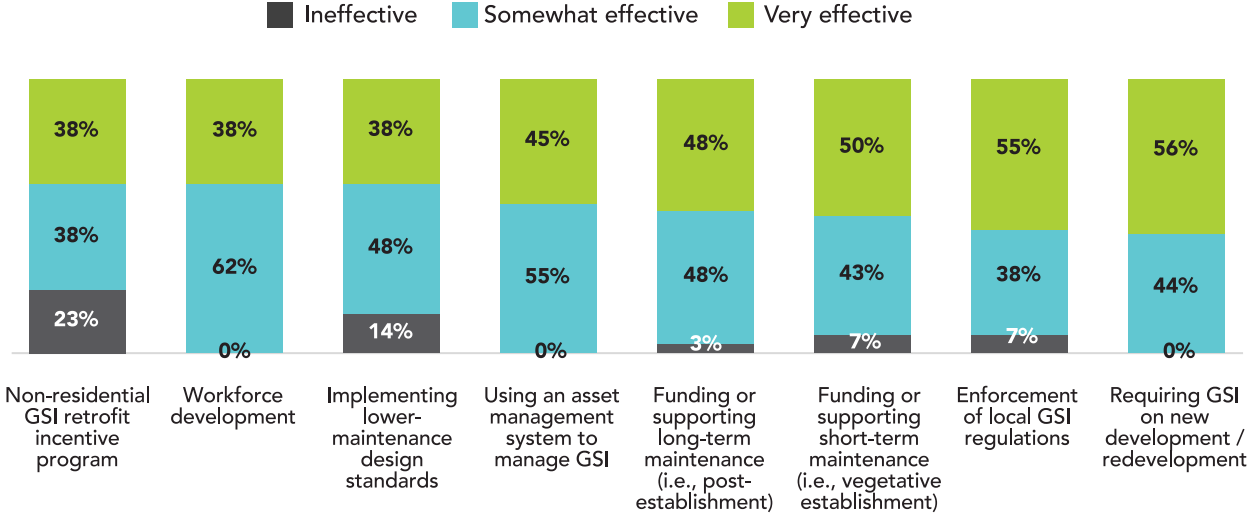
The topic of **maintenance** elicited more divergent responses. On the positive side, one respondent stated that, "Developing, funding, and staffing a permanent maintenance program early in the life cycle of green infrastructure funding and construction was paramount to being able to quickly develop and build the site-scale and regional green infrastructure we have today. Without an answer for 'how will it be maintained,' it would have been far more difficult to get buy-in." However, several wrote about the difficulty of resourcing maintenance. One summed it up succinctly saying that, "Maintenance continues to be the most difficult part of our program." Even with lower maintenance design standards, one stated, "maintenance is continually challenging and certain classes of facilities perform poorly."

Workforce development was described in narrative comments as "burdensome," "hard" and threatened by staff turnover, however all respondents who used this lever described it as "somewhat" or "very effective" because, as one respondent put it, "we expect this to be the most effective long-term lever."

When it came to **non-residential incentive programs**, some of the biggest barriers described were the inability to offer large enough incentives to drive uptake, and urban density that limits opportunities for cost effective green infrastructure. However as one respondent put it, "the top most effective levers for accelerating green infrastructure are requirements on private development and retrofit incentive programs. Taken together, these provide a stick and carrot approach."

Below is a summary graphical representation of the Process Levers' use and effectiveness.

Effectiveness of levers to scale GSI - process levers



The table below offers a summary of the survey data related to Process Levers. Full data and graphics are available in Appendix B.

Category	Lever	Description	% Using	% Rated as Effective
REGULATION	<i>Requiring green infrastructure on new development / redevelopment</i>	Development regulations drive investment in green infrastructure from both private and public real estate owners. Common strategies include “sticks” like onsite retention requirements and greened area ratios; “carrots” such as accelerated permitting, property tax abatements, and zoning bonuses; and alternative compliance programs like in-lieu fees and credit trading.	89%	100%
	<i>Enforcement of local green infrastructure regulations</i>	Enforcement includes measures taken to increase compliance with green infrastructure regulations and ensure ongoing performance of installed green infrastructure. Examples include self-reporting, inspections, and penalties.	81%	93%
O&M	<i>Using an asset management system to manage green infrastructure</i>	Asset management systems leverage technology and best practices to efficiently track and monitor many green infrastructure assets with diverse ownership across an SMO’s service area.	59%	100%
	<i>Funding or supporting short-term maintenance (i.e., vegetative establishment)</i>	Allocating a sustainable source of funding to vegetative establishment helps green infrastructure assets survive the highest-risk period of plant growth, increasing the likelihood of long-term performance.	79%	93%
	<i>Funding or supporting long-term maintenance (i.e., post-establishment)</i>	Allocating a sustainable source of funding to long-term maintenance helps ensure long-term performance and stewardship of BMPs while building contractor pools to grow the green infrastructure ecosystem, creating efficiencies and competition that can drive down costs over time.	81%	97%
	<i>Implementing lower maintenance design standards</i>	Green infrastructure design standards that prioritize manageable maintenance requirements can help streamline the project design process and simplify maintenance training requirements, leading to more consistently applied maintenance tasks and increasing the likelihood of long-term performance.	58%	86%

Category	Lever	Description	% Using	% Rated as Effective
WORKFORCE	<i>Workforce Development</i>	Workforce development programs seek to recruit, train, and support a local workforce to meet the contracting needs of green infrastructure development, especially for construction and maintenance.	35%	100%
INCENTIVES	<i>Non-residential green infrastructure retrofit incentive program</i>	Non-residential green infrastructure incentive programs offer grants, incentives, and technical assistance to offset (in full or in part) the cost of green infrastructure retrofits on large commercial, institutional, and industrial properties with high impervious surface (e.g., roof and parking areas).	35%	76%

LEVER SPOTLIGHT. The process-related lever with the highest number of respondents who rated it “Very Effective” was **Requiring green infrastructure on new development / redevelopment**: Development regulations drive investment in green infrastructure from both private and public real estate owners. Common strategies include “sticks” like onsite retention requirements and greened area ratios; “carrots” such as accelerated permitting, property tax abatements, and zoning bonuses; and alternative compliance programs like in-lieu fees and credit trading.

Requiring GSI on new development / redevelopment



- 89% of respondents reported that they require green infrastructure on new development or redevelopment.
- Among respondents who use this lever:
 - 100% stated that it was somewhat or very effective.
 - No one responded that it was ineffective.
 - The most frequent rating was very effective.

To access a similar analysis for each lever, see Appendix B.

BRIGHT SPOT

Prioritizing Maintenance in Milwaukee, WI

Milwaukee Metropolitan Sewerage District

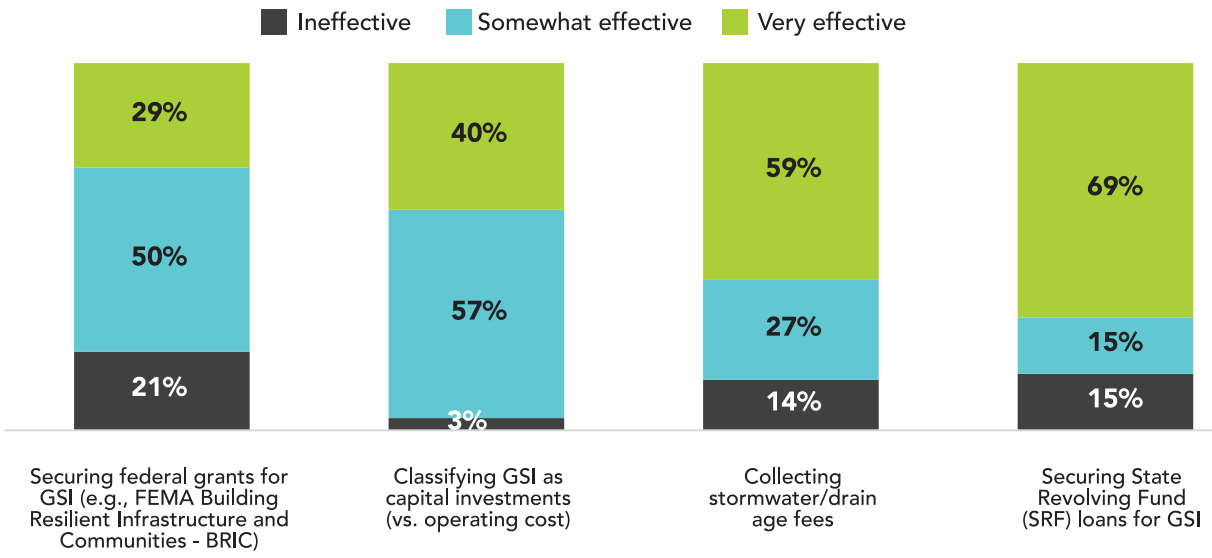
The Milwaukee Metropolitan Sewerage District (MMSD) is making thoughtful strides in addressing the issue of maintenance for green infrastructure installations. MMSD's survey response elevated maintenance funding as one of the top three most effective levers for accelerating green infrastructure. Its focus on maintenance is underscored by its investments in making progress towards creative approaches to maintenance over the past several years. In 2016, MMSD invested in creating an [O&M Implementation Framework](#), and then built on that with the workforce development-focused [An Equitable Water Future: Milwaukee](#) report, developed as part of the US Water Alliance's Equitable Water Future Roadmap. These reports guide implementation, including, most recently, its [Fresh Coast Protection Partnership and Fresh Coast Green Communities](#) programs, both examples of green infrastructure programs that make a strong commitment to vegetation establishment. MMSD requires an 11-year limited term conservation easement on their green infrastructure investments and will be paying for the first five years of vegetation establishment through their two new programs.

FINANCIAL LEVERS

The third category focuses on levers that match the right funding and financing sources to the relevant activities across the green infrastructure life cycle. While as one respondent put it, "Reliable funding [from **stormwater fees**] is critical for ongoing stormwater work," four respondents described their discouraging efforts to enact this lever as caused by lack of voter support, negative perceptions of a new "tax," and legal challenges. Classifying green infrastructure as a **capital expenditure** is a high-yield strategy - as one respondent explained, "[it] allows us to move from smaller rain garden systems to larger infiltration galleries and other stormwater facilities creating a greater impact to the environment. This has been facilitated by leveraging our stormwater fee for low-interest loans." However, respondents also acknowledged that it can be "a bit messy and cumbersome." **Federal grant programs**, while scoring relatively high on effectiveness, were almost universally described as "burdensome" by respondents who used this strategy because of the "staff resources or senior level support to apply or manage the grants."

The Exchange recognizes that there are many additional financial levers in use, including but not limited to innovative finance like bonding, monetizing benefits, and bringing together multiple budget streams around local priorities. The four focal financial levers were prioritized because of their current use at scale, but the Exchange expects to explore additional financial levers in future report iterations. Below is a summary graphical representation of the four selected financial levers' use and effectiveness.

Effectiveness of used levers to scale GSI - financial levers



The table below offers a summary of the survey data related to Financial Levers. Full data and graphics are available in Appendix B.

Lever	Description	% Using	% Rated as Effective
Collecting stormwater / drainage fees.	Stormwater / drainage fees generate a dedicated revenue source that can fund investments in green infrastructure.	65%	86%
Classifying green infrastructure as capital investments (vs. operating cost)	Accounting for green infrastructure as a capital investment rather than an operating cost enables access to larger pools of capital from traditional municipal financing sources.	83%	97%
Securing State Revolving Fund (SRF) loans for green infrastructure	State Revolving Funds (SRF) provide low interest, long-term sources of financing that can be used to fund green infrastructure. Many SRF programs also offer principal forgiveness and grants for disadvantaged communities.	35%	85%
Securing federal grants for green infrastructure (e.g., FEMA Building Resilient Infrastructure and Communities - BRIC)	Green infrastructure projects are increasingly eligible for a growing number of federal grant programs.	39%	79%

LEVER SPOTLIGHT. The funding-related lever with the highest number of respondents who rated it “Very Effective” was *Securing State Revolving Fund (SRF) loans for green infrastructure*: State Revolving Funds (SRF) provide low interest, long-term sources of financing that can be used to fund green infrastructure. Many SRF programs also offer principal forgiveness and grants for disadvantaged communities.

Securing State Revolving Fund (SRF) loans for GSI

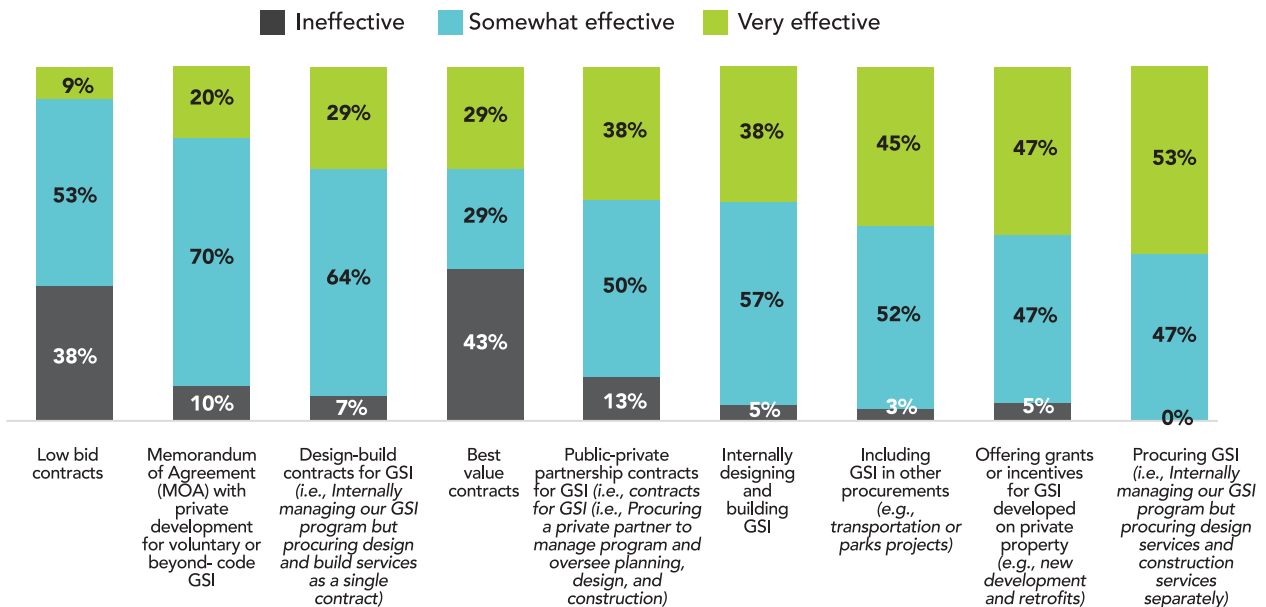


- Only 35% of respondents reported that they have secured State Revolving Funds for green infrastructure. Notably, an additional 22% are planning to begin using this lever in the near term.
- Among respondents who use this lever:
 - 85% stated that it was somewhat or very effective.
 - 15% responded that it was ineffective.
 - The most frequent rating was very effective.
 - To access a similar analysis for each lever, see Appendix B.

PROCUREMENT + DELIVERY LEVERS

A final category focuses on levers that support effective procurement and implementation. In general, even the most highly rated procurement and alternate delivery models sparked comments about the challenges inherent in delivering a procurement system that is efficient, effective at prioritizing the best projects, friendly to small businesses trying to compete effectively, and that works within existing state laws. It was clear from comments that SMOs are limited by state laws governing procurement and are struggling to come to the best solutions that balance quality, effectiveness, capacity, cost, and risk allocation. Below is a summary graphical representation of the procurement and delivery levers' effectiveness as perceived by the SMO administering the procurement.

Effectiveness of used levers to scale GSI - procurement + delivery levers



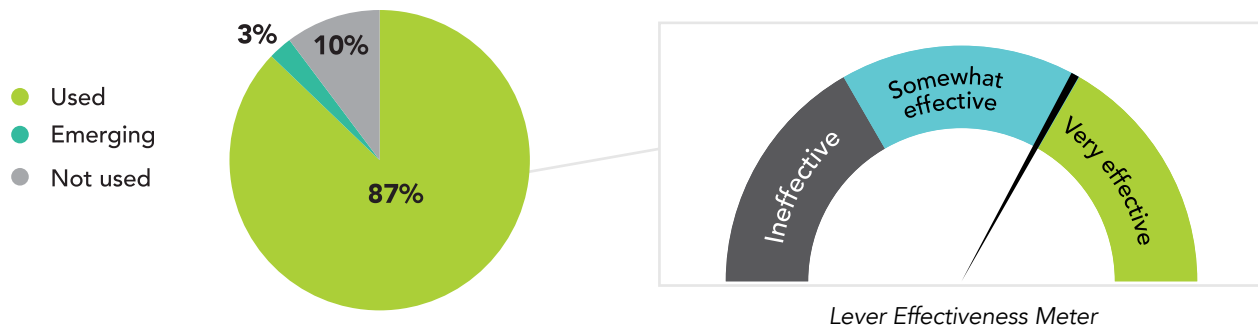
The table below offers a summary of the survey data related to Procurement Levers. Full data and graphics are available in [Appendix B](#). The levers are categorized in the table below as traditional procurement strategies or alternate delivery models. Within each category they are ordered by the number of respondents who rated them “highly effective.”

Category	Lever	Description	% Using	% Rated as Effective
PROCUREMENT	<i>Procuring green infrastructure</i>	Many SMOs manage their own green infrastructure program with internal staff, but individually procure design, construction, and maintenance services.	87%	100%
	<i>Internally designing and building green infrastructure</i>	Some SMOs manage all aspects of planning, designing, building and maintaining green infrastructure with internal staff.	57%	95%
	<i>Best value contracts</i>	Among SMOs that procure green infrastructure, some SMOs request proposals for the installation of green infrastructure where the scope is not strictly defined and the proposer has discretion as to how they will meet the goals of the contract. The SMO then selects the proposal which provides the overall best value and not simply the lowest cost proposal.	26%	57%
	<i>Low bid contracts</i>	Among SMOs that procure green infrastructure, many use low-bid contracts, meaning they intend to accept the lowest bid offered by a qualified contractor.	92%	62%
ALTERNATIVE DELIVERY	<i>Offering grants or incentives for green infrastructure developed on private property</i>	Some SMOs incentivize inclusion of green infrastructure in new development or through existing property retrofits.	54%	95%
	<i>Including green infrastructure in other procurements</i>	Many SMOs include green infrastructure requirements in procurements for transportation, parks, or other infrastructure projects.	78%	97%
	<i>Public-private partnerships</i>	A small but growing number of SMOs procure a contractor to manage their green infrastructure program, overseeing planning, design, construction, and in some cases, maintenance.	25%	87%

Category	Lever	Description	% Using	% Rated as Effective
ALTERNATIVE DELIVERY	<i>Design-Build contracts for green infrastructure</i>	Among SMOs that procure green infrastructure, some internally manage their green infrastructure programs, but procure design and construction within a single “Design-Build” contract.	42%	93%
	<i>Memorandum of agreement with private development for voluntary or beyond-code green infrastructure</i>	A limited but growing number of SMOs work with private developers to encourage green infrastructure that goes beyond code requirements.	31%	90%

LEVER SPOTLIGHT. The procurement-related lever with the highest number of respondents who rated it “Very Effective” was *procuring green infrastructure*. This was defined as the situation in which SMOs manage their own green infrastructure program with internal staff, but individually procure design, construction, and maintenance services.

Procuring GSI



- 87% of respondents reported that they manage their own green infrastructure program with internal staff, but individually procure design, construction, and maintenance services.
- Among respondents who use this lever:
 - 100% stated that it was somewhat or very effective.
 - No one responded that it was ineffective.
 - The most frequent rating was very effective.

To access a similar analysis for each lever, see [Appendix B](#).

The State of Implementation

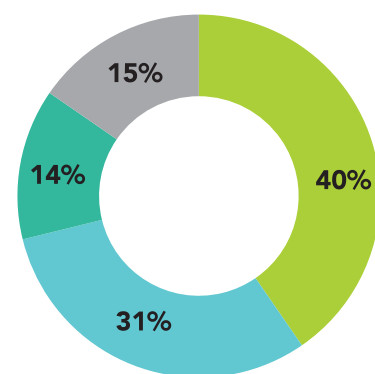
One of the goals of this report is to establish a baseline to better understand the current state of local public sector green infrastructure implementation, including how much has been implemented, where it has been implemented, how much it costs, and how well it is serving communities. The following section highlights key data from the Inaugural *State of Public Sector Green Stormwater Infrastructure* survey.

