

FINANCING GREEN INFRASTRUCTURE PROJECTS

Municipal budget officers have long been familiar with the intricacies of capital improvement planning, which allows governments to align infrastructure investments with their communities' long-range comprehensive plans¹. Conventional stormwater management systems (often called "gray") contain stormwater runoff in reservoirs and massive underground pipes and tunnels—large scale public works projects—to prevent polluted runoff from draining directly into waterways.

Green infrastructure uses largely natural processes (trees, soil, floodplains, and wetlands) to retain and treat stormwater at its source, reducing the amount of water and improving the quality of the water that eventually enters a community's waterways. Because a system based on natural vegetation is inherently different from one based on concrete, these types of projects have unique characteristics that, when compared to traditional gray infrastructure, require special consideration in the budget process.

The Government Finance Officers Association recommends that, when incorporating environmentally responsible practices into capital improvement plans, both financial and nonfinancial long-term project impacts should be considered by quantifying expected energy or water savings, or offsets,

KEY POINTS

- #1 The budgeting process must consider the differing life cycle characteristics between green and gray infrastructure.
- #2 Local taxes, user fees, and stormwater utility fees are suitable for both capital and O&M expenses.
- #3 Grants and state revolving funds or other low- to zero-interest loans may fund planning and capital costs.
- #4 Nontraditional sources of financing, such as public-private partnerships and nongovernmental funding, allow communities to leverage public funding against foundation, corporate, and community contributions.

1 Government Finance Officers Association (GFOA). 2008. [Best Practices: Master Plans and Capital Improvement Planning](#).

when accounting for ongoing maintenance and management costs for green infrastructure². Cost-benefit analysis can calculate and account for the value of reduction in volume of stormwater runoff (valued at \$0.66 per cubic foot in Houston in 2000, for example), pollutant removal from runoff, and energy savings provided by green infrastructure³.

In addition to different life cycle costs, green infrastructure projects also lend themselves to innovative funding strategies that take advantage of their various desirable co-benefits for the environment, economy, and community⁴. Nontraditional partners for infrastructure projects, such as community organizations, nonprofits, and private investors, are potential sources of funds for green stormwater projects that might also create natural habitats for wildlife, increase property values, create job opportunities, and improve public health while they retain stormwater runoff.

KEY POINT #1

The budgeting process must consider the differing life cycle characteristics between green and gray infrastructure.

Expenses for traditional gray infrastructure projects fall neatly into the budget categories of capital and operations and maintenance (O&M). Capital improvement planning for gray infrastructure projects typically includes extremely high up-front costs for planning, design, and construction, but relatively little for ongoing O&M until well into their expected life span—perhaps 50 to 100 years for a stormwater pipe, depending on the construction materials and location characteristics—with total replacement required at the end of that life span⁵. Steel, aluminum, and plastic pipe last no more than 50 years, while concrete pipes have a useful life of at last 50 years and commonly 70 to 100 years⁶. As cities within the United States have been steadily advancing their wastewater management strategies since the early 19th century, there is a wealth of data on gray infrastructure's life cycle costs.

Green infrastructure stormwater management is not a new practice and there is a rapidly growing body of long-

term data on O&M costs. However, its impacts on municipal budgeting do not benefit from the same historical data trove as gray infrastructure. The performance of individual green infrastructure projects is also more closely tied to local conditions (weather conditions, soil types, climate, maintenance techniques, etc.), than that of gray infrastructure⁷. For this reason, capital cost estimations should include a conservative buffer amount to allow for the possibility of replanting vegetation and other critical maintenance within the first several years of a project. However, as a given community becomes more familiar with the characteristics and performance of green infrastructure within that community, less of a budgetary buffer should be necessary for subsequent projects⁸.

Green infrastructure projects may look different on paper as well, in that they require planning for regular, smaller capital investments instead of a massive up-front capital expense⁹. Initial estimates for ongoing O&M expenses will be higher than those for gray infrastructure and may need to adapt to the performance of the green infrastructure, but should have a lower overall life cycle cost¹⁰. Routine maintenance includes minor but labor-intensive tasks such as removal of trash and accumulated organic material, control of invasive species, pruning, mulching, reseeding, structural repairs, and pipe/inlet flushing¹¹.