A word of caution when interpreting this data:

It is important to acknowledge that SMOs measure and report green infrastructure efforts in several different ways, including: total runoff area captured; impervious runoff area captured; volume of water stored in green infrastructure features; and nutrient capture. Additionally, SMOs design their green infrastructure for varying storm frequencies and/or percentage of total storm events captured. In order to aggregate survey results, various assumptions were made to convert all data to a uniform unit of measurement. Users of the data contained in this report should be aware that the raw data collected from survey respondents may have been modified in order to report data in a uniform and consistent manner.

One of the core areas of variability across the country is in the ways that SMOs measure the quantity of green infrastructure built. **As shown in the graph below 71% of respondents track impervious acres managed and 45% of respondents track gallons managed (with 31% of these measuring both).** However, 6% responded that they use an altogether different unit of measure from different volume metrics (e.g., “inches per hour”), to pollutants removed (e.g., sediment removed), to BMP counts (e.g., bioswales per year). A full summary of responses is available as an Appendix.

Measurement unit(s)
to quantify GSI



- Impervious acres / Greened acres / Drainage acres
- Both Gallons & Acres
- Gallons Managed
- Other

QUANTITY AND LOCATION OF GREEN INFRASTRUCTURE BUILT TO DATE

The survey asked respondents to estimate the cumulative amount of green infrastructure that their organization has built, incentivized, or required through regulations to date on the following land types: right-of-way (publicly and privately developed), private new development/redevelopment, and parcel retrofits (public and private). While attempts were made to ensure clarity around definitions of each land type, it is important to acknowledge that SMOs can vary in how they define these land

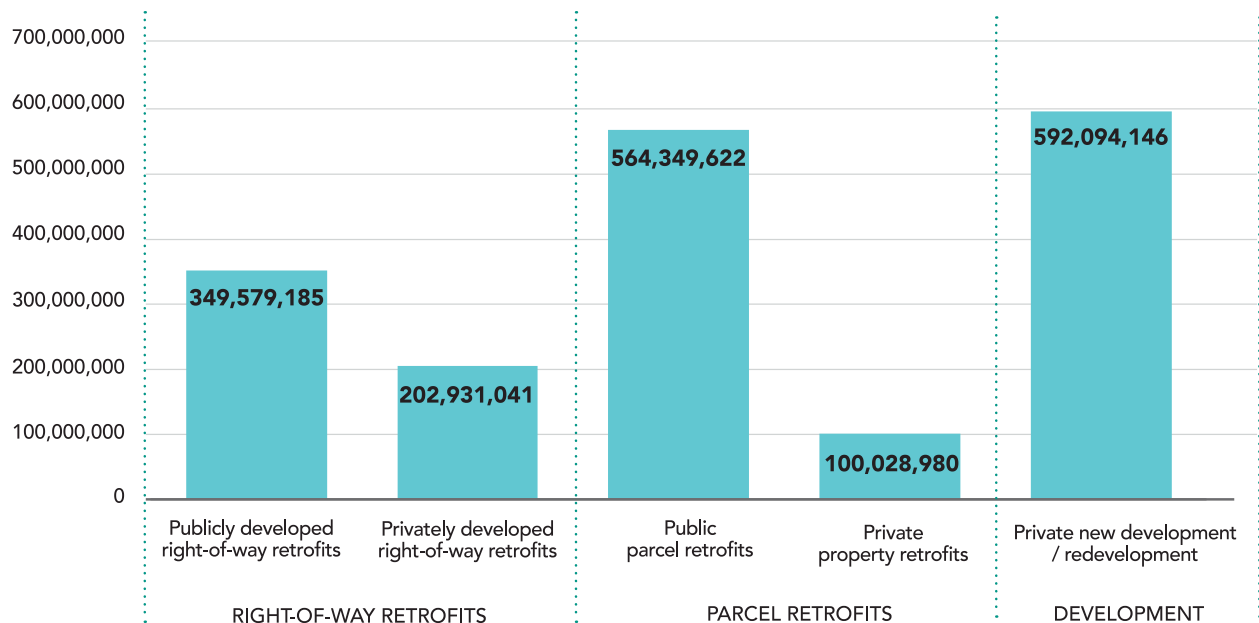
types, which may have resulted in inconsistent interpretation in some cases. Below are summary graphs of the data collected from respondents. Access the dashboard to apply a range of filters to the data and access national averages.

Cumulative gallons of capacity by land type³

KEY FINDINGS

- 37% of gallons managed through green infrastructure are from parcel retrofit projects (85% public property retrofits, 15% private property retrofits).
- 33% of gallons managed through green infrastructure are from private new development / redevelopment projects.
- 31% of gallons managed through green infrastructure are from projects in the public right of way (63% of that is publicly developed, 37% is privately developed).

Total gallons per land type



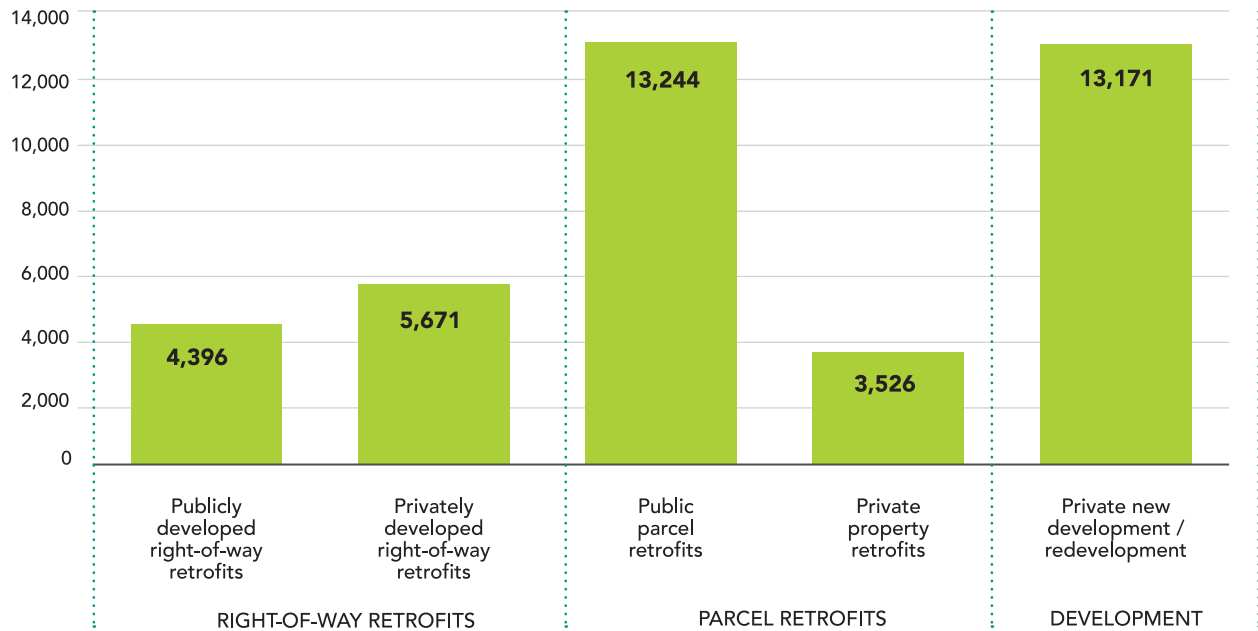
Cumulative managed acres built by land type

KEY FINDINGS

- 42% of acres managed with green infrastructure are from projects on parcels (79% public parcel retrofits, 21% private property retrofits).
- 33% of acres managed with green infrastructure are from private development or redevelopment projects.
- 25% of acres managed with green infrastructure are from projects in the public right of way (44% of that is publicly developed, 56% is privately developed).

³ One respondent noted, "For questions where green infrastructure is being, or will be built, there wasn't an option regarding Public New Development/Redevelopment. We have another 200,000 gallons treated on new public development. As a growing community, we have very little retrofitting compared to developed urban areas."

Total acres per land type



BRIGHT SPOT

Public Incentives for New Development in San Antonio, TX

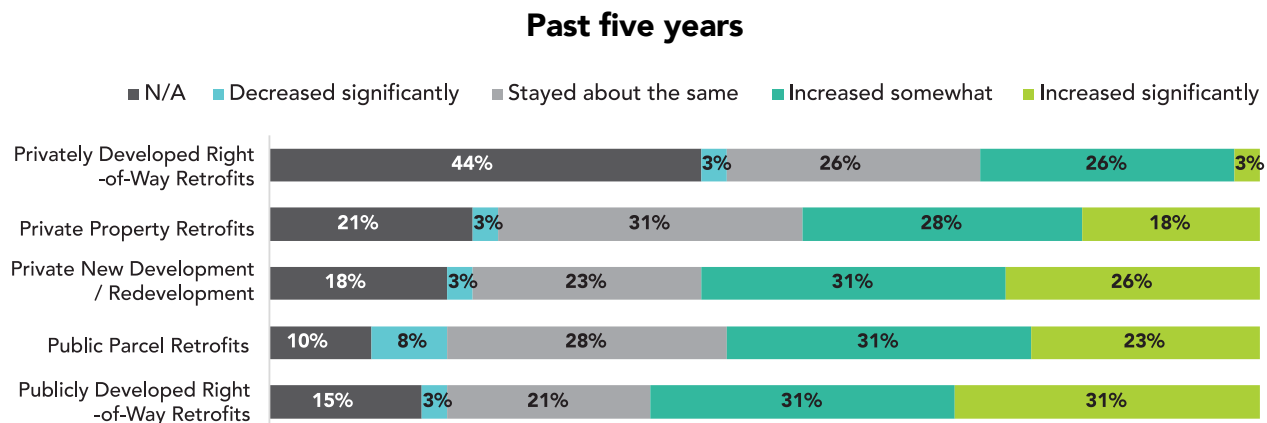
San Antonio River Authority

The San Antonio River Authority's (River Authority) [Watershed Wise Rebate Program](#) provided rebates for new construction — a fairly unique example of public agency financial incentives for private property — in addition to the more broadly adopted retrofit incentive program model. The River Authority started providing these rebates in 2014, well before their [Green Stormwater Infrastructure Master Plan](#) was released in 2019 through a Clean Water Act Grant by the USEPA. The program was intended to be a five-year pilot program, and was extended through 2021 due to its high uptake before officially sunsetting in 2022. One of the program's key successes was coaching designers in Low Impact Design (LID) skills, enabling them to apply their learnings to rebate-funded projects for public, private, non-profit, and public K-12 schools in the River Authority's four-county jurisdiction through the program's school grant component.

This allowed the River Authority to reduce runoff volume, achieve improved water quality, and realize the additional benefits that come with vegetative green infrastructure types (2021). While the San Antonio River Basin is relatively new to green infrastructure, the Watershed Wise Rebate Program has already seen notable improvements in the water quality key performance indicators (KPIs), including, total suspended solids, total nitrogen, and *E. coli*, all of which are tracked on the program's interactive [green infrastructure dashboard](#). KPIs are calculated based upon the known LID design, size, and contributing watershed/impervious cover.

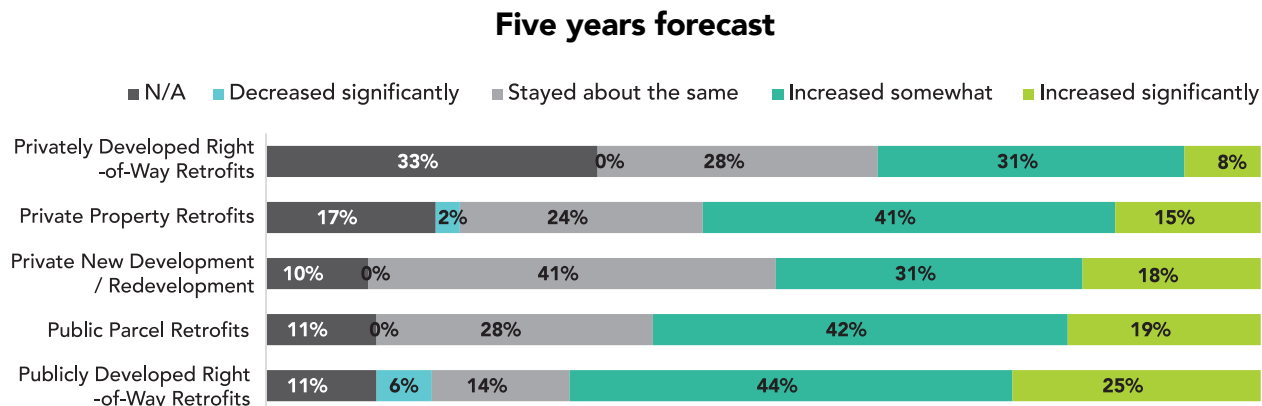
Change (Past 5 years)

Over the past five years, more than half of SMOs reported increases in green infrastructure through private new development and redevelopment, public parcel retrofits, and publicly developed right of way retrofits.



Forecasted Change (Next 5 years)

Over the next five years, more than half of SMOs anticipate increases in green infrastructure implementation through private property retrofits, public parcel retrofits, and publicly developed right of way retrofits. Very few SMOs anticipate near-term decreases in green infrastructure implementation in the land profiles.



GREEN INFRASTRUCTURE ANNUAL EXPENDITURES

The survey asked respondents to approximate actual annual expenditures on green infrastructure in their most recently completed fiscal year. The survey testers provided consistent feedback that detailed annual breakdowns of green infrastructure spending would be difficult to isolate consistently. Therefore, based on advice of survey testers, questions were limited to three specific data points:

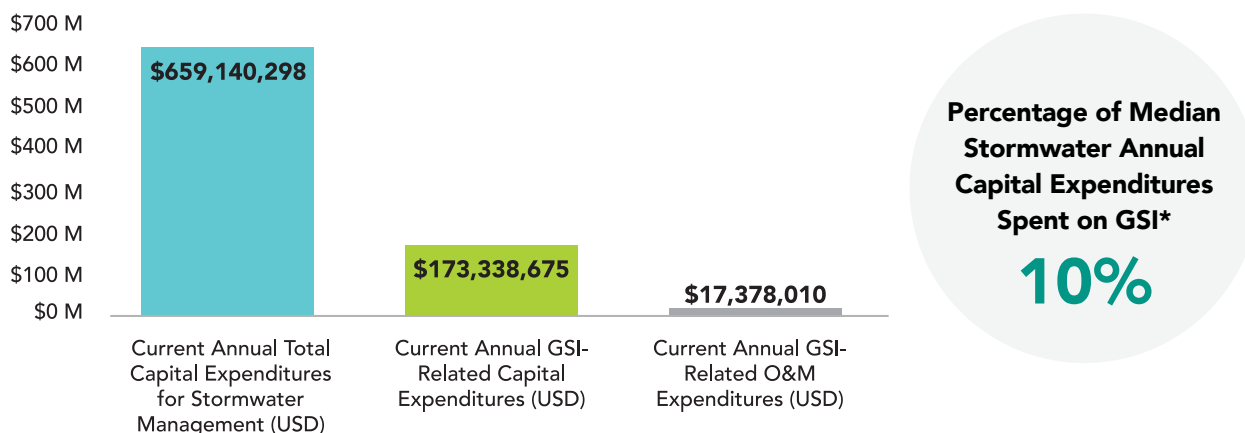
1. Current annual total capital expenditure for stormwater management,
2. Current annual green infrastructure-related capital expenditures, and
3. Current annual green infrastructure-related O&M expenditures.

Current Annual Expenditures

KEY FINDINGS

- Green infrastructure accounts for roughly 10% of respondents' annual stormwater capital expenditures.
- The current annual capital expenditures for **stormwater management** among respondents ranged from \$0 to \$250 million with a median annual expenditure of **\$2.75 million**, and **\$14.71 per capita**.
- The current annual capital expenditures for **green infrastructure** among respondents ranged from \$0 to \$90 million with a median annual capital expenditure of **\$280,000**, and **\$3.87 per capita**.
- The current annual expenditures for **green infrastructure operations and maintenance** among respondents ranged from \$0 to \$5.3 million with a median annual expenditure of **\$100,000**, and **\$0.39 per capita**.

Total reported expenditures

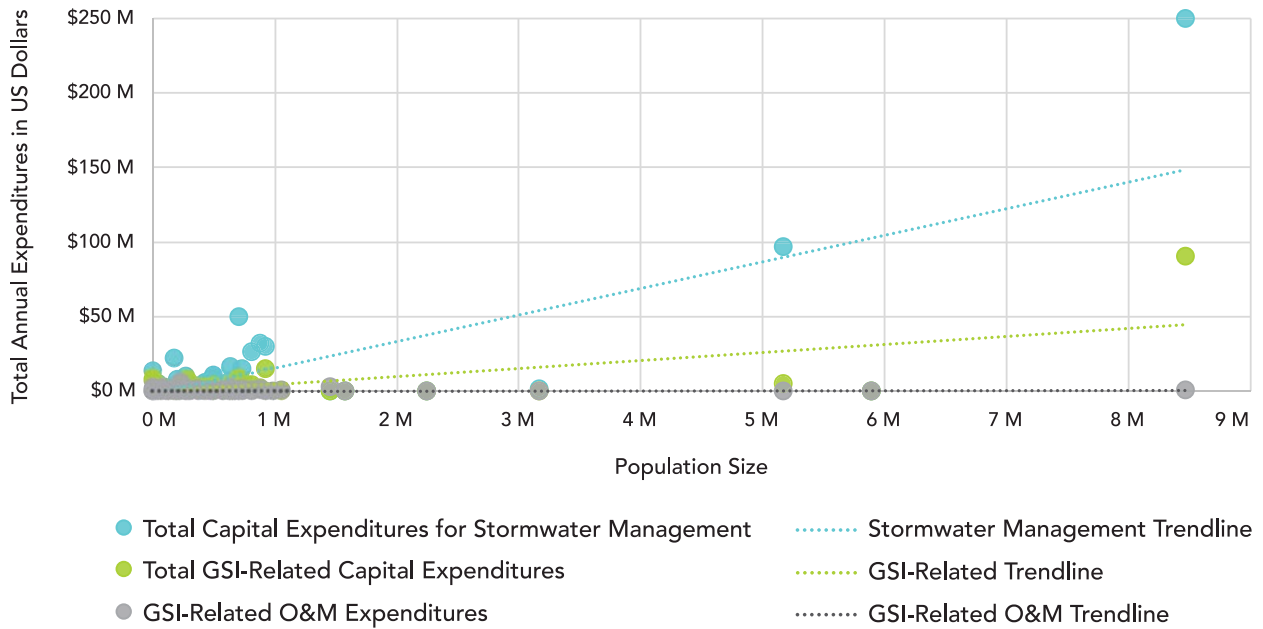


	Range	Median	Mean
Current Annual Total Capital Expenditures for Stormwater Management (USD)	\$0 - \$249.87M	\$2.75M	\$19.39M
Current Annual Green Infrastructure-Related Capital Expenditures (USD)*	\$0 - \$90.40M	\$0.28M	\$5.10M
Current Annual Green Infrastructure-related O&M Expenditures (USD)*	\$0 - \$5.3M	\$0.10M	\$0.51M

**This data has been normalized: of the responses that included a stormwater capital expense, that expense ('Total GSI-Related Capital Expenditures') median was divided by the 'Total Capital Expenditures for Stormwater Management' response median. This only includes responses for which complete data was provided.

While this dataset is relatively small, a trendline begins to appear suggesting a positive correlation (blue line) in the data between jurisdiction size and stormwater capital expenditures. There was a more modest positive correlation (green line) between jurisdiction size and green infrastructure-related capital expenditures and almost no relationship (gray line) between jurisdiction size and green infrastructure-related O&M spending (see scatter plot below).

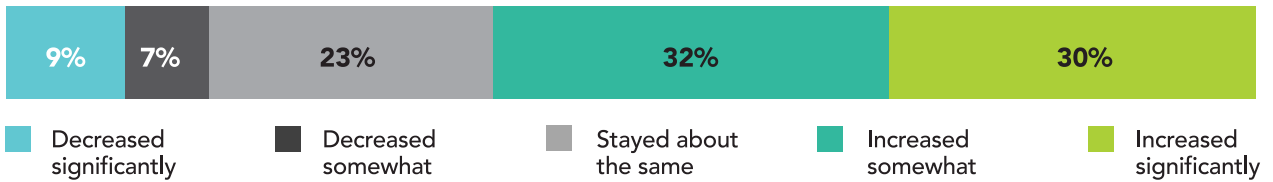
Jurisdiction service population vs total current annual capital expenditures (Stormwater, GSI, GSI - related O&M)



Change (Past 5 years)

Over the past five years, only 16% of respondents observed a decrease in green infrastructure expenditures. In fact, **61% observed increases in green infrastructure spending.**

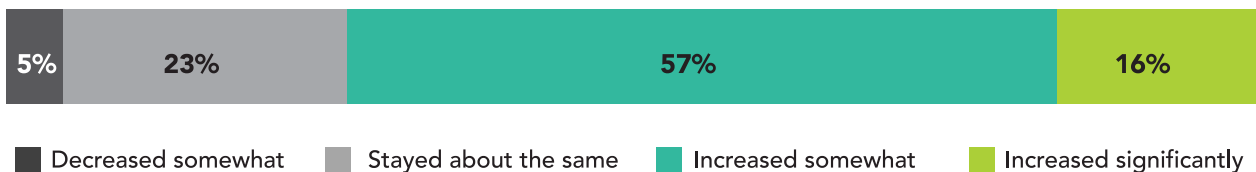
Change in annual GSI expenditures (past 5 years)



Forecasted Change (Next 5 years)

Over the next five years, respondents forecast sustained gains in green infrastructure expenditures, with **73% predicting an increase in green infrastructure spending.**

Change in annual GSI expenditures (next 5 years)



Recommendations

The key findings of the inaugural *State of Public Sector Green Stormwater Infrastructure* survey have implications for every sector working to advance green infrastructure; everyone has a role to play in advancing strategies that survey respondents indicate are working, and in reducing persistent and emerging barriers. This section offers recommendations for focus areas for each sector in the coming years to accelerate the pace of equitable, multi-benefit green infrastructure that serves communities.

Local public sector SMOs

The recommendations that follow seek to build upon the survey findings to illustrate a basic roadmap for effectively and equitably scaling green infrastructure. This section begins with levers for all SMOs, regardless of the maturity of their green infrastructure program. It then offers a summary of the levers an SMO may pull as it progresses through stages of program maturity (early stages, mid-stages, and advanced stages) to accelerate equitable, multi-benefit green infrastructure in their service areas.

ALL STAGES

PRIORITIZE DATA STANDARDIZATION. The exercise of developing, testing, and interpreting data from a survey that attempts to collect apples-to-apples data across jurisdictions uncovered a need for increased standardization across all SMOs in the ways that we measure, categorize, and define green infrastructure. Examples of divergences in data that challenged our ability to draw substantive conclusions included substantial differences in how SMOs define green infrastructure retrofits, how gallons and acres are calculated, and what “counts” as green infrastructure. Moving toward a national glossary of terms and shared metrics for green infrastructure will enable more fruitful data collection and clearer communication between SMOs.

CODIFY A PLAYBOOK. Contribute experiential knowledge to the creation and adoption of an industry Playbook that codifies standardized principles and best practices emerging in the areas of green infrastructure such as funding and financing, planning, design, construction, maintenance, and asset management, and offers case studies.

CENTER EQUITY. It is never too early to invest in capacity-building to center equity in green infrastructure strategies. Regardless of the green infrastructure program’s maturity, it is important for practitioners to learn, adopt, and apply best practices and metrics from resources like the [Equity Guide for Green Stormwater Infrastructure Practitioners](#), which offers practitioners seven equity goal areas and a roadmap for progression and continuous improvement. In the words of one group from the *State of Public Sector Green Stormwater Infrastructure Advisory Committee*, “fully absorbing what that means as a public servant requires a combination of training and culture change. If funding and support for that isn’t available to practitioners, they’re not going to gain the trust of communities.”

One specific recommendation in light of survey data is to ensure each jurisdiction has adopted well-informed, shared definitions around equity, that those definitions lead to rigorous standards for equitable actions, and that there is clarity and accountability to those standards not only within the SMO, but also in any contracted services.

The central recommendation of the *Equity Guide* is about centering community. Advisory Committee members especially keyed into recommendations related to this theme, including:

- **Grow relationships.** Investing in relationship building within representative communities by reaching out, meeting them where they are, compensating them for their time in meaningful ways, connecting them with their elected representatives, and growing communities' capacity to serve as advocates to local government. Relationships with community-based organizations in particular need to begin with foundational trust and repair, when needed, and continued with ongoing reciprocity on both sides to enable a true partnership over time.
- **Co-create inclusive policies.** Drawing representative community members into the process of updating policies that guide green infrastructure development, and compensating them for their time and expertise.
- **Provide resources and capacity building for community partners.** Resourcing community partners, through funding, training, and dedicated support for community-based organizations that can elevate community priorities to inform multi-benefit projects and connect communities to those benefit outcomes. Some training ideas that emerged were 101 training in the CIP process budget and how to make an effective public comment as well as communication channels that provide easily accessible information from the City on upcoming plans, projects, and engagement opportunities (e.g newsletters, radio programs in multiple languages, regularly updated central hub webpage). The *State of Equity Practice* report underscored this recommendation, and suggested funding community-based organizations to allow them to engage on more equal footing with their public sector partners.
- **Leverage partnerships.** Increase partnerships between SMOs and non-governmental and philanthropic partners to cost share in a way that recognizes the restrictions that exist for certain types of public sector funding (*State of Equity Practice*). This enables SMOs and community partners to access private philanthropy and other forms of funding that deepen impact.

The stages below represent the evolution of the public sector green infrastructure field to date and how early movers tended to mobilize and implement green infrastructure. In working towards a more standardized field, SMOs at the early stages of adopting green infrastructure systems may not evolve in the same way and, ideally, will leapfrog some areas of the learning curve.

EARLY STAGES

Begin by pulling the levers required for any successful government program: growing buy-in from—and engagement with—the people who control resources and priorities, from elected officials, to leaders, to voters. Success in pulling these levers is often a prerequisite to being able to advance more targeted levers that require funding allocations, policy change, and creative program and procurement structures. It's important to note that growing buy-in and facilitating engagement must continue throughout a green infrastructure program's evolution to weather changes in leadership and public opinion.

- **Connect with elected officials.** Cultivate supportive elected official(s) for whom green infrastructure and its benefits are a high priority. Build a relationship, share timely information, grow fluency, and offer proof points through demonstration projects they can campaign around and publicly support.
- **Identify co-conspirators.** SMOs early on in the green infrastructure journey, may face significant political, cultural, educational, and/or financial obstacles that need to be addressed in order to scale a green infrastructure program. Practitioners can call upon other like-minded professionals within the jurisdiction and consider seeking out others at SMOs further along to serve as sounding boards and aid in problem solving. Networks like the Exchange can also be an invaluable resource for early stage SMOs in advancing green infrastructure.
- **Identify senior champions.** Hire, promote, cultivate, and retain strong senior champions for green infrastructure within your organization. Improve their fluency around multi-benefit and equitable green infrastructure and support them in efforts to guide broad organizational adoption of and focus on green infrastructure. Increase recruitment of equity-minded people into leadership positions (general managers, commissioners, department heads), as a strategy to increase budget allocations toward equity-targeted activities (*State of Equity Practice*).
- **Reach the public.** Invest in public outreach and/or education about green infrastructure to grow a coalition of support for public investments in green infrastructure. Focus on more and better storytelling, case-making, connecting the public (and others) to high profile demonstration projects, and engaging the public in creating a shared vision and goals for green infrastructure implementation.
- **Show and tell.** Develop multi-benefit demonstration projects in high profile locations as proof of concept and fodder for public conversation. Draw leaders and the public into the stories of these projects through opportunities for community authorship and co-design, education, communications and public relations, and celebrations like ground-breakings, ribbon cuttings, and tours. Supplement these tangible positive experiences of local green infrastructure with talking points from case-making research from around the country and world. Ensure equity considerations and goals manifest across the design, construction, and maintenance phases of the project to build a precedent of accountability for the entire project (*State of Equity Practice*).
- **Bust siloes.** Identify areas where siloed thinking will hinder green infrastructure development and where advancing coordination between departments, agencies, and/or sectors will create enabling conditions for green infrastructure to succeed. Examples include:
 - Opening dialogue with regulators and viewing regulators as partners, not just governing bodies; working with the State-level regulators responsible for interpreting regulation to foster mutual understanding of how interpretations could evolve to enable high impact green infrastructure.
 - Regularly meeting with staff in the finance, engineering, planning & development, transportation, and community services departments (or your equivalents) to coordinate project efforts better, align capital projects, and prioritize projects based on mutual needs. Consider including a broader set of departments and agencies to elevate equity and community benefits: public health, parks, racial equity, sustainability, and many others. Seek out individuals and leaders in these departments who share your priorities and whose jurisdiction or influence can support green infrastructure policies, programs, and projects.

- Coordinating efforts to update policies and norms that hinder green infrastructure (such as fees being charged to nonprofits improving public land, or not allowing storage of water from private parcels in the public right-of-way) and encouraging creative collaborations between sectors.
- Using the One Water campaign as common ground to break down silos and increase coordination. See US Water Alliance’s [One Water Hub](#) and [Equitable Water Future Resources](#).
- **Put Federal dollars to work.** For small, rural, and disadvantaged communities, consider participating in a funding accelerator program, such as those designated as [Environmental Finance Centers](#), to support pursuit of competitive federal grant programs. All communities should consider how green infrastructure can be packaged together with other capital investments, such as roadway improvements, and co-created with community members to create the most compelling grant applications. Ideally this strategy would be part of a comprehensive funding plan that understands how federal funds can complement other sustainable funding sources, such as stormwater utility fees to support long-term maintenance.

MID-STAGE

The first grouping of levers results in funding and policy alignment that enables a secondary group of levers that can result in strong gains in green infrastructure development.

- **Invest.** Classify green infrastructure as a capital investment so funds come from capital budget rather than the operating budget.
- **Regulate.** Put local regulations to work to scale green infrastructure by requiring green infrastructure on new development and redevelopment through stormwater regulations, retention standards and nonpoint source regulations⁴. When developing or refining policies, always consult with (compensated) community leaders and community-based organizations with a track record of developing nature based solutions in communities to avoid inadvertently adopting inequitable policies. Once policies are in place, apply consistent and equitable policy enforcement.
- **Maintain.** Develop and implement plans to fund and support short- and long-term maintenance, because without proper maintenance, green infrastructure will not perform as designed⁵. Several SMOs noted that upfront support from decision-makers can be essential to building in regulations or requirements for maintenance up front.
- **Train.** Invest in continuing education and training for internal and contracted staff. Examples include green infrastructure standards and design, maintenance, centering equity (in particular racial equity) in infrastructure. In jurisdictions with fewer resources and staff (e.g., rural communities) outside support may be necessary for this training.

4 The EPA’s [Compendium of MS4 Permitting Approaches](#) provides examples across the USA of how municipalities are requiring green infrastructure or LID in their permits.

5 For Clean Water State Revolving Fund projects, the EPA has guidance on O&M importance: [The Importance of Operation and Maintenance for the Long-Term Success of Green Infrastructure](#).

ADVANCED STAGE

SMOs with leadership and public support, policy and funding alignment may pursue a third group of levers that enable scale.

- **Diversify funding streams.** Scale green infrastructure by braiding together multiple funding streams, such as adopting and collecting local **stormwater / drainage fees** to create a steady revenue stream; pursuing **State Revolving Fund (SRF) loans**; participating in a Funding Accelerator program to support pursuit of competitive **federal grants** through BRIC and other programs; fundraising for multi-benefit green infrastructure by pursuing **philanthropic and local grant funds** focused on outcomes of green infrastructure (partnerships between public entities and non-government and philanthropic partners can access less restricted sources of funding to fill the equity gaps prevalent in public funding sources); and seeking federal funding, such as [FEMA Building Resilient Infrastructure and Communities](#) (BRIC) grants that are guided by the [Justice40 Initiative](#), which aims to funnel 40% of federal infrastructure investments into marginalized, underserved, and overburdened communities to help overcome barriers at local level. Other funding sources include [Environmental Justice Grants, Funding and Technical Assistance](#), and the [Green Infrastructure Federal Collaborative](#). Creatively assessing funding sources for criteria that allows for green infrastructure funding, even if not explicitly stated, can also be fruitful; an example is EPA's [Brownfields Job Training \(JT\) Grants](#) which can fund workforce development opportunities. This type of funding could also support green infrastructure maintenance which is not typically eligible from direct federal funding.
- **Standardize.** Implement local design standards, especially for low-maintenance designs and the integration of co-benefit-rich practices (e.g., accessible, vegetative, reflective of local identity).
- **Manage.** Build or source an asset management system that helps system operators understand: the green infrastructure assets they have, data about the state of each asset, which assets are critical to the system, how assets are managed, maintained, and repaired over their lifecycle, and how they'll be funded. Furthermore, standardization of asset management data across organizations would be extremely valuable for industry standardization and measuring national trends and progress. The *State of Equity Practice* report further suggests that SMOs begin to normalize equity tracking in performance analysis systems.
- **Incentivize.** Design and launch programs that encourage voluntary green infrastructure installations, such as retrofit incentive programs and/or stormwater credit trading programs, to engage commercial, institutional, industrial, and residential landowners⁶.
- **Grow a workforce.** As green infrastructure investments expand, plan, and implement workforce development strategies⁷. To better advance equity, connect the green infrastructure industry programs with larger water sector workforce development programs. The *State of Equity Practice* also recommended broadening the focus of green infrastructure training programs to include additional skill sets of complementary sectors, such as energy and transportation, to enhance seasonal job mobility for a more equitable approach.

6 See the EPA's [Alternative Site Stormwater Management](#) guide for examples and case studies

7 The EPA has a green jobs webinar with examples on [Growing a Green Infrastructure Workforce](#).

National and Regional Nonprofits

Green infrastructure and its associated community and environmental benefits are a priority for many national and regional nonprofits. Examples include but are not limited to the Green Infrastructure Leadership Exchange, the US Water Alliance, WaterNow Alliance, The Nature Conservancy, American Rivers, and the Trust for Public Land. Such organizations have played vital roles in green infrastructure research, policy advocacy, demonstration projects, program model exploration, public outreach, and more. The following recommendations for national and regional nonprofits were elevated by industry leaders and Exchange members in response to the findings in the *State of Public Sector Green Stormwater Infrastructure*.

- **Advocate.** Given that regulation is the most important driver for green infrastructure, nonprofits can focus advocacy efforts on refining regulations to make green infrastructure a preferred regulatory option. The *State of Equity Practice* report highlights the opportunity to enhance regulatory requirements for community engagement to advance equity in the field as well.
- **Drive new standards.** Nonprofits can facilitate the industry toward an impactful standard for green infrastructure (centering community, multiple benefits, vegetative practices, maintenance, performance monitoring, and impact evaluation). Nonprofits can also help advance language, norms, and data trends around the returns on investment from green infrastructure developments that exemplify these characteristics. Standards for multi-benefit green infrastructure would benefit from nonprofit leadership in articulating regional standards for benefits that account for weather patterns.
- **Facilitate peer exchange.** One of the major roles played by nonprofits is as conveners that bring together industry players (examples include the Exchange bringing together SMO green infrastructure practitioners, and the US Water Alliance and WaterNow Alliance bringing together local water leaders to share best practices, case studies, and challenges to learn from one another). It is likely that one of the reasons for clear alignment around levers is due to the success of peer exchange completed to date. Data points like lack of standardization around green infrastructure, and struggles to incorporate and fund maintenance suggest that peer exchange will continue to be a critical part of the path ahead. The *State of Equity Practice* highlighted the importance of the role for knowledge partners such as universities and research organizations to share data and analysis tools that could support equity focused green infrastructure siting decisions.
- **Build the case.** Nonprofits have traditionally played an important role in leading research that builds the case for green infrastructure. Given the importance of secondary drivers (flooding and support for aging infrastructure) and tertiary benefits (community quality of life and equity), nonprofits can invest in additional research, elevate existing research, and combine technical knowledge with community insights to build the case for decision-makers. Given that SMOs gave somewhat less weight to economic development as a driver, nonprofits can strengthen the case for local economic development outcomes related to risk reduction, job creation, and the economic benefits of beautification.
- **Tap funding.** Given that public dollars for green infrastructure are limited, nonprofits can continue to identify and source matching funds to create more holistic projects that center communities, drive multi-benefits, and elevate equity. Nonprofits can help SMOs identify funding avenues that have not been explored and braid them together, acknowledging that attempts to secure a single funding stream is a distraction from finding the portfolio of funding opportunities,

from the capital market, to Federal funds, to philanthropic funds. Rigorous quantification and monetization of certain co-benefit categories like flood mitigation and risk reduction remain technically challenging, although some study results are available. Nonprofits can drive more research and real-world case studies. Supporting public entities in identifying more flexible funding sources is an opportunity that arose out of the *State of Equity Practice* report which further supports this recommendation.

- **Innovate.** Industry-wide innovation is needed in several areas, from driving multi-benefit approaches to green infrastructure program and project development, to workforce development, and to maintenance program design. One example apparent from survey data is that—with roughly 60% of green infrastructure built to date built on public land—nonprofits can support program innovation to scale implementation on private land, such as through incentive programs.

Private Sector

To scale green infrastructure, all SMOs rely on the private sector to some extent, whether from the Architecture, Engineering and Construction (AEC) industry, consultants, contractors, suppliers, or private real estate. The private sector delivers market-driven solutions to scaling green infrastructure. Such organizations have played vital roles offering strategy, technical expertise, labor capacity, materials, private land access, and more. The following recommendations for the private sector were elevated by industry leaders and Exchange members in response to the findings in the *State of Public Sector Green Stormwater Infrastructure*.

- **Comply with regulation.** Survey data show that requiring green infrastructure on private development/redevelopment is a widely used and largely effective lever among SMOs. Developers can do their part to meet and exceed code requirements and ensure long-term compliance. Existing property owners can bring their properties up to current code, especially when adding any impervious cover that increases stormwater runoff.
- **Build knowledge.** The planning and AEC industries can invest in training to ensure green infrastructure planning, design, and construction professionals have the knowledge and skills to fully support local public sector SMOs in delivering equitable, multi-benefit, community centered green infrastructure. Private sector players have a role to play in building each others' knowledge by not only sharing the successes they experience planning and delivering green infrastructure, but also helping industry peers learn from challenges when they occur. This is especially important to fill knowledge gaps for service providers working in high equity value communities and rural areas.
- **Participate in market-based programs.** In some markets, incentive programs and stormwater credit trading programs offer an avenue to fund high-impact green infrastructure projects. Firms can seek opportunities to develop stormwater projects in underserved and flood-burdened communities, and to direct projects to properties like public parks where a large number of people will have access to the infrastructure.
- **Innovate.** Survey data indicate that SMOs anticipate that recent growth in green infrastructure investments will persist. With a growing business opportunity for private sector service providers comes an opportunity to invest in development of green infrastructure products and services that increase performance and cost efficiency for green infrastructure at scale for resource constrained SMOs. Examples may include integrated asset management systems, innovations in operations and maintenance, and more.

- **Grow equity services.** Survey data suggest a collective commitment to increased equity and community centering in green infrastructure, but a long road ahead to have implementation fully meet intent. Consultants serving SMOs can bring new expertise to support SMOs in meeting equity goals. Existing Exchange resources like the [Equity Guide for Green Stormwater Infrastructure Practitioners](#) offer best practices, metrics, and bright spots for topics like equitable siting and investment, centering community, benefits driven project development, economic stability, and workforce development.
- **Deliver on drivers.** Firms supporting SMOs with green infrastructure planning and delivery can align project priorities with the important drivers beyond regulatory compliance like addressing flooding risk, increasing community quality of life, and increasing equity. Projects that deliver on drivers help build the case for scaling green infrastructure locally and nationally.
- **Prepare for growth areas.** Green infrastructure in the public right of way is an example of an area of projected growth in the coming five years. Firms can grow capacity and capabilities to serve the growing need in this area, and also offer consultations on the challenges of right-of-way green infrastructure, such as preparing their clients for maintenance.

CBOs and Community Leaders

It cannot be overstated that in most cases, the responsibility for initiating authentic relationship- and trust-building between SMOs and CBOs is likely to fall on the shoulders of SMOs. Historically speaking, many community groups have been intentionally excluded, ignored, or otherwise treated as nuisances and their communities may have been harmed through policies, projects, or actions taken by SMOs. It is important to recognize this and hold space for repairing and building relationships prior to advancing a constructive partnership for green infrastructure development. The following recommendations for CBOs who are engaging with SMOs arose as examples of ways to facilitate the relationship on their end to help assure success.