KEY POINT #2

Local taxes, user fees, and stormwater utility fees are suitable for both capital and O&M expenses.

Local sources of funding may include general funds, bonds, taxes (dedicated/ad valorem, property, real estate transfer, business improvement district, tax increment financing, stormwater), and fees (impact, fee in lieu, utility)¹².

Water utilities generally have their own dedicated or fee-charge funding sources, but they may also serve as reliable long-term partners and funders for green infrastructure on public lands. It is important to build a strong relationship with them as true partners, not just a presumed source of funding¹³. Strong partnerships between public agencies can result in truly innovative green infrastructure solutions, such as the award-winning AlexRenew Nutrient Management Facility. This \$160 million project in Alexandria, Virginia, topped an 18-million-gallon storage facility with a lit public athletic

2 Government Finance Officers Association (GFOA). 2010. [Best Practices: Environmentally Responsible Practices in Capital Planning](#).

3 The Civic Federation. 2007. [Managing Urban Stormwater with Green Infrastructure: Case Studies of Five U.S. Local Governments](#); Milwaukee Metropolitan Sewerage District (MMSD). 2013. [Regional Green Infrastructure Plan](#).

4 Rouse, David and Ignacio Bunster-Ossa. 2013. [Green Infrastructure: A Landscape Approach](#). PAS Report no. 571. Chicago: American Planning Association.

5 Berahzer, Stacey Isaac. 2014. [Crosswalking between Gray and Green Infrastructure for Budget Officers](#). UNC Environmental Finance Center; Marr, Jeff. 2012. [A Research Plan and Report on Factors Affecting Culvert Pipe Service Life in Minnesota](#). St. Anthony Falls, Minn.: Minnesota Department of Transportation.

6 U.S. Army Corps of Engineers. 1997. [Engineer Manual 1110-2-2902, Engineering and Design: Conduits, Culverts, and Pipes](#).

7 Berahzer, "Crosswalking between Gray and Green Infrastructure."

8 American Rivers, American Society of Landscape Architects, ECONorthwest, and Water Environment Federation. 2012. [Banking on Green: A Look at How Green Infrastructure Can Save Municipalities Money and Provide Economic Benefits Community-Wide](#).

9 American Rivers et al., [Banking on Green](#).

10 Berahzer, "Crosswalking between Gray and Green Infrastructure."

11 Philadelphia Water Department. 2012. [Green Infrastructure Maintenance Manual Development Process Plan](#).

12 Low Impact Development Center. (LIDC). 2016. [Great Urban Parks Convening Summary](#). Chicago: American Planning Association.

13 LIDC, [Convening Summary Report](#).

field that stores wastewater during nutrient peaks to balance the amount of nitrogen that goes into biological treatment processes¹⁴. The project is part of a larger effort to develop a former landfill that includes an environmental education center and additional recreational green space¹⁵.

It is important to ensure a dedicated funding source for O&M, as these activities are essential for the success of a green infrastructure budget. The importance of regular O&M for green infrastructure projects is critical for both long-term success and financial viability, as deferred maintenance can increase the total cost of the improvements by a factor of 15-to-1 to as much as 40-to-1¹⁶. Despite the essential nature of O&M, if local general funds pay for these expenses, they are at risk of competing against other spending obligations¹⁷. For this reason, it is beneficial to have a stormwater utility fee that can provide a source of funding that ensures that other priorities do not crowd green infrastructure O&M out of the budget.

The stormwater fee model used by the city of Philadelphia is calculated based on a parcel's gross surface area and its amount of impervious surface area¹⁸. Unlike usage based fees (such as those based on the number/size of water meters or actual gallons used), this calculation results in a fee based on the amount of stormwater that a property generates. Property owners are also incentivized to reduce the amount of impervious surface area and implement stormwater best management practices on their properties, as discussed further in Key Point #4.

KEY POINT #3

Grants and state revolving funds or other low- to zero-interest loans may fund planning and capital costs.