- **Ensure appropriate compensation.** CBOs can seek out compensated opportunities with SMOs for both their organization and neighborhood residents and businesses in exchange for lending time and expertise. They can bring a clear understanding of the assets, perspectives, and connections CBOs bring to the table and keep a close eye on when requests for participation are going beyond their capacity to contribute without compensation and propose a scope of work and budget to the partnering agency. In particular, these opportunities may arise during the pre-development phase for green infrastructure projects. CBO work in this phase can be proposed to the SMO or a partnering agency (such as a municipal planning or transportation department), either to be funded by that agency or philanthropic funds. In addition, CBOs can elevate local residents and businesses to the SMO who could be a good fit for employment and/or contract work.
- **Build existing expertise.** Participating in green infrastructure project development processes led by SMOs is aided by a baseline understanding of both environmental issues and how green infrastructure serves as a potential solution, as well as of how those processes are conducted by SMOs. CBOs can consider providing professional development opportunities to existing staff so that they can attain that baseline understanding, hiring dedicated staff with environmental expertise, or partnering with other organizations when appropriate to fill knowledge gaps. They can also engage community members around green infrastructure planning and delivery to understand their assets, needs, and priorities for flood risk reduction, infrastructure improvement, community benefits, and equitable access, and be able to articulate back to the local SMO what was heard. Lastly, CBOs can get to know SMO staff who are responsible for

green infrastructure as well as the processes by which they plan, design, construct, and maintain these facilities. This will enable CBOs to proactively identify places where their organization and local stakeholders can plug into the process to ensure community-driven projects.

- **Advocate for better SMO processes.** As local organizations, CBOs have a unique vantage point for how to engage with their constituents that can be invaluable to SMOs who are looking to better center community in their processes. CBOs can suggest participation formats, accommodations, and locations that can help SMOs optimize participation in their events (e.g. by suggesting existing times and spaces where community already gathers). CBOs are also typically experts in best practices to center community and conduct effective engagement (such as providing meals and/or child care to remove barriers to participation, empowering community residents to take on leadership roles, providing outreach with culturally and linguistically appropriate messaging, and anchoring engagement to key concerns and priorities of those in the community). This expertise can be of great value to SMOs who are looking to improve their engagement methods. CBOs can also advocate for improvements to SMO processes and engagement efforts to daylight blind spots.

Philanthropy

The Philanthropic community fills essential industry gaps, catalyzes innovation, and supports communities and community-based organizations in participating in green infrastructure visioning and development. A group of green infrastructure funders including representatives of The JPB Foundation, The Kresge Foundation, Pisces Foundation, William Penn Foundation, and the Robert Wood Johnson Foundation gathered in January 2023 to review the survey's key findings and discuss implications for how funders can effectively target their funding to break down barriers and better catalyze investment in equitable green infrastructure. Acknowledging that funders have a range of focus areas and priorities, the following recommendations are drawn from a broad-ranging conversation at the Funders Roundtable, and may apply to a range of philanthropic priorities.

- **Support SMOs in centering equity.** Support SMOs in discovering why 45% of respondents could not estimate the percentage of their funding directed in communities considered disadvantaged, socially vulnerable, or environmentally vulnerable. Build capacity for SMOs to better define what is meant by "disadvantaged, socially vulnerable and/or environmentally vulnerable" within their local contexts. Help SMOs adopt best in class equity indexing tools to help characterize equity opportunities in their jurisdictions, moving toward standardization while preserving room for tracking local determinants of equity and enabling SMOs to transparently assess impact. Invest in leadership and equity training for senior and emerging leaders, leveraging existing industry resources such as the [Equity Guide for Green Stormwater Infrastructure Practitioners](#).
- **Support demonstration projects.** Continue to play the vital role of supporting highly visible, highly impactful demonstration projects to grow local support for green infrastructure in areas where scale is hindered by lack of awareness and buy-in.
- **Advocate.** 88% of survey respondents reported that regulation is a "very important" driver for green infrastructure. Support advocacy efforts to enact regulatory changes that make green infrastructure a preferred regulatory compliance strategy.
- **Build the case.** Invest in additional research and case making to show the connections to important secondary drivers (flood resilience and support for aging infrastructure) and tertiary drivers (community quality of life and equity).

- **Tell stories.** Philanthropy can support more sophisticated storytelling and communications around green infrastructure, especially in communicating about what various types and scales of green infrastructure can—and cannot—accomplish related to flood risk reduction, managing nuisance flooding, and reducing basement backups. Another avenue to explore is equipping communities to be the storytellers about the benefits of green infrastructure to increase local trust and buy-in.
- **Reduce green gentrification risks.** Support efforts to combat green gentrification by breaking down silos. According to the *Sharing the Benefits of a Greening City* report published by the CREATE Initiative, one of the most effective tools for reducing green gentrification risk is to protect affordable housing in neighborhoods where greening is planned. Funders who have initiatives related to both affordable housing and urban greening may be uniquely situated to support these two siloed areas in collaborating to reduce green gentrification risks.
- **Fund benefits.** “Fill the gap” in funding to enable multi-benefit projects: fund CBOs and multi-stakeholder collaboratives to lead pre-development of multi-benefit projects in partnership with local government and utilities; proactively offer funding for supplemental amenities, placemaking, and other community benefits to projects that would ordinarily primarily focus on gallons managed. This builds upon the *State of Equity Practice’s* highlighted opportunity to provide funding for data collection and analytical tools to make the case to leadership for why deploying green infrastructure in specific areas is good policy.
- **Support local CBOs.** Provide operational funding to CBOs and Communities to support them in participating in green infrastructure planning. Simultaneously, push for SMOs to shift policy and practice on contracting CBOs to make it easier for local SMOs to effectively partner with and compensate CBOs in project and program development.
- **Support adoption of emerging levers.** Effective but underutilized levers like maintenance programs, workforce development, and asset management systems may require further support and piloting to increase adoption. Philanthropies could invest in more pilots and support for these emerging levers.

Federal and State Government

Federal and state governments have the potential to provide standards, carrots, sticks, funding, and communications support to increase equitable green infrastructure across municipalities, cities, and states. The following recommendations are drawn from a broad-ranging conversation at a roundtable with state and federal government staff members and include: supporting industry standardization and consensus; breaking down barriers to green infrastructure implementation through funding, regulation carrots and sticks, offering tools that help assessing green infrastructure impacts and equity; and increasing Federal funding.

- **Support standardization.** Facilitate and codify industry consensus around definition of and standards for green infrastructure. Standardization of definitions, terms, construction, should drive better incentives for federal funding (e.g., SRF). Where standardization is not possible, understanding which agencies use which terminology (e.g., “green stormwater infrastructure” versus “nature-based solutions”) can help shape future proposals and technical assistance to ensure alignment. A report released by the White House on Nov 8, 2022 gathers different definitions used by federal agencies currently (2022, [White House Report on Green Infrastructure & Nature-Based Solutions](#)).

- **Raise the bar.** Tie funding and regulation to a new standard for green infrastructure (community driven, multi-benefit, vegetative, actively monitored, maintained, and researched for holistic impact), and ensure green infrastructure is designed to account for up-to-date climate forecasts.
- **Coordinate funding opportunities.** Over 15 federal agencies have come together to form the [Green Infrastructure Federal Collaborative](#) to coordinate federal funding and technical assistance opportunities to accelerate green infrastructure.
- **Enhance impact assessment tools.** Consider how regulators and major government agency funders can break down barriers and better catalyze investment in equitable green infrastructure. Understand who is benefiting from investments and whether or not they are being distributed equitably. Re-evaluate publicly available tools for assessing equitable impacts. Better understand if these tools are used widely and what can be done to increase adoption.
- **Support compliance.** Ensure that green infrastructure is a fully acceptable, if not preferred, solution for regulatory compliance. Where green infrastructure is already an acceptable compliance option, promote it as such to ensure all stakeholders fully consider green solutions in their compliance program. And if regulation still drives everything, the regulations themselves need to require multi-benefit green infrastructure to get multi-benefit green infrastructure. While green infrastructure was officially included in the Clean Water Act as a viable compliance option in 2019 ([EPA, 2022](#)), other agencies are still working towards making it easier to obtain funding using green infrastructure in federal permits.
- **Explore incentives.** Continue to explore opportunities to offer carrots that incentivize use of green infrastructure over gray in addition to regulatory sticks.
- **Focus SRF.** Encourage states to create dedicated green infrastructure programs within their SRF programs to attract more green infrastructure projects and direct a greater proportion of funding towards green infrastructure. Seek opportunities to improve SRF loans' emphasis on green infrastructure through recommendations outlined in Environmental Policy Innovation Center's [Financing Green Stormwater and Natural Infrastructure with Clean Water State Revolving Funds](#). According to the EPA, all states, except North Dakota, fund some level of green infrastructure with Clean Water SRFs with various program requirements. The states that create dedicated green infrastructure programs will attract and fund a larger amount of projects⁸.
- **Promote holistic projects.** Invest in technical assistance and funding for making multi-benefit green infrastructure the norm. Expand funding to include community amenities that contribute to secondary and tertiary drivers of green infrastructure.

8 See [CWSRF Best Practices Guide](#) for more information

Looking Forward

The purpose of this baseline report was to better understand the state of public sector green infrastructure development. Equipped with a clearer picture of the barriers, drivers, and levers used by these entities across the country and their effectiveness, its intention was to establish a baseline to support green infrastructure partners in more effectively directing resources toward investments with the greatest likelihood of accelerating progress at implementing green infrastructure at scale. By creating a shared blueprint for green infrastructure implementation that better serves communities, the aim is to move the industry toward a shared standard for green infrastructure that's inclusive of equity, community engagement, co-benefits, and long term maintenance and fit it within the national One Water framework.

While there are many examples of concerted efforts and strong progress, many opportunities to further standardize and support green infrastructure efforts exist. Given that survey findings represent the experiences of public sector SMOs that serve only around 10-15% of the US population, many of whom are Exchange Members, the opportunity to capture a more accurate reflection of the state of the field through future efforts, including public sector stormwater entities serving the other 85% of the population across the nation, is significant.

To contribute towards the delivery of such potential impact, the Exchange commits to exploring the following activities and themes with an equity-centered lens for future iterations of this report:

Improve the Green Infrastructure Data Ecosystem

- **Learn from the gaps.** Document and pull insight out of what we don't know and what SMOs are not currently tracking to elevate areas for future projects, alignments, and improvements. Support SMOs in building their capacity and commitment to tracking standardized data on green infrastructure implementation.
- **Increase participation.** The survey should include as many non-Exchange members as possible to expand the response pool and increase the representativeness of responses. Increasing response numbers will increase confidence in emerging data trends and allow for more precise cuts of data that are important to industry partners, such as the ability to filter data by region, length of program, jurisdiction size, regulation type(s), and sewer types.
- **Improve the survey format and data gathered.** The project team learned many lessons through the design and delivery of the survey that supported this report, the application of which can make future versions of the survey—and data collected from it—all the more impactful. The survey in general could be shortened to increase the number of responses, which would aid in the ability to draw sound conclusions from the data. Terminology and questions could be modified to ensure further clarity on the part of the survey takers. There

is also certain information that was not requested, including green infrastructure expenditures per capita, why and how gallons and acres are used and measured, and why respondents are or are not using certain drivers and levers, that could help paint a more complete picture. Lastly, a more complex and longer term recommendation is to build SMO capacity to collect data via an asset management system so that they can accurately—and quickly—answer survey questions.

Future Research and Report Recommendations

- **Survey and Report Timing.** Explore opportunities to operationalize this research over time if prioritized by the Exchange, its members, and funders. Seek opportunities to streamline the survey and adopt a regular schedule for its distribution to a larger and more diverse cohort of SMOs.
- **Further Contextualize Data.** Provide greater context on the reasons that green infrastructure costs vary significantly and offer regional and urban vs. rural construction cost baselines.
- **Flooding.** Pursue a deeper analysis of flooding, the second most highly ranked driver for green infrastructure after regulation. One industry leader pushed for clarification of how and where flooding has become an effective driver for green infrastructure and suggested further examination of cities for which flood resilience is driving the strategy. One focus group of Exchange members underscored the desires for: further research and analysis on the connections between flooding and green infrastructure; better communication strategy and case studies to build the case for green infrastructure within this context; and data about how changes in flood management are being modeled and planned for in the context of a changing climate among their peers.
- **Levers.** Consider offering a deeper analysis of levers and showing which are most effective for SMOs pursuing green infrastructure to meet regulations and which are most effective for SMOs pursuing green infrastructure on a voluntary basis.

This Report's Tactical Successes

The following are fruitful strategies to continue to build upon in future iterations.

- **Advisory Committee.** Convening a diverse group of industry leaders to guide the research as an Advisory Committee resulted in a broader set of research questions and expanded the perspectives and interpretations of the survey data and ultimate recommendations.
- **Survey Testing.** Testing the survey first with beta interviews allowed for multiple updates and edits that made the survey easier to answer.
- **Focus Groups and Roundtables.** Through sector specific roundtables and Exchange member focus groups that shared initial key findings, the research team benefited from a breadth of insight and recommendations that supported analysis within the final report.

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Appendix A: Links

SURVEY QUESTIONS

See the original survey questions as they were presented to the survey respondents here:
<https://bit.ly/GSISurveyStatic>.

DATA DASHBOARD

Download a copy of the corresponding excel dashboard of this data here:
<https://giexchange.org/the-state-of-public-sector-gsi/>

Appendix B: Full Levers Data

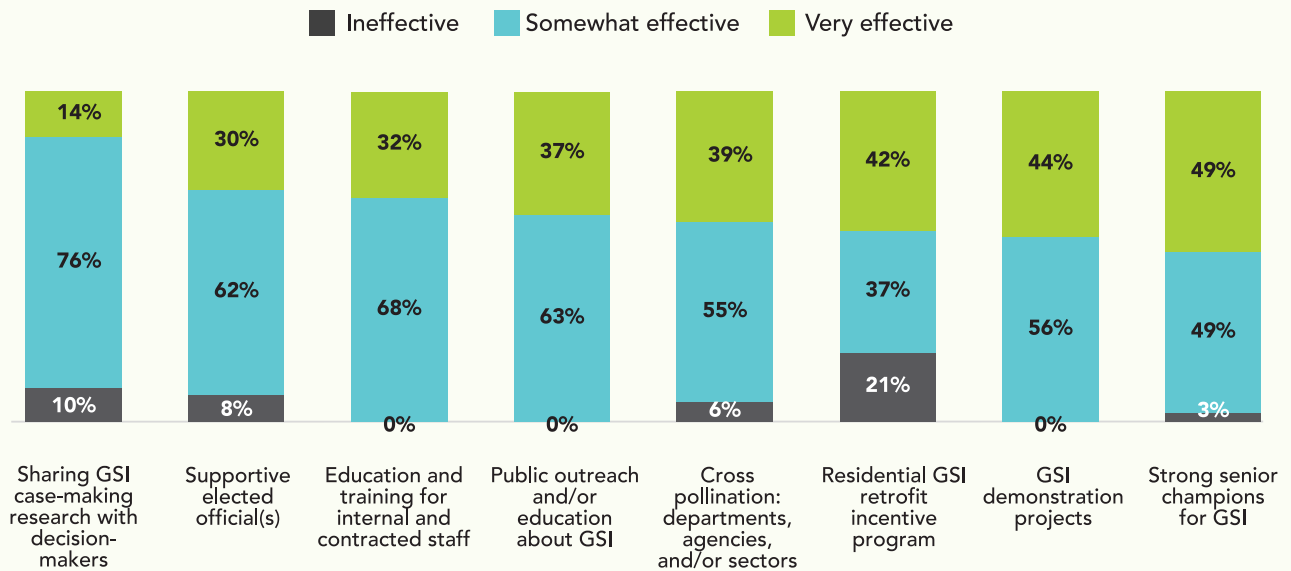
An in depth look at each lever, including narrative descriptions from survey takers' responses, is provided here. The levers have been divided into four categories.

- People Levers
- Process Levers
- Financial Levers
- Procurement Levers

PEOPLE LEVERS

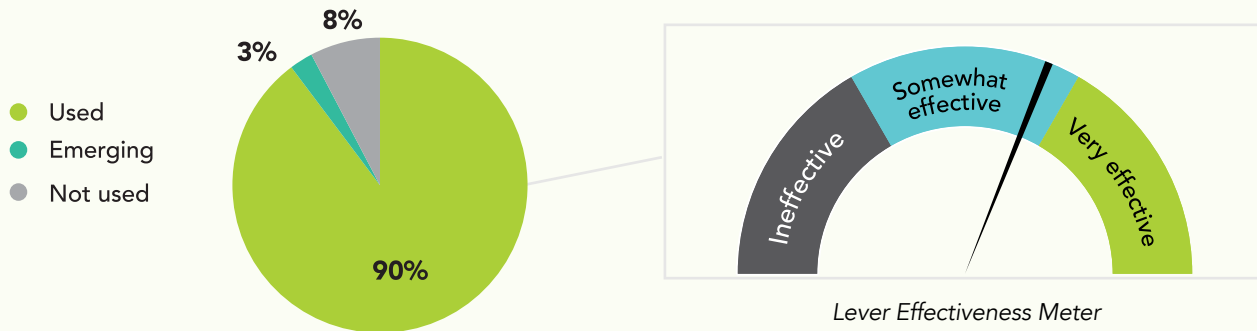
The first category focuses on levers that impact people's awareness, acceptance, and support for green infrastructure. Below is a summary graphical representation of the people levers' use and effectiveness.

Effectiveness of levers to scale GSI - people levers



LEADERS: Strong senior champions for green infrastructure: SMO senior staff (GM, CEO, Director of Public Works, etc.) and public leaders (Mayor, City Council President, etc.) can both advocate for, and prioritize, investments in green infrastructure.

Strong senior champions for GSI



- 90% of respondents reported that they have strong senior champions for green infrastructure.
- Among respondents who use this lever:
 - 97% stated that it was somewhat or very effective.
 - Less than 3% responded that it was ineffective.
 - The most frequent responses were somewhat effective and very effective.

RESPONDENT PERSPECTIVES

Having strong senior champions is among the most effective levers because...

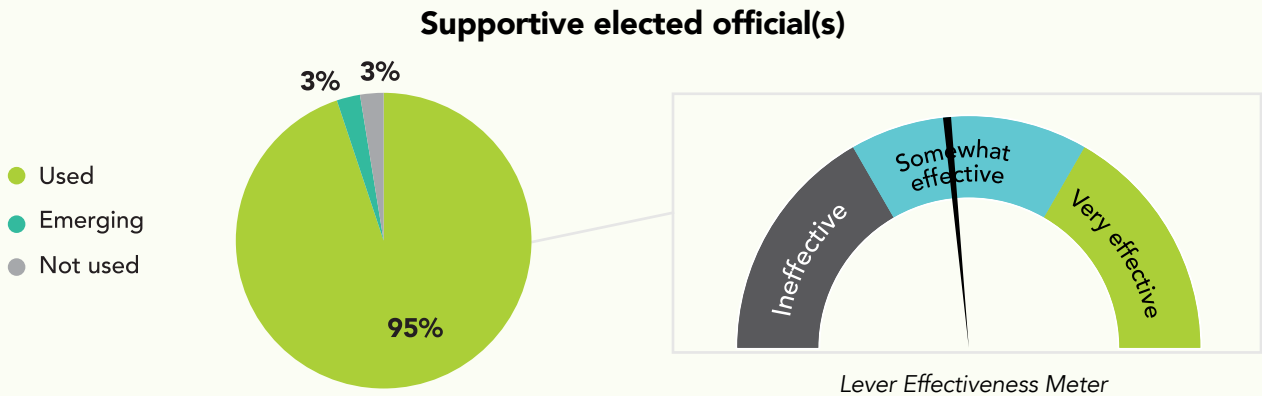
- *"Someone needs to say 'yes' and having that champion is critical to launching green infrastructure programs."*
- *"Essential- You have to have the leadership to help [the] agency prioritize, and set budgets."*
- *"Strong internal leadership has been most effective for installation in public ROW."*
- *"Champions in the wastewater department are the players who make it happen on the maintenance side. Without those dedicated employees, green infrastructure would not be a discussion point."*
- *"Having a passionate leader who helps to facilitate cross-departmental collaboration has allowed the City to complete several large green infrastructure projects."*

Having strong senior champions is among the least effective levers because...

- *"We have thought about using this approach and prepared materials for targeted outreach within the organization. There are a few key staff who are green infrastructure champions and this has been critical for any successes so far, but overall there is a lack of FTEs to manage green infrastructure programmatically within the organization and a lack of sufficient dedicated staff resources to enable development of green infrastructure champions across all levels of the organization, but especially with upper management."*

- “Needed support at all levels of the agency even when elected officials were in favor. Decision maker discounted data. Decision makers can’t get past maintenance concerns.”
- “Senior leaders are supportive in theory, but aren’t doing anything to help overcome the challenges in implementing a new program.”

SUPPORTIVE ELECTED OFFICIALS: Elected officials (City Council, Commissioners, etc.) that are aligned with staff in commitment to green infrastructure can direct funding and other resources (staff time, etc.) to green infrastructure programs. They also effectively communicate the benefits of green infrastructure to their constituents.



- 95% of respondents reported that they have supportive elected officials.
- Among respondents who use this lever:
 - 92% stated that it was somewhat or very effective.
 - Only 8% responded that it was ineffective.
 - The most frequent rating was somewhat effective.

“To “Job training and recruitment in the green infrastructure field should be for both entry level and leadership positions, and it should involve residents. Decision makers should reflect and understand the community they serve. There’s a disconnect between who is in management in municipalities and who comprises the communities they serve...” – Meishka (Camden, NJ)

RESPONDENT PERSPECTIVES:

Having supportive elected officials is among the most effective levers because...

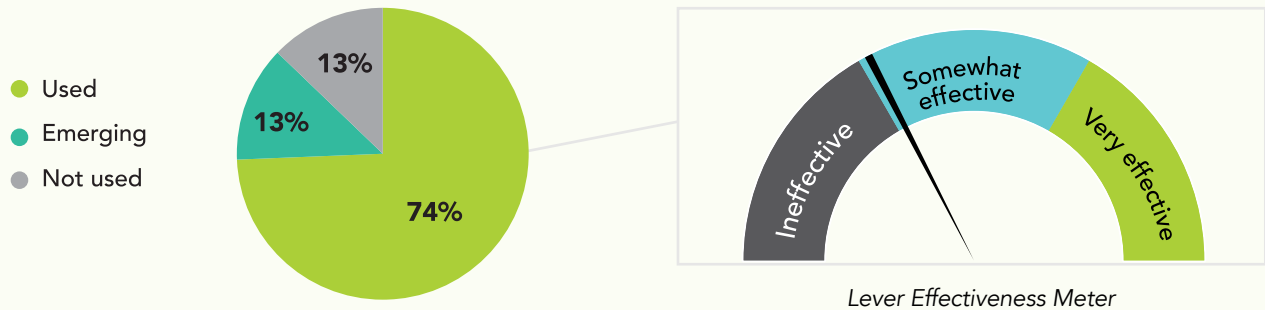
- “Having support of elected officials makes it easy to implement provided that there is money in the budget.”
- “Strong champions at the senior management and elected levels provide the foundational support it takes to underpin a green infrastructure program as well as move it forward. You need both for a successful program. We have been fortunate in that arena.”

- “Supportive City Council and Stormwater Management Advisory Commission, both of which have asked for staff to have a green infrastructure program.”
- Having supportive elected officials is among the least effective levers because...
- “Having supportive city officials is nice, but hasn’t necessarily driven green infrastructure implementation (yet!)”

SHARING GREEN INFRASTRUCTURE CASE-MAKING RESEARCH WITH DECISION-MAKERS:

Research efforts to make the case and provide evidence to policymakers and decision makers can help “unstuck” investments in green infrastructure. Examples can include official databases of BMPs and O&M procedures, and co-benefits research.

Sharing GSI case-making research with decision-makers



- 74% of respondents reported that they share case-making research with decision-makers. Notably, an additional 13% are planning to begin using this lever in the near term.
- Among respondents who use this lever:
 - 90% stated that it was somewhat or very effective.
 - Only 10% responded that it was ineffective.
 - The most frequent rating was somewhat effective.

RESPONDENT PERSPECTIVES:

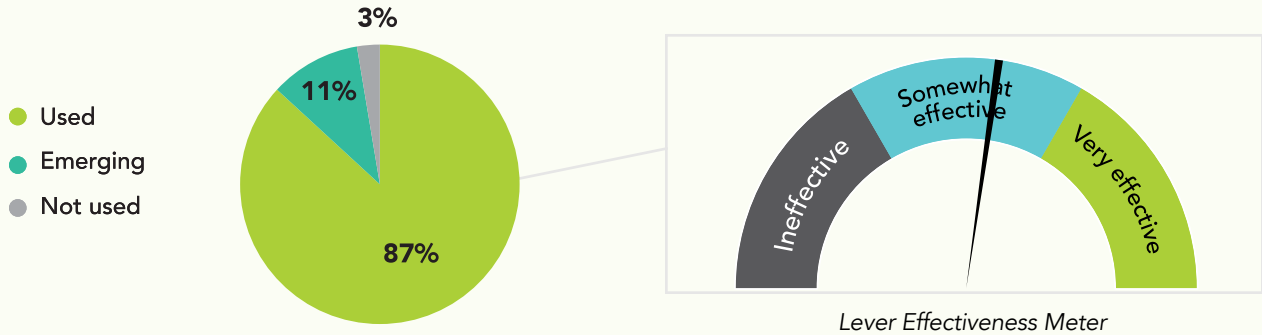
Sharing green infrastructure case-making research with decision-makers is among the least effective levers because...

- “I think sharing case-making research with decision makers is not very effective because green infrastructure is not a priority for many public agencies given funding constraints. It’s good to keep them informed, but without funding options there is not much that can be done to reprioritize limited funding where other infrastructure needs may dominate (i.e., roadway improvements, bike/pedestrian facilities, etc.)”

STAFF: Cross pollination between departments, agencies, and sectors: Better coordination across public boundaries, as well as between public investments and private development, can drive higher impact solutions.

Cross pollination: departments, agencies, and/or sectors

- 87% of respondents reported that they engage in cross pollination between departments,



agencies, and sectors. Notably, an additional 11% are planning to begin using this lever in the near term.

- Among respondents who use this lever:
 - 94% stated that it was somewhat or very effective.
 - Only 6% responded that it was ineffective.
 - The most frequent rating was somewhat effective.

RESPONDENT PERSPECTIVES:

Cross pollination between departments, agencies, and sectors is among the most effective levers because...

- "We have been implementing more and more green infrastructure in City parks and ROWs in partnership w/ our Departments of Parks & Rec and City Planning."*
- "We have strong collaboration internally and across government-affiliated organizations (community development, elected official support, state DNR, regional planning commissions), which leverages opportunities for green infrastructure in developments, capital projects and funding requests."*
- "The City's stormwater regulations have required thousands of green infrastructure installations in the City (re/development projects). Providing maintenance contracts for use by various departments removes maintenance as a barrier to green infrastructure construction."*
- "We've established grassroots champions for green infrastructure among the staff in other departments, notably Parks & Rec and Roadway Design & Construction."*
- "It's important to break down silos - we build more green infrastructure when everyone is working together to achieve the same goal."*
- "Building support because all parties involved (city leadership, maintenance staff, planners, plan review team, inspectors, etc) is how we have ensured that everyone is reviewing all plans to ensure that green infrastructure is prioritized."*

Cross-pollination between departments, agencies, and sectors is among the least effective levers because...

- “We have had great success working with our transportation bureau but continue to have coordination challenges with the water bureau limiting infiltration of stormwater around water mains.”
- “We have the biggest challenge with siloing in the organization between divisions that build and maintain, and those that regulate, permit and inspect. This needs work. Much of this is due to staff turnover, creating long arcs in establishing institutional knowledge and skills, which leads to things getting missed on plan review, etc. Once things are built incorrectly or without proper oversight, our maintenance inherits additional problems, adding to our capacity challenges.”

EDUCATION AND TRAINING FOR INTERNAL AND CONTRACTED STAFF: Internal education and training efforts increase a department’s comfort level with green infrastructure, with the goal of increasing internal adoption.

Education and training for internal and contracted staff



- 74% of respondents reported that they engage in education and training for internal and contracted staff. Notably, an additional 18% are planning to begin using this lever in the near term.
- Among respondents who use this lever:
 - 100% stated that it was somewhat or very effective.
 - No one responded that it was ineffective.
 - The most frequent rating was somewhat effective.

RESPONDENT PERSPECTIVES:

Education and training for internal and contracted staff are among the most effective levers because...

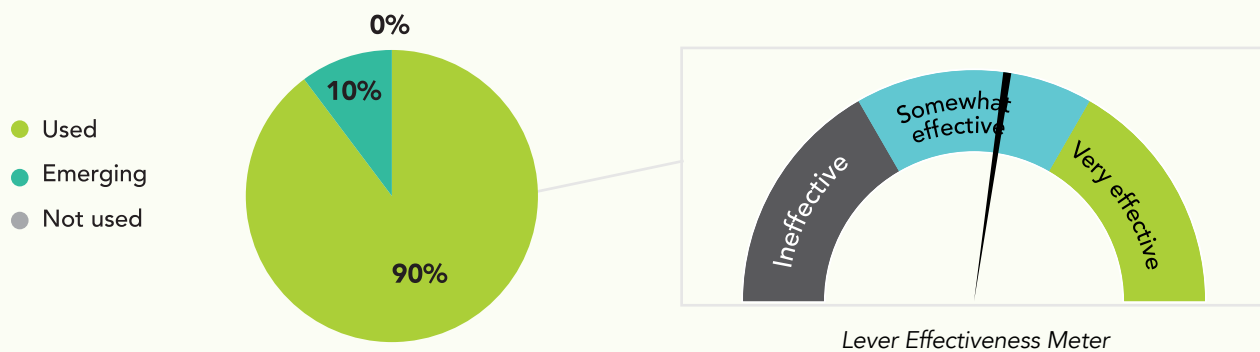
- “We have a joint contract with our city’s Public Utilities and a local engineering firm, which has provided resources to conduct numerous trainings for internal staff on multiple topics and to create new trainings at the request of staff or partners.”
- “Our program, in partnership with our city’s Public Utilities, hosts specific trainings/orientations for contractors who want to install our program specific rain gardens and cisterns. These

contractors may have existing businesses or are starting new businesses and are building out their skill-set and offerings. Historically, this orientation has also been offered in Spanish, Vietnamese, and Mandarin to serve multi-cultural contractors interested in being part of the program. Additionally, the program has a grant with a local organization to fund their green infrastructure job training cohort. The training provides hands-on training in the design, construction, and maintenance of green infrastructure using existing community-based installations needing assistance as learning opportunities. It also provides mentorship and skill-building opportunities for existing and emerging contractors.”

- “Training provides [a] foundation for sound planning, design, construction, and maintenance.”

PUBLIC: Public outreach and/or education about green infrastructure: Communication and education campaigns seek to drive public understanding of, and demand for, investments in green infrastructure. This can include creating public awareness of the costs of unmanaged stormwater and flooding, and the multiple benefits of green infrastructure.

Public outreach and/or education about GSI



- 90% of respondents reported that they engage in public outreach and/or education around green infrastructure. Notably, the remaining 10% stated they are planning to begin using this lever in the near term.
- Among respondents who use this lever:
 - 100% stated that it was somewhat or very effective.
 - No one responded that it was ineffective.
 - The most frequent rating was somewhat effective.

RESPONDENT PERSPECTIVES:

Public outreach and/or education about green infrastructure is among the most effective levers because...

- “The support, awareness, and partnership of communities, stakeholders and local grassroots and enviro org’s is critical to the success of the green infrastructure program.”
- “Education through programs, events, staff, along with outreach partners from local community-based organizations grant funded through the program, educate communities about the problem of stormwater and how green infrastructure plays a role in solving the problems our region faces.

For our program specifically, since the program operates with combined sewer basins, we do a lot of education about overflows of the wastewater system and how green infrastructure helps reduce these although since we meet folks from throughout the entire County and not just the city, we also promote green infrastructure more generally since it is a benefit beyond the combined system."

- *"Educating the public has always been an effective method to change the way people view green infrastructure. It creates a positive understanding."*
- *"Support needs to come from the bottom up, education of the community is paramount."*
- *"We are able to reach a broad audience and use marketing based approaches to raise awareness of the value and benefits of green infrastructure."*
- *"Educating the public helps to reinforce or leads to supportive leadership, but it is also important for public acceptance of infrastructure that looks different and actions they can take to keep it performing well."*
- *Public outreach and/or education about green infrastructure is among the least effective levers because....*
- *"Not enough time to make general public understand importance or details of green infrastructure."*
- *"Stormwater is a secondary thought in the public and with elected officials."*

"To improve government-resident relationships, the best places to start are with the children. Stormwater management should be taught and discussed, so it's a regular part of life, so kids come up understanding that there is a better way to build. Signage would help increase awareness and educate people about a site's function, why it's designed the way it is, what taking care of it looks like. That way, residents could become part of the maintenance, part of the solution."

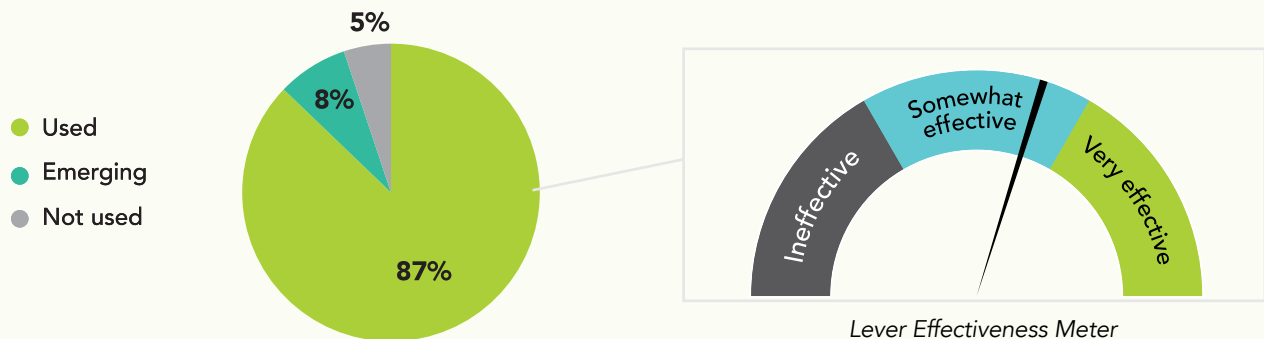
– Denzel (Baltimore, MD)

"A 'one size fits all' approach to engagement is not authentic. Without relationships, you can't understand the history, the patterns, or the nuances of a community. Each community needs a customized strategy for sharing and receiving information, ideas, and solutions." – Antoine (Milwaukee, WI)

"To me, outreach is going into the community to announce 'this is what we're doing' versus engagement, which is 'we are seeking your feedback and involvement, and we will be integrating your ideas into our solutions'." – Vaughn (Washington, DC).

GREEN INFRASTRUCTURE DEMONSTRATION PROJECTS: Demonstration projects can test new approaches to green infrastructure planning, design, implementation and maintenance, as well as provide real world examples of the positive impacts of green infrastructure. The goals of demonstration projects may include, but are not limited to, reducing risk, testing out new approaches prior to making larger investments, and increasing both internal and public buy-in.

GSI demonstration projects



- 87% of respondents reported that they develop green infrastructure demonstration projects.
- Among respondents who use this lever:
 - 100% stated that it was somewhat or very effective.
 - No one responded that it was ineffective.
 - The most frequent rating was somewhat effective.

.....

“Working with local groups will help you get small wins on the ground. Start right away, build trust by listening to their concerns, and responding by completing a project, no matter how small. Those early wins (i.e., neighborhood beautification projects, education activities like building rain gardens) will build community members’ investment and their trust, and that will help the community hang in, because you know the larger, more ambitious projects will take more time.” – Meishka (Camden, NJ)

.....

RESPONDENT PERSPECTIVES:

Green infrastructure demonstration projects are among the most effective levers because...

- “[They] eliminate developer’s risk. Develop early pilot projects for demonstration sites.”
- “Demonstration projects have pushed the city to take additional risks, increase outreach and monitor the impact of green infrastructure.”

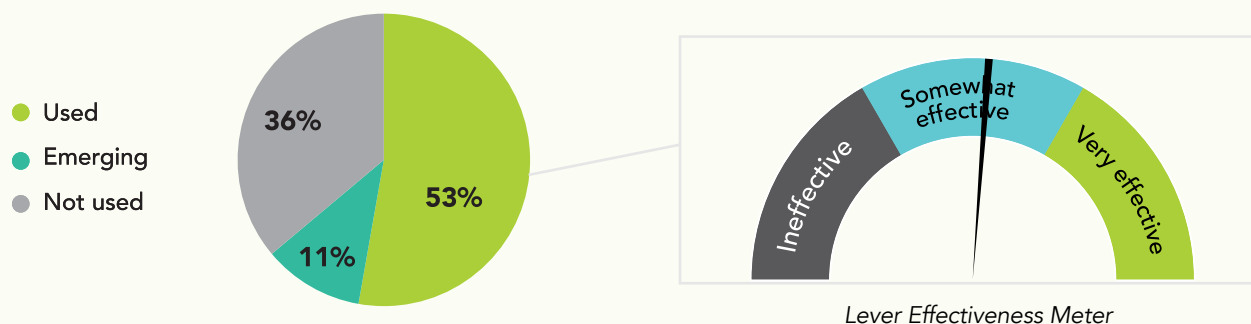
Green infrastructure demonstration projects are among the least effective levers because...

- “Demonstration projects in the sewershed was determined not to be effective due to limited space for green infrastructure and public pushback/silos with government agencies.”
- Pilots/demonstrations are great and “convince” some, but lose their influence without proper maintenance.”

RESIDENTIAL GREEN INFRASTRUCTURE RETROFIT INCENTIVE PROGRAMS

Residential green infrastructure incentive programs bring awareness and direct benefits to individual households. Although these programs do not result in as many gallons managed as other program models, they can make a difference within individual households to help address drainage issues, as well as drive public awareness and demand for broader investments in green infrastructure.

Residential GSI retrofit incentive program



- 53% of respondents reported that they offer residential green infrastructure retrofit incentive programs. Notably, an additional 11% are planning to begin using this lever in the near term.
- Among respondents who use this lever:
 - 79% stated that it was somewhat or very effective.
 - 21% responded that it was ineffective.
 - The most frequent rating was very effective.

RESPONDENT PERSPECTIVES:

Residential green infrastructure retrofit incentive programs are among the most effective levers because...

- *"We performed audience research to better understand barriers to participation in green infrastructure Incentive programs. We built the programs based on that feedback, which is why those approaches have been so effective, because we heard that it was a need, directly from the audiences we are serving."*
- *"We also have a successful partnership with the Conservation District for private green infrastructure incentives and cost share. We fund them, they do the work and assist homeowners with getting the right solutions for their situation, and cumulatively water quality gets better as well all work together."*
- *"Engaging private property owners to manage the rain that falls on their properties both educates about the importance of managing combined sewer overflows and stormwater. Our program provides a generous rebate for rain gardens and cisterns. The green infrastructure Mini Grants were developed because the education was effective and others wanted to get involved that were not in eligible CSO basins. A local non-profit organization wrote a grant to fund mini grants. They also manage a rain gardens campaign, so there are thriving partnerships with education and on available incentives."*

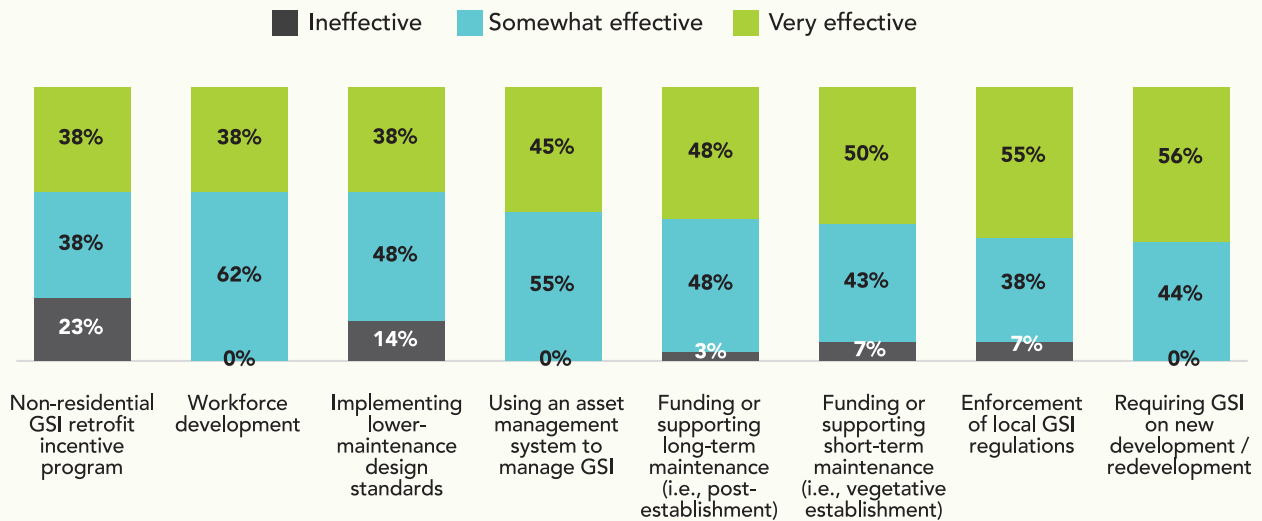
Residential green infrastructure retrofit incentive programs are among the least effective levers because...

- “Property owners didn’t understand the maintenance requirements.”
- “Our existing private property incentive program is a rebate program that is inequitable in its design, because it targets homes in uncontrolled CSO basins that tend to be near the water and wealthier. Those who cannot afford the upfront costs of such projects are less likely to participate. Further, there are not enough contractors willing to take on the work for smaller green infrastructure installations (e.g. rain gardens and cisterns) at the residential property scale because the utility doesn’t pay enough per gallon managed.”
- “Our residential retrofit is limited to a downspout disconnection program, primary benefit is public outreach, while managed acres from this program are limited and remain low.”

PROCESS LEVERS

The second category focuses on levers that address some of the process-related challenges with scaling green infrastructure, such as maintaining living infrastructure, integrating it into building codes, and enforcing regulation. Below is a summary graphical representation of the people levers’ use and effectiveness.

Effectiveness of levers to scale GSI - process levers

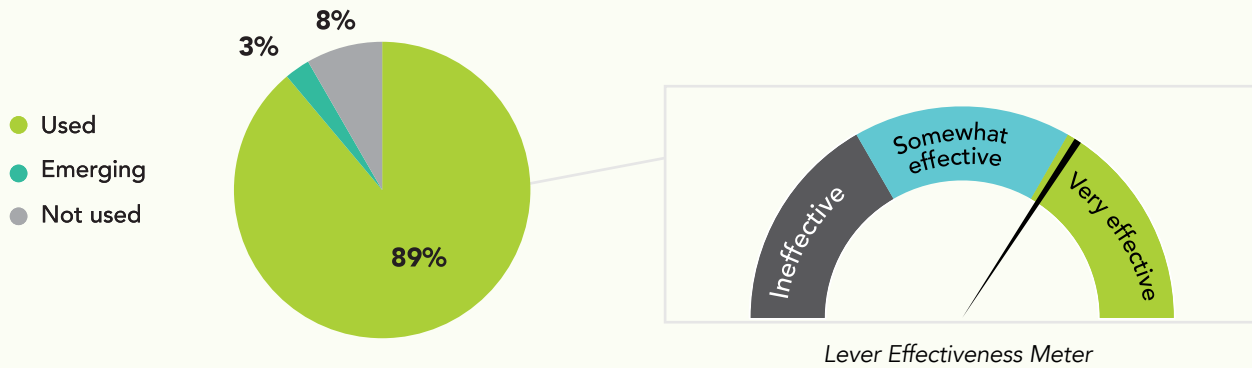


REGULATION & ENFORCEMENT

REQUIRING GREEN INFRASTRUCTURE ON NEW DEVELOPMENT / REDEVELOPMENT:

Development regulations drive investment in green infrastructure from both private and public real estate owners. Common strategies include “sticks” like onsite retention requirements and greened area ratios; “carrots” such as accelerated permitting, property tax abatements, and zoning bonuses; and alternative compliance programs like in-lieu fees and credit trading.

Requiring GSI on new development / redevelopment



- 89% of respondents reported that they require green infrastructure on new development or redevelopment.
- Among respondents who use this lever:
 - 100% stated that it was somewhat or very effective.
 - No one responded that it was ineffective.
 - The most frequent rating was very effective.

RESPONDENT PERSPECTIVES:

Requiring green infrastructure on new development / redevelopment is among the most effective levers because...

- *"The majority of our green infrastructure is installed by the private sector as a condition of new and re-development."*
- *"The total number of properties that have had to provide onsite stormwater in the 20+ years it's been in place. Over 9000 properties have installed stormwater management per the requirements."*
- *"The City's Post-Development Stormwater Ordinance was amended in 2013 to add a green infrastructure requirement to manage 1st 1" of runoff onsite for all residential and commercial new and re-developments. Since 2013 under the ordinance, green infrastructure projects have been permitted on over 7,350 private sites, which together will reduce annual runoff volume by >1.5 billion gallons."*
- *"The top most effective levers for accelerating green infrastructure are requirements on private development and retrofit incentive programs. Taken together, these provide a stick and carrot approach. We are further exploring opportunities for private development to go "beyond code" by managing stormwater from the right-of-way as part of their projects and providing a financial incentive to do so."*
- *"Zoning requirement to capture first inch of runoff on private new and major redevelopment projects along with strong review and enforcement has been most effective for green infrastructure installation on private property. "*
- *"Development regulations and enforcement of these regulations are effective because they create a standard for implementation that apply broadly and are backed by private sector funding which is more accessible than public sector funding."*

- “Local green infrastructure Regulations - drives the majority of green infrastructure development in the city.”
- “Requiring green infrastructure on new development/redevelopment projects has been the primary driver of implementing green infrastructure to date. It is a regulatory mandate and thus developers must comply with the requirements.”

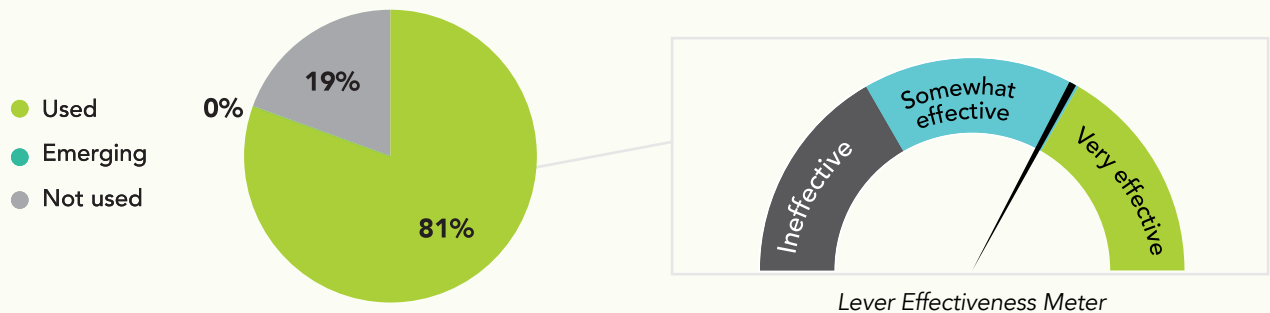
Requiring green infrastructure on new development / redevelopment is among the least effective levers because...

- “Implementation of [green infrastructure] in the private realm has been particularly challenging. There are many different departments involved in private realm policy. There is also a legacy of policies and building codes that make changes to lot development difficult. And in an era of extreme housing pressures there is resistance to anything that may make new construction or redevelopment more difficult. Also, we have densities that make on-site rainwater management all the more expensive. Implementing more [green infrastructure] on private property would be a big win, but it is a tough nut to crack.”

ENFORCEMENT OF LOCAL GREEN INFRASTRUCTURE REGULATIONS:

Enforcement includes measures taken to increase compliance with green infrastructure regulations and ensure ongoing performance of installed green infrastructure. Examples include self-reporting, inspections, and penalties.

Enforcement of local GSI regulations



- 81% of respondents reported that they enforce local green infrastructure regulations.
- Among respondents who use this lever:
 - 93% stated that it was somewhat or very effective.
 - Only 7% responded that it was ineffective.
 - The most frequent rating was very effective.

RESPONDENT PERSPECTIVES:

Enforcement of local green infrastructure regulations is among the most effective levers because...

- “All new development requires infiltration or a highly involved process and penalties for failure to do so.”

- “Having regulatory requirements for green infrastructure implementation as a driver facilitates conversations with other agencies including budget to prioritize green infrastructure projects.”
- “Regulating forces the conversation with those who are not otherwise engaged.”

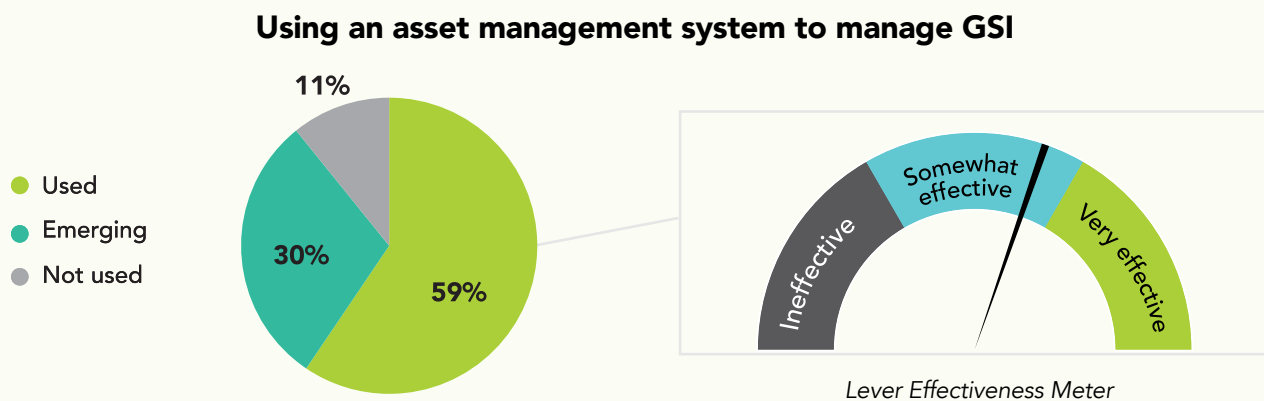
Enforcement of local green infrastructure regulations is among the least effective levers because...

- “Enforcement is a non-existent entity in this City. Not just for SW but across all sectors.”
- “Enforcement can lead to bad publicity of a program and decrease trust in us as a local government organization among our audiences.”

OPERATIONS & MAINTENANCE

USING AN ASSET MANAGEMENT SYSTEM TO MANAGE GREEN

INFRASTRUCTURE: Asset management systems leverage technology and best practices⁹ to efficiently track and monitor many green infrastructure assets with diverse ownership across an SMO’s service area.



- 59% of respondents reported that they use an asset management system to manage green infrastructure. Notably, an additional 30% are planning to begin using this lever in the near term.
- Among respondents who use this lever:
 - 100% stated that it was somewhat or very effective.
 - No one responded that it was ineffective.
 - The most frequent rating was somewhat effective.

FUNDING OR SUPPORTING SHORT-TERM MAINTENANCE (I.E., VEGETATIVE ESTABLISHMENT):

Allocating a sustainable source of funding to vegetative establishment helps green infrastructure assets survive the highest-risk period of plant growth, increasing the likelihood of long-term performance.

⁹ See the [Green Stormwater Infrastructure Asset Management Resources Toolkit](#), 2021

Funding or supporting short-term maintenance



- 79% of respondents reported that they fund or otherwise support short-term maintenance (e.g., vegetative establishment) of green infrastructure.
- Among respondents who use this lever:
 - 93% stated that it was somewhat or very effective.
 - Only 7% responded that it was ineffective.
 - The most frequent rating was very effective.

RESPONDENT PERSPECTIVES:

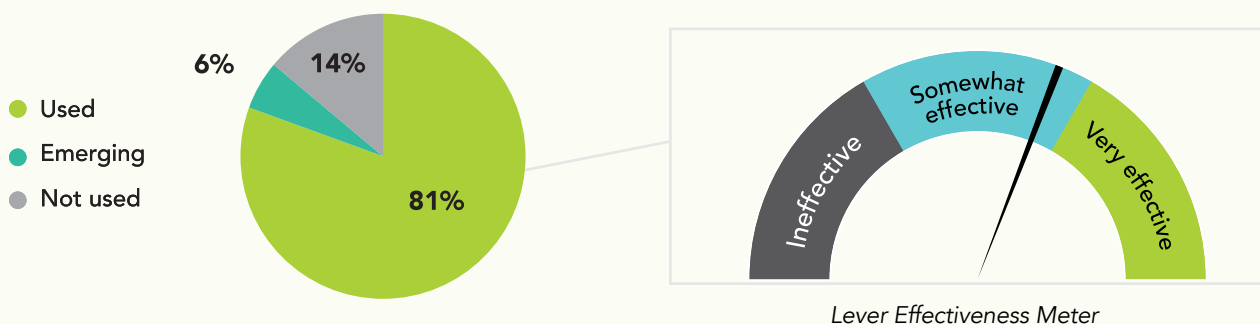
Funding or supporting short-term maintenance is among the most effective levers because...

- *"A maintenance plan that is in place during the first three years of establishment is critical for green infrastructure. Having knowledgeable staff maintain our green infrastructure and having a high standard of vegetation establishment for our green infrastructure has gone a long way to success. Setting a vegetation standard of established native community vs 70% vegetated cover has changed the management of green space built by developers and then accepted by the municipality."*
- *"Establishment maintenance is one of the biggest ways to build the cost of maintenance into the contract while we don't have maintenance staff or funds. Using community members and organizations has been a way for us to get people involved and fill the gap while we write business plans and recruit for a maintenance program."*

FUNDING OR SUPPORTING LONG-TERM MAINTENANCE (I.E., POST-ESTABLISHMENT):

Allocating a sustainable source of funding to long-term maintenance helps ensure long-term performance and stewardship of BMPs while building contractor pools to grow the green infrastructure ecosystem, creating efficiencies and competition that can drive down costs over time.

Funding or supporting long-term maintenance (i.e., post-establishment)



- 81% of respondents reported that they fund or otherwise support long-term maintenance of green infrastructure.
- Among respondents who use this lever:
 - 97% stated that it was somewhat or very effective.
 - Only 3% responded that it was ineffective.
 - The most frequent ratings were Somewhat Effective and Very Effective.

RESPONDENT PERSPECTIVES:

Funding or supporting long-term maintenance is among the most effective levers because...

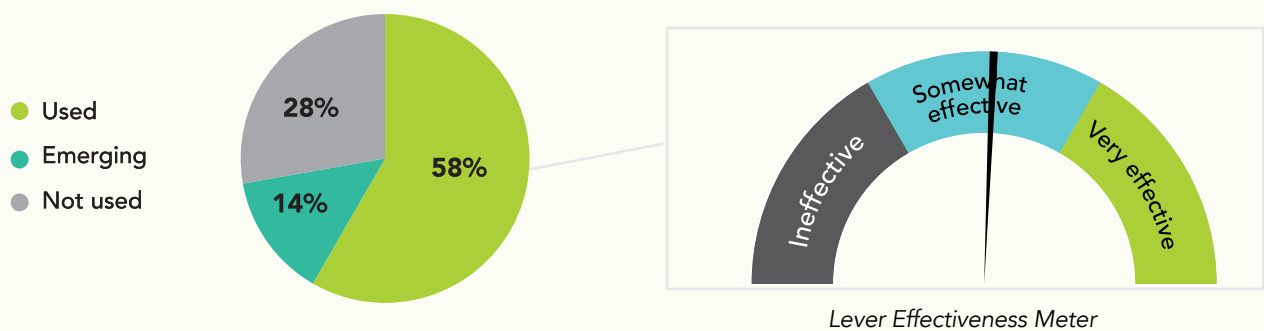
- *“Developing, funding, and staffing a permanent maintenance program early in the life cycle of green infrastructure funding and construction was paramount to being able to quickly develop and build the site-scale and regional green infrastructure we have today. Without an answer for ‘how will it be maintained,’ it would have been far more difficult to get buy-in. Also, having high-level support within many public agencies has helped to drive the adoption and acceptance of green infrastructure as a useful tool.”*

Funding or supporting long-term maintenance is among the least effective levers because...

- *“We have struggled to allocate budget and resources to support long-term maintenance. It requires specialized landscaping knowledge, and either additional FTEs or contracted staff, and would be most effective if it had a green jobs/workforce development component. Our agency has been reluctant to fund this.”*
- *“Providing maintenance pushes a lot onto the utility and becomes unaffordable long-term.”*
- *“Maintenance continues to be the most difficult part of our program. We have learned that just having maintenance funding available through our stormwater utility is not enough. As a local government, we need to predict the number of FTEs needed a couple of years in advance, since we need to request new positions and fill them in advance of the actual maintenance need. We’ve also seen that we need to do a better job of getting buy-in for green infrastructure strategies and the “why” from those who manage maintenance staff and maintenance contracts.”*

IMPLEMENTING LOWER-MAINTENANCE DESIGN STANDARDS: Green infrastructure design standards that prioritize manageable maintenance requirements can help streamline the project design process and simplify maintenance training requirements, leading to more consistently applied maintenance tasks and increasing the likelihood of long-term performance.

Implementing lower-maintenance design standards



- 58% of respondents reported that they implement lower maintenance design standards for green infrastructure. Notably, an additional 14% are planning to begin using this lever in the near term.
- Among respondents who use this lever:
 - 86% stated that it was somewhat or very effective.
 - 14% responded that it was ineffective.
 - The most frequent rating was somewhat effective.

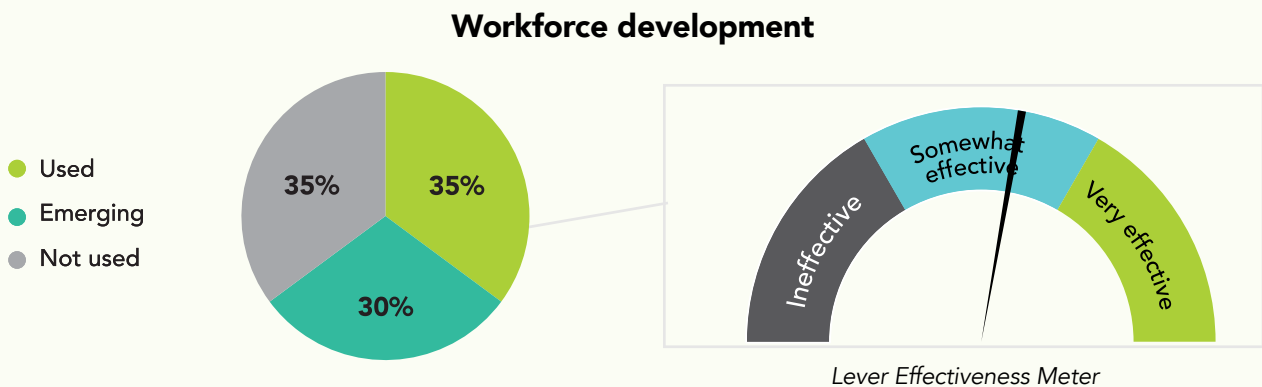
RESPONDENT PERSPECTIVES:

Implementing lower-maintenance design standards is among the most effective levers because...

- *“Our community is still in development (about half built-out), but rapidly developing, with no dedicated stormwater funding, so engineering design standards are instrumental.”*
- *“Our state has a standard and oversight committee that develops technical standards for designers to utilize. This assists both designers and reviews ensure that a quality design is being achieved.”*
- *Implementing lower-maintenance design standards is among the least effective levers because...*
- *“We have spent a lot of design effort on improving long-term maintenance burdens. Many of our public facilities do well, however maintenance is continually challenging and certain classes of facilities perform poorly.”*

WORKFORCE DEVELOPMENT

WORKFORCE DEVELOPMENT: Workforce development programs seek to recruit, train, and support a local workforce to meet the contracting needs of green infrastructure development, especially for construction and maintenance.



- 35% of respondents reported that they offer workforce development.
- Among respondents who use this lever:
 - 100% stated that it was somewhat or very effective.
 - 0% responded that it was ineffective.
 - The most frequent rating was Somewhat Effective.

“As we install these green infrastructure solutions, we need a knowledgeable workforce to monitor and maintain this infrastructure, and residents in our community are being overlooked for such jobs... This is a groundbreaking new field, a major opportunity, jobs that will provide mid-career salaries in early career positions. We’ve seen that residents can ultimately fulfill green infrastructure maintenance jobs with long-term, well-paying jobs and careers, especially for those with past involvement in the criminal justice system.” – Angela (New Orleans, LA)

RESPONDENT PERSPECTIVES:

Workforce development is among the most effective levers because...

- “We are slowly seeing results with workforce training. This is the hardest, but we expect this to be the most effective long-term lever.”
- “Green jobs training programs for maintenance gaps.”

Workforce development is among the least effective levers because...

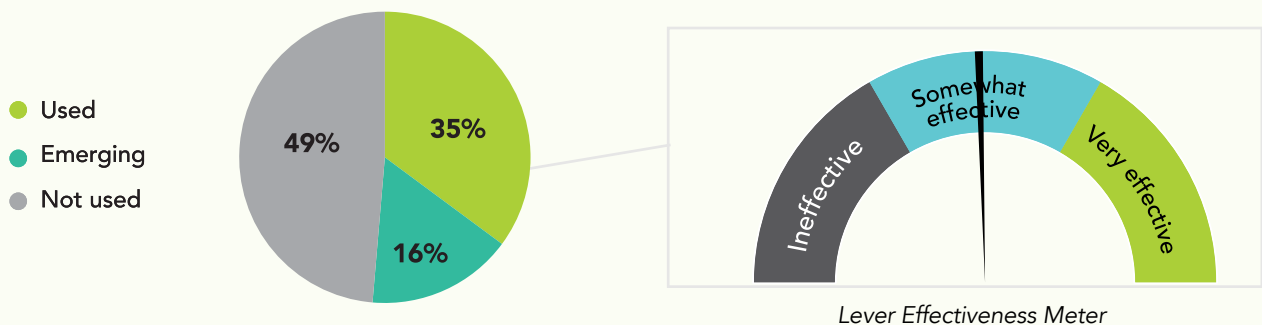
- “Doesn’t spur or stop green infrastructure Implementation, can be burdensome on project management staff to run these programs when it is out of their expertise.”
- “Workforce development is listed as highly effective and least effective because the investment is only valuable if you can keep the employee. We experience significant turnover, so it costs us significantly. We need to create better onboarding training with training materials and SOPs. This will create more measurable and lasting results.”

INCENTIVES

NON-RESIDENTIAL GREEN INFRASTRUCTURE RETROFIT INCENTIVE PROGRAM:

Non-residential green infrastructure incentive programs offer grants, incentives, and technical assistance to offset (in full or in part) the cost of green infrastructure retrofits on large commercial, institutional, and industrial properties with high impervious surface (e.g., roof and parking areas).

Non-residential GSI retrofit incentive program



- 35% of respondents reported that they offer a non-residential green infrastructure retrofit incentive program.
- Among respondents who use this lever:
 - 76% stated that it was somewhat or very effective.
 - 23% responded that it was ineffective.
 - The most frequent rating was a tie between Somewhat Effective and Very Effective.

RESPONDENT PERSPECTIVES:

Non-residential green infrastructure retrofit incentive programs are among the most effective levers because...

- *“The top most effective levers for accelerating green infrastructure are requirements on private development and retrofit incentive programs. Taken together, these provide a stick and carrot approach. We are further exploring opportunities for private development to go “beyond code” by managing stormwater from the right-of-way as part of their projects and providing a financial incentive to do so.”*
- *“The regional stormwater permit’s requirements have resulted in green infrastructure implementation on both public and private projects over the last permit term.”*

Non-residential green infrastructure retrofit incentive programs are among the least effective levers because...

- *“Using grant or incentive programs to retrofit existing commercial properties is challenging. Existing drainage patterns, site use, and structural limitations for installing green roofs make these projects mostly infeasible.”*
- *“We have no levers to mandate private property controls on the vast majority of the most dense developments taking place in the city, and it is a huge missed opportunity to provide meaningful on-site controls. However, the DGI (the Division of Green Infrastructure) is working diligently to create an initiative that will change that in the next 2-5 years.”*
- *“Many incentive programs are expensive to run and provide some educational benefit, but other levers listed have had quicker results.”*
- *“Incentives have largely been ineffective as they do not offer sufficient incentives given the restrictive covenants typically required to receive the incentive.”*
- *“Our non-residential incentive program has had little adoption. It is relatively new but I believe that the lack of participation is that the financial return on investment is too low 30-yrs. The return is low as the maximum “savings” is the current stormwater utility fee. Our modest fee coupled with the high cost of green infrastructure construction makes the payback long.”*
- *“Implementation of [green infrastructure] in the private realm has been particularly challenging. There are many different departments involved in private realm policy. There is also a legacy of policies and building codes that make changes to lot development difficult...Also, we have densities that make on-site rainwater management all the more expensive. Implementing more [green infrastructure] on private property would be a big win, but it is a tough nut to crack.”*

OTHER STANDARDS

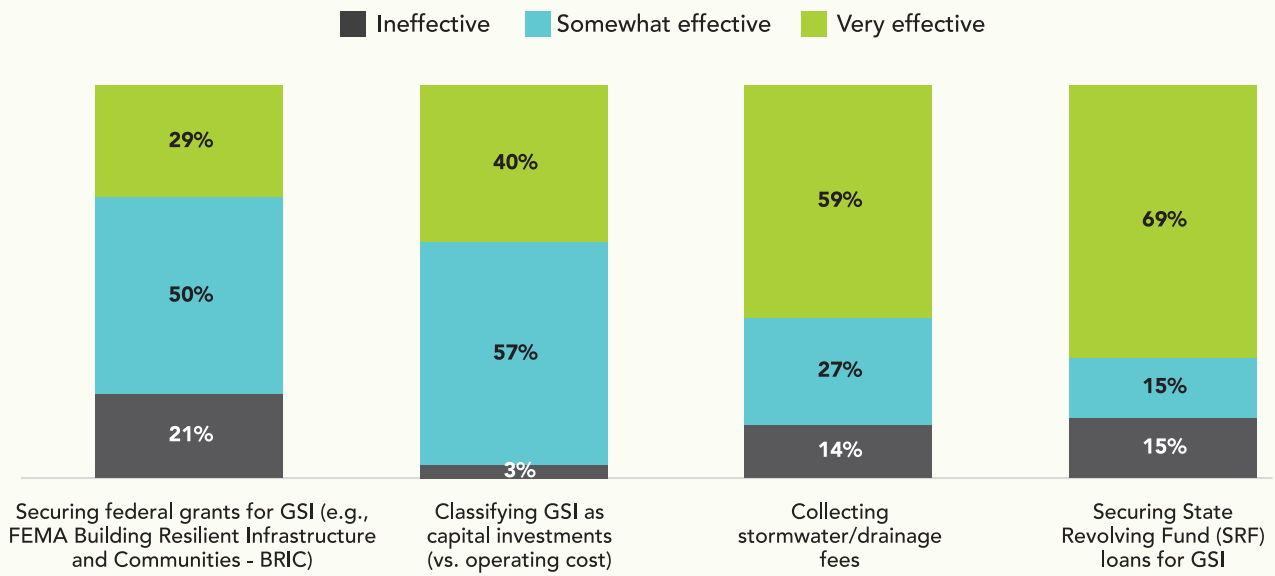
Respondents were also invited to write in and rank any other process levers that were effective within their jurisdictions. Write in responses included:

- *“Developing strong state technical standards.” (Very effective)*
 - *“Technical Design Guidance Manual.” (Somewhat effective)*
-

FINANCIAL LEVERS

The third category focuses on levers that match the right funding and financing sources to the relevant activities across the green infrastructure life cycle. Below is a summary graphical representation of the financial levers' use and effectiveness.

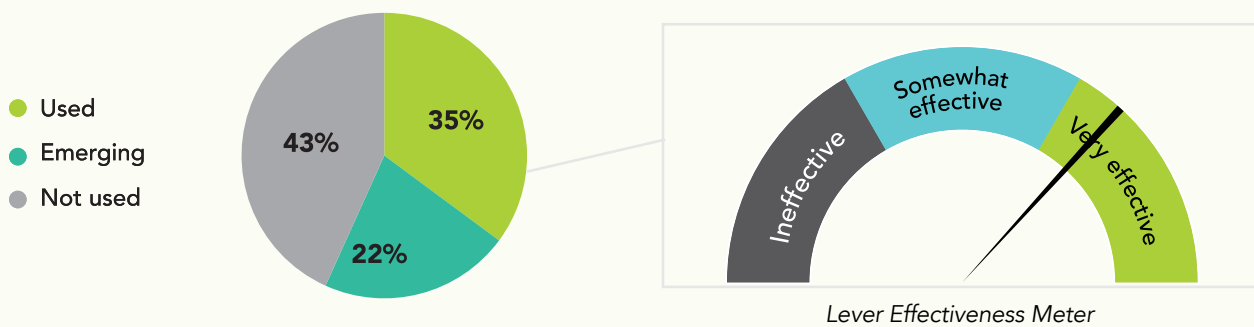
Effectiveness of levers to scale GSI - financial levers



SECURING STATE REVOLVING FUND (SRF) LOANS FOR GREEN

INFRASTRUCTURE: State Revolving Funds (SRF) provide low interest, long-term sources of financing that can be used to fund green infrastructure. Many SRF programs also offer principal forgiveness and grants for disadvantaged communities.

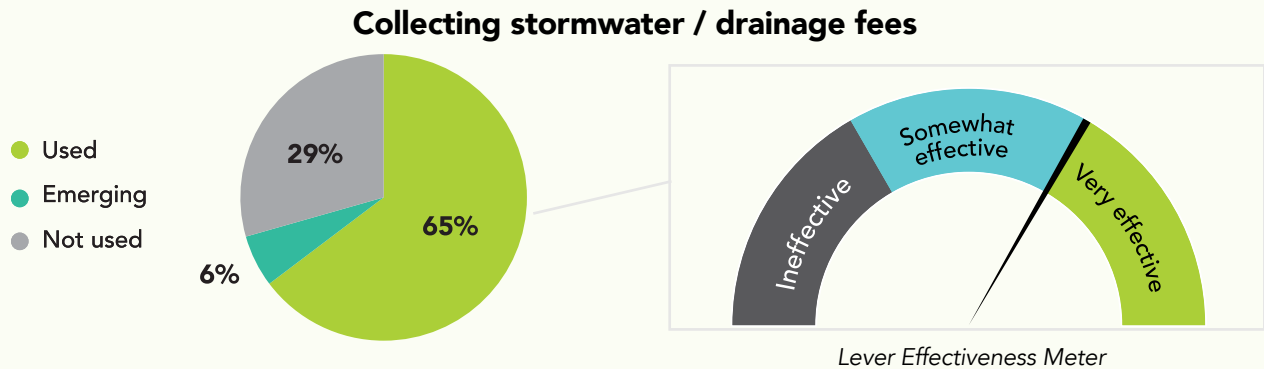
Securing State Revolving Fund (SRF) loans for GSI



- Only 35% of respondents reported that they have secured State Revolving Funds for green infrastructure. Notably, an additional 22% are planning to begin using this lever in the near term.
- Among respondents who use this lever:

- 85% stated that it was somewhat or very effective.
- 15% responded that it was ineffective.
- The most frequent rating was very effective.

COLLECTING STORMWATER / DRAINAGE FEES: Stormwater / drainage fees generate a dedicated revenue source that can fund investments in green infrastructure.



- 65% of respondents reported that they collect stormwater / drainage fees.
- Among respondents who use this lever:
 - 86% stated that it was somewhat or very effective.
 - 14% responded that it was ineffective.
 - The most frequent rating was very effective.

RESPONDENT PERSPECTIVES:

Collecting stormwater / drainage fees is among the most effective levers because...

- *“Reliable funding is critical for ongoing stormwater work.”*

Collecting stormwater / drainage fees is among the least effective levers because...

- *“Stormwater Fee - most of funding goes to drainage issues and consent decree requirements.”*
- *“While the fee funds public water quality projects and the public outreach. The fee itself does not encourage residents to install green infrastructure.”*

Collecting stormwater / drainage fees is challenging because...

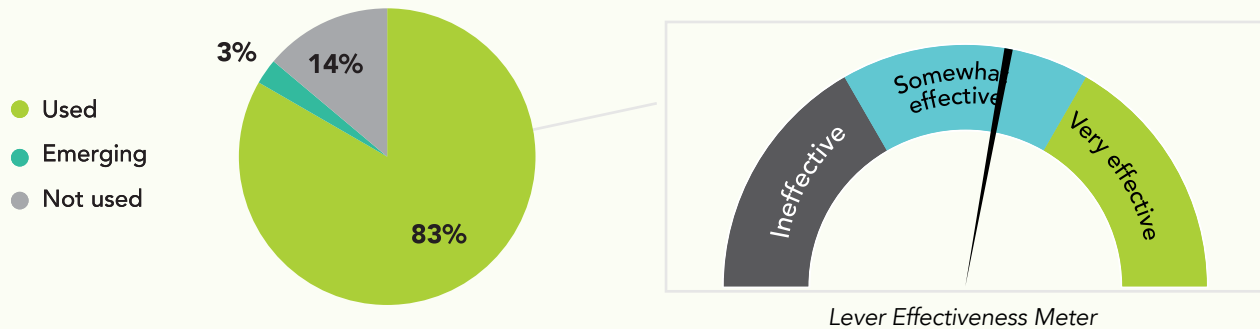
- *“Failed about a decade ago when introduced because [it’s] seen as a tax and green infrastructure had not yet been installed in the City.”*
- *“Parks & Stormwater tax failed twice in the early 2000s. Thereafter our city tried to establish a stormwater utility fee to fund MS4 compliance and stormwater asset management, but other communities were sued for similar taxes/fees; it got indefinitely tabled due to negative publicity and potential litigation. More recently, our city passed a ½ cent parks only tax. Our state has a ½ cent cap on this tax and the state has an amendment which generally would require a stormwater utility establishment be approved by voters. Voter approval is difficult without major visible community issues.”*
- *“Adding a new stormwater fee is challenging as it directly involves city law and rates.”*

- “There are very strict constraints for establishing or raising stormwater fees in the state, requiring a majority of affected property owner approval or super majority of general electorate approval for new/increased fees. So this lever is not effective (not very feasible).”

CLASSIFYING GREEN INFRASTRUCTURE AS CAPITAL INVESTMENTS (VS. OPERATING COST):

Applying revised GASB 62 guidelines and accounting for green infrastructure as a capital investment rather than an operating cost enables access to larger pools of capital from traditional municipal financing sources.

Classifying GSI as capital investments (vs. operating cost)



- 83% of respondents reported that they classify green infrastructure as a capital investment.
- Among respondents who use this lever:
 - 97% stated that it was somewhat or very effective.
 - Only 3% responded that it was ineffective.
 - The most frequent rating was somewhat effective.

RESPONDENT PERSPECTIVES:

Classifying green infrastructure as capital investments is among the most effective levers because...

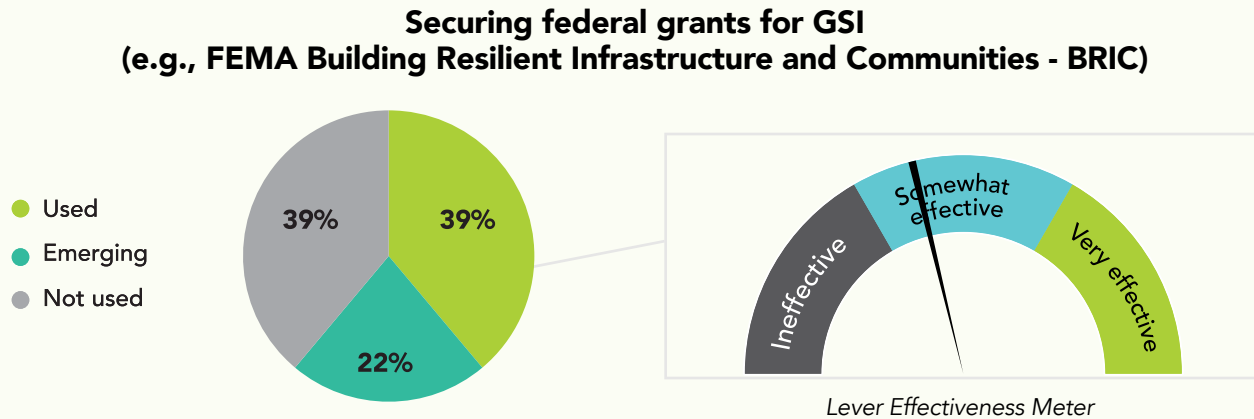
- “Capturing green infrastructure projects as capital improvements allows us to move from smaller rain garden systems to larger infiltration galleries and other stormwater facilities creating a greater impact to the environment. This has been facilitated by leveraging our stormwater fee for low-interest loans.”
- “We have established a goal to spend approximately 10-20 percent of our capital expenditures on green infrastructure.”
- “Unlocks additional funding.”

Classifying green infrastructure as capital investments is among the least effective levers because...

- “We have an extremely large capital program with an annual budget of \$250M and a system of prioritization for different categories of capital projects (regulatory, asset management, etc.). These projects are mostly gray infrastructure wastewater projects, and green infrastructure projects do not fit well in these categories and generally do not compete well with other projects in terms of cost/gallon managed. Ongoing operational costs for maintenance are managed in a different budget from the capital budget and additional operational costs are seen as a negative when evaluating a capital project.”

- “Classifying green infrastructure as capital vs operation has been a bit messy and cumbersome. This is especially true with permeable roads. it is more effective with infiltration and bioretention devices.”

SECURING FEDERAL GRANTS FOR GREEN INFRASTRUCTURE (E.G., FEMA BUILDING RESILIENT INFRASTRUCTURE AND COMMUNITIES - BRIC): Green infrastructure projects are increasingly eligible for a growing number of federal grant programs.



- Only 39% of respondents reported that they have secured federal grants for green infrastructure. Notably, an additional 22% are planning to begin using this lever in the near term.
- Among respondents who use this lever:
 - 79% stated that it was somewhat or very effective.
 - 21% responded that it was ineffective.
 - The most frequent rating was somewhat effective.

RESPONDENT PERSPECTIVES:

Securing federal grants for green infrastructure is among the most effective levers because...

- “Since we don’t have a stormwater utility or funding source for green infrastructure, we rely on grant funding for project implementation.”

Securing federal grants for green infrastructure is among the least effective levers because...

- “We’d like to apply for more federal grants, but don’t have the staff resources or senior level support to apply or manage the grants.”
- “Grants can be effective, but also burdensome.”
- “We have a horrible time pursuing and managing outside grants.”
- “Fed/State Loan Programs - only accessed after green infrastructure is funded in capital plan; often burdensome for smaller projects. BRIC looks promising, but only if we could secure a high amount.”
- “BRIC was not seen as viable due to the requirement of a county to develop a plan for only parts of the county, too much emphasis on flooding, green infrastructure eligible, but really they want to fund flooding projects.”

OTHER FINANCIAL LEVERS

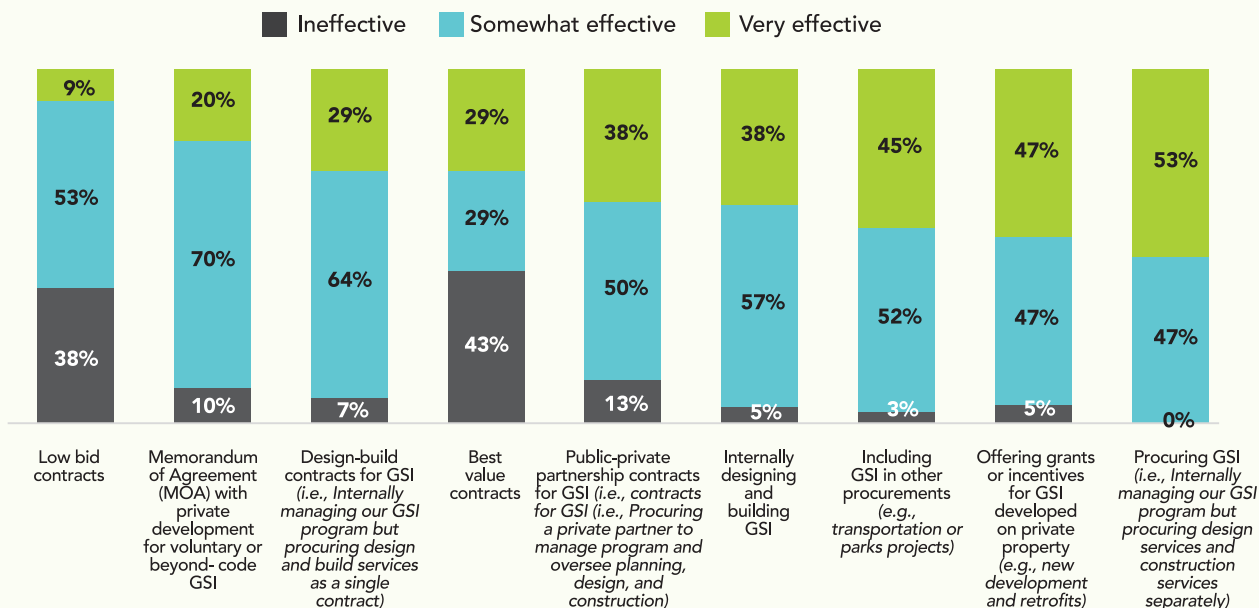
Respondents were also invited to write in and rank any funding levers that were effective within their jurisdictions. Write in responses included:

- “Environmental Impact Bond (innovative outcomes-based financing).” (Very effective)
- “Watershed organization grants.” (Very effective)
- “Environmental State Grants.” (Very effective)
- “Federal loan forgiveness, private foundation grants.” (Very effective)
- “The City is great with obtaining state funding for green infrastructure projects. The state funding is key for a municipality with little construction and maintenance dollars.”

PROCUREMENT + DELIVERY LEVERS

A final category focuses on levers that support effective procurement and implementation. Below is a summary graphical representation of the procurement and delivery levers’ effectiveness as perceived by the SMO administering the procurement.

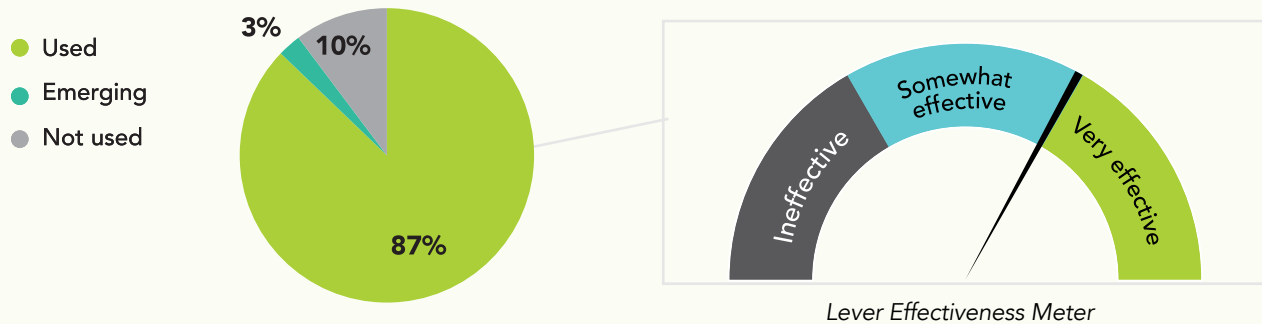
Effectiveness of used levers to scale GSI - procurement + delivery levers



PROCUREMENT STRUCTURES

PROCURING GREEN INFRASTRUCTURE: Many SMOs manage their own green infrastructure program with internal staff, but individually procure design, construction, and maintenance services.

Procuring GSI



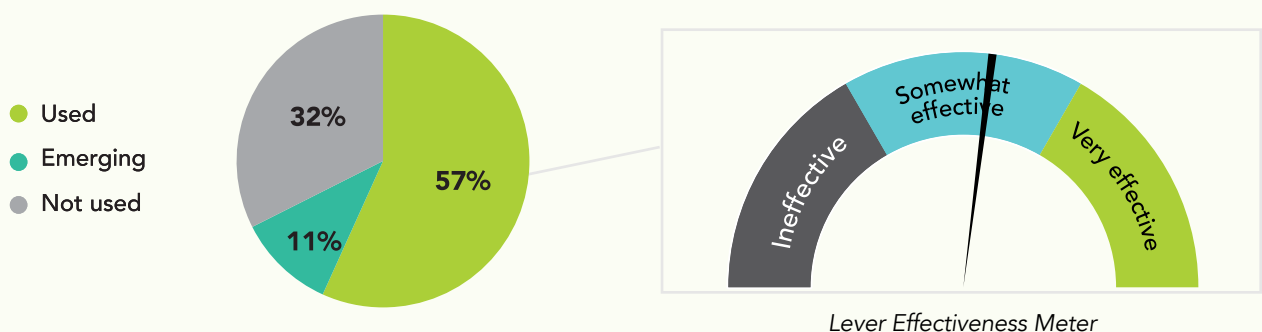
- 87% of respondents reported that they use a traditional approach to green infrastructure procurement.
- Among respondents who use this lever:
 - 100% stated that it was somewhat or very effective.
 - No one responded that it was ineffective.
 - The most frequent rating was very effective.

RESPONDENT PERSPECTIVES:

- *“Procurement is the number one biggest challenge and main barrier to project implementation. It is cumbersome, time consuming, rigid, and inefficient for staff, and it is a very difficult system for a small business to navigate to compete for projects.”*
- *“We currently utilize outside contractors to design and build all and maintain about 75% of our green infrastructure. We are working toward creating specialized and trained crews that can begin to take over areas that include green infrastructure. We believe linking this specialization to increased wages will provide the incentives to create real change. Also, training is key to this success.”*

INTERNALLY DESIGNING AND BUILDING GREEN INFRASTRUCTURE: Some SMOs manage all aspects of planning, designing, building and maintaining green infrastructure with internal staff.

Internally designing and building GSI

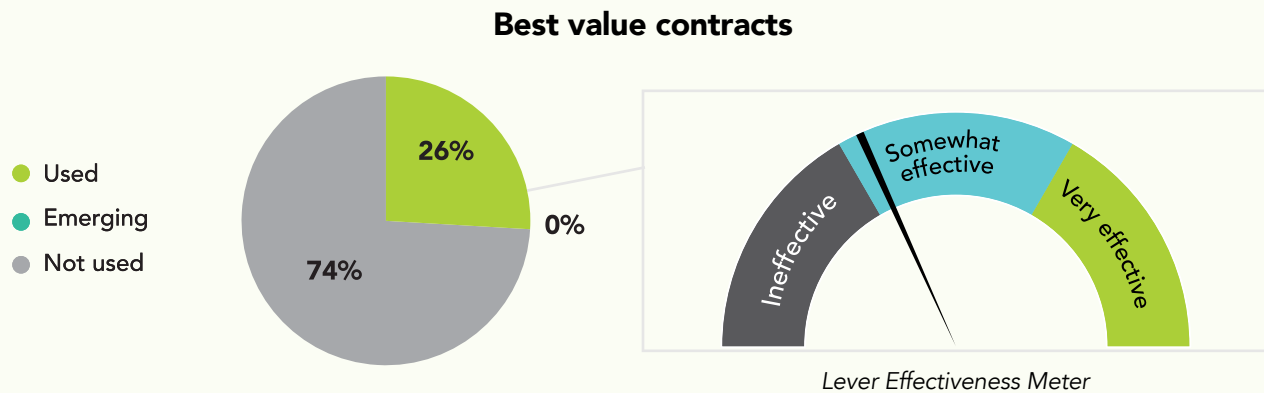


- 57% of respondents reported that they internally design and build green infrastructure. Notably, an additional 11% are planning to begin using this lever in the near term.
- Among respondents who use this lever:
 - 95% stated that it was somewhat or very effective.
 - Only 5% responded that it was ineffective.
 - The most frequent rating was somewhat effective.

RESPONDENT PERSPECTIVES:

- *“Lack of staff requires us to contract green infrastructure work.”*
- *“The city design and procurement process does not allow for internal design and implementation. All work is done by private design and contracting firms and managed by internal staff.”*
- *“In house designers and subcontractors are in another department and somewhere they forgot that green infrastructure is not green space. They also install green infrastructure that does not have enough ROI for the maintenance it will need.”*

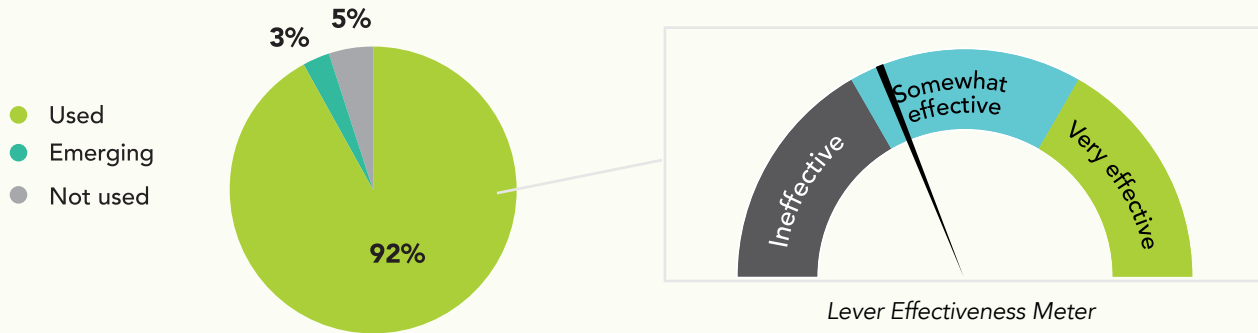
BEST VALUE CONTRACTS: Among SMOs that procure green infrastructure, some SMOs request proposals for the installation of green infrastructure where the scope is not strictly defined and the proposer has discretion as to how they will meet the goals of the contract. The SMO then selects the proposal which provides the overall best value and not simply the lowest cost proposal



- Only 26% of respondents reported that they use best value contracts.
- Among respondents who use this lever:
 - 57% stated that it was somewhat or very effective.
 - 43% responded that it was ineffective.
 - The most frequent ratings were somewhat and very effective.

LOW BID CONTRACTS: Among SMOs that procure green infrastructure, many use low-bid contracts, meaning they intend to accept the lowest bid offered by a qualified contractor.

Low bid contracts



- 92% of respondents reported that they use low bid contracts.
- Among respondents who use this lever:
 - 62% stated that it was somewhat or very effective.
 - 38% responded that it was ineffective.
 - The most frequent rating was somewhat effective.

RESPONDENT PERSPECTIVES:

- *"Low-bid contracts and partnerships allow the work to get done under our state laws and can in fact be required, but often the quality is lacking."*
 - *"We are required to use low-bid contracts."*
 - *"Low bid contract green infrastructure projects generally produce less successful green infrastructure projects. This is particularly true with vegetated BMPs."*
 - *"Low bid contracts still tend to increase the cost of individual projects and reduce our ability to work with smaller contractors who are focused on green job creation and providing those contractors a chance to pay their staff a living wage."*
 - *"We have struggled with "low bid" contractors and are looking to include green infrastructure certifications/qualifications in our contracts in the future."*
-

ALTERNATIVE DELIVERY MODELS

OFFERING GRANTS OR INCENTIVES FOR GREEN INFRASTRUCTURE

DEVELOPED ON PRIVATE PROPERTY: Some SMOs incentivize inclusion of green infrastructure in new development or through existing property retrofits.

Offering grants or incentives for GSI developed on private property



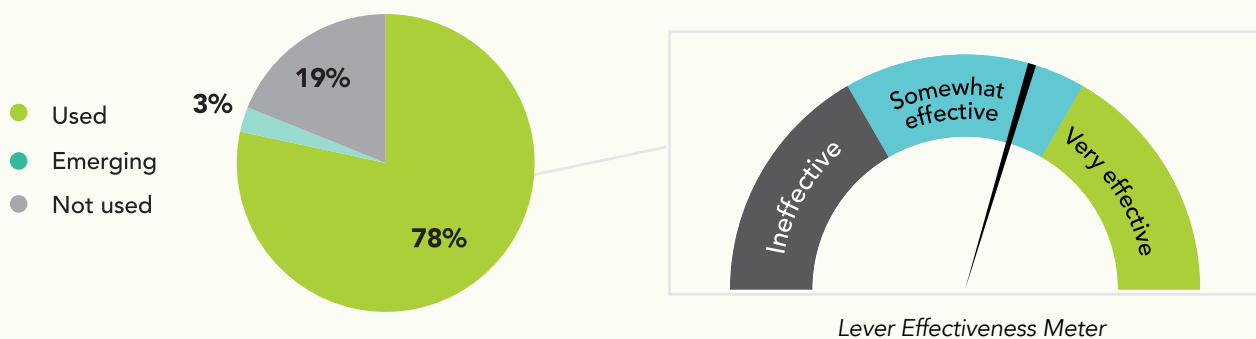
- 54% of respondents reported that they offer grants or incentives for green infrastructure on private property. Notably, an additional 11% are planning to begin using this lever in the near term.
- Among respondents who use this lever:
 - 95% stated that it was somewhat or very effective.
 - Only 5% responded that it was ineffective.
 - The most frequent ratings were somewhat and very effective.

RESPONDENT PERSPECTIVES:

- *"Incentives work, but to administer individual contracts for these projects can be cumbersome. A lot of private property partners are not well versed in contracting with the government and there is very little control over design, schedule, and quality."*

INCLUDING GREEN INFRASTRUCTURE IN OTHER PROCUREMENTS: Many SMOs include green infrastructure requirements in procurements for transportation, parks, or other infrastructure projects.

Including GSI in other procurements

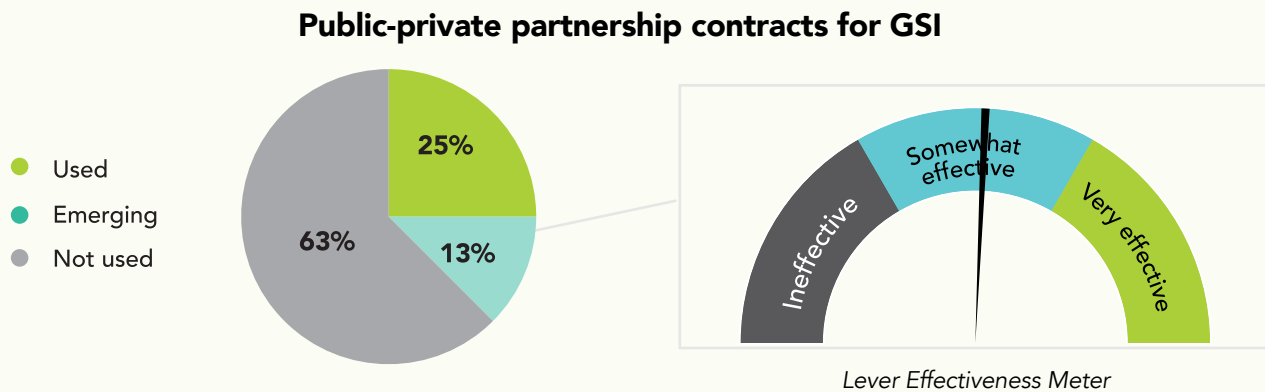


- 78% of respondents reported that they include green infrastructure in other procurements.
- Among respondents who use this lever:
 - 97% stated that it was somewhat or very effective.
 - Only 3% responded that it was ineffective.
 - The most frequent rating was somewhat effective.

RESPONDENT PERSPECTIVES:

- *“Coordination with the City to implement green infrastructure in transportation and parks projects is effective. However, the challenge is the administrative burden and equitable cost share of the projects is skewed to the anchor institution at times. Currently, the anchor institution is comfortable taking on this added challenge - ultimately, our customers are the same whether it is a cost to the City or a cost to [the] institution.”*
- *“Integrating green infrastructure with transportation and climate resilience investments is a current strategy we are advancing in the County through master planning documents. So far we are not seeing significant outcomes in terms of funding and building projects, likely because green infrastructure adds too much to the overall cost. It may help with grant applications in some cases, however.”*
- *“We have been very successful having green infrastructure installed as part of transportation projects, although that has mainly happened after stricter guidelines from the state about treatment requirements for federal pass-through dollars. Many locally funded trans projects still do nothing under the auspices of “maintenance” versus it being” redevelopment.”*

PUBLIC-PRIVATE PARTNERSHIPS: A small but growing number of SMOs procure a contractor to manage their green infrastructure program, overseeing planning, design, construction, and in some cases, maintenance.



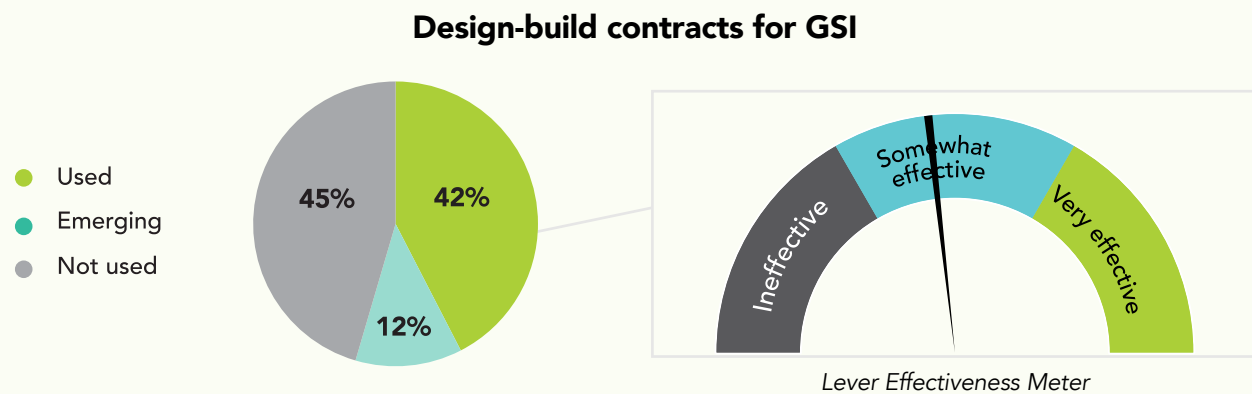
- Only 25% of respondents reported that they use public-private partnerships to build green infrastructure. Notably, an additional 13% are planning to begin using this lever in the near term.
- Among respondents who use this lever:
 - 87% stated that it was somewhat or very effective.
 - 13% responded that it was ineffective.
 - The most frequent rating was somewhat effective.

RESPONDENT PERSPECTIVES:

- “We have been hiring non-profit organizations to complete portions of projects, like outreach, landscaping, maintenance, etc. Extending the establishment period to 3 years and restructuring contracts to separate landscaping pieces.”
- “It’s too early to tell on P3 for our GI, there are some benefits I can see from this where it is like hiring a second arm of staff that would be otherwise unavailable.”

DESIGN-BUILD CONTRACTS FOR GREEN INFRASTRUCTURE:

Among SMOs that procure green infrastructure, some internally manage their green infrastructure programs, but procure design and construction within a single “Design-Build” contract.



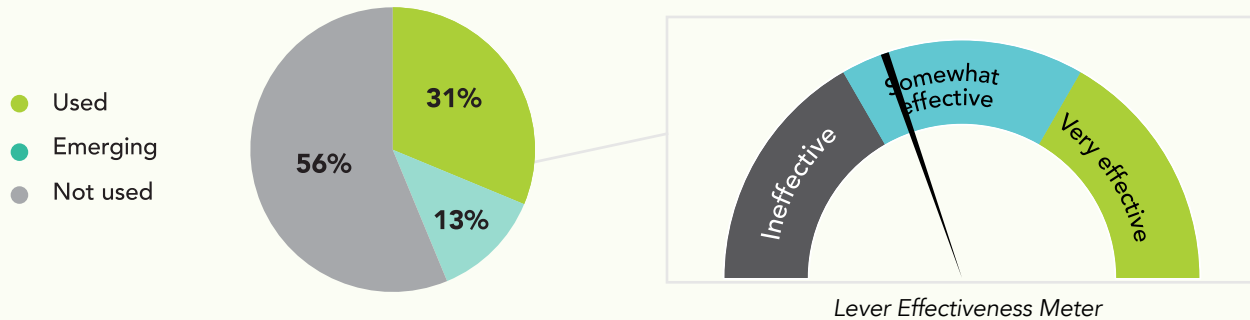
- 42% of respondents reported that they use design-build contracts. Notably, an additional 12% are planning to begin using this lever in the near term.
- Among respondents who use this lever:
 - 93% stated that it was somewhat or very effective.
 - Only 7% responded that it was ineffective.
 - The most frequent rating was somewhat effective.

RESPONDENT PERSPECTIVES:

- “Design-build seems like a strategic approach, but may limit creativity and progressive design and construction of facilities.”

MEMORANDUM OF AGREEMENT WITH PRIVATE DEVELOPMENT FOR VOLUNTARY OR BEYOND-CODE GREEN INFRASTRUCTURE: A limited but growing number of SMOs work with private developers to encourage green infrastructure that goes beyond code requirements.

Memorandum of Agreement (MOA) with private development for voluntary or beyond-code GSI



- Only 31% of respondents reported that they use Memorandums of Agreement with private developers to build green infrastructure. Notably, an additional 13% are planning to begin using this lever in the near term.
- Among respondents who use this lever:
 - 90% stated that it was somewhat or very effective.
 - 10% responded that it was ineffective.
 - The most frequent rating was somewhat effective.

RESPONDENT PERSPECTIVES:

- *"We have had some very successful public-private partnerships where a redevelopment project wasn't required to do frontage improvements, but were willing to partner with the city and for some additional funds, incorporate green infrastructure to add treatment to the existing roadway. Have also been able to do some innovative work with our local community college through some funds as well as project design work to make improvements to existing paved areas that now receive treatment by green infrastructure."*

OTHER PROCUREMENT LEVERS

Respondents were also invited to write in and rank any procurement levers that were effective within their jurisdictions. Write-in responses included:

- *"Blanket contractors for work less than \$15,000." (Very effective)*
- *"Pre-approved contractors." (Very effective)*
- *"Public partnerships to build green infrastructure on other public partners' land." (Very effective)*
- *"Relying on watershed organizations to provide assistance for private developments." (Somewhat effective)*
- *"The City takes ownership of infiltration basins that treat water from streets in new plat level development." (Very effective)*
- *"Memorandum of Agreement (MOA) with other public agencies to construct green infrastructure as part of a larger non-green infrastructure project." (Very effective)*
- *"Working with community organizations with green jobs training initiatives to complete portions of projects." (Very effective)*

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