Locally sourced funds are often the fallback for infrastructure projects in general because they are close at hand, but it is important to consider the wide range of external agencies that provide funding for green infrastructure.

For most states, the Clean Water State Revolving Fund (CWSRF) is a readily available source of low- to no-interest funding that can cover up to 100 percent of a project's cost¹⁹.

14 CH2M Hill. 2016. "[CH2M and Alexandria Renew Enterprises Recognized with Envision Platinum Rating for Nutrient Management Facility.](#)"

15 National Association of Clean Water Agencies (NACWA). 2016. "[Member Spotlight: Alexandria Renew Enterprises – Taking Community Engagement to the Next Level!](#)"

16 U.S. Environmental Protection Agency (EPA). 2015. "[Managing Wet Weather with Green Infrastructure Municipal Handbook: Funding Options.](#)"

17 Georgetown Climate Center. "[Green Infrastructure Toolkit – How to Pay for Green Infrastructure: Funding and Financing.](#)"

18 Valderrama, Alisa, and Starla Yeh. 2012. *Financing Stormwater Retrofits in Philadelphia and Beyond*. National Resources Defense Council.

19 U.S. Environmental Protection Agency (EPA). 2008. "[Green Infrastructure Approaches to Managing Wet Weather with Clean Water State Revolving Funds.](#)" Fact Sheet.

SOURCES FOR GRANTS AND LOANS

Federal

- Community Reinvestment Act
- CDC Community Health Assessments & Health Improvement Plans
- EPA
- Clean Water State Revolving Funds
- Section 319 Grant Program
- FEMA National Flood Insurance Program Community Rating System
- FHWA
- Congestion Mitigation and Air Quality Improvement (CMAQ) Program
- Recreational Trails Program
- Transportation Alternatives Program
- HUD Community Development Block Grant Program
- NPS Land and Water Conservation Fund
- U.S. Army Corps of Engineers
- U.S. DOT Transportation Investment Generating Economic Recovery (TIGER) Program
- USDA
- Natural Resources Conservation Service
- USFS National Urban and Community Forestry Advisory Council (NUCFAC)
- USFWS Endangered Species Act

Regional/State

- Cap and Trade (CA) Greenhouse Gas Fund
- Federal Reserve Banks
- State departments of Natural Resources, Fish, Wildlife, Game, etc.
- State resource extraction dollars (e.g. fracking)
- State trails programs
- Parkland dedication ordinance/fees (regional/watershed approach)
- Stormwater credit trading programs (D.C., Los Angeles)
- Workforce development

Source: LIDC, Convening Summary Report

Green infrastructure projects are eligible for the program as they nearly always provide water quality benefits. The Hidden Creek development near Columbus, Ohio, used CWSRF to capture runoff through green infrastructure improvements including \$1.1 million of vegetated swales, restored wooded stream buffers, and the establishment of emergent wetland habitat within the Big Darby Creek watershed²⁰. Although CWSRF is most typically used for large-scale projects, several states such as Washington and Maine are able to distribute CWSRF monies to individual property owners via pass-through lending programs²¹.

State departments of natural resources are another potential source of water-related grant dollars, as well as other state agencies that have other funding priorities. For example, the Tennessee Department of Environment and Conservation's Green Development Grants are available to city or county governments to fund green infrastructure projects as well as related outreach and education efforts²².

Although grants are an excellent source of critical seed funding when they are available, many agencies caution against relying upon grants and loans for long-term funding due to their competitive nature and lack of year-to-year availability that often changes depending on the budget of the funder²³. It should be noted that such funding sources usually cannot be used for public recreational amenities. Funding for recreational improvements must come from operational and capital budget of the managing agency or from outside funding sources.

KEY POINT #4

Nontraditional sources of financing, such as public-private partnerships and nongovernmental funding, allow communities to leverage public funding against foundation, corporate, and community contributions.

A 2017 report on green infrastructure in the Great Lakes Basin found that private delivery or financing of large-scale green infrastructure (at least \$50 million) can be the least costly approach²⁴. The case studies of large-scale projects referenced in that report showed cost reductions of 40 percent to 96 percent gained through economies of scale²⁵. Successful public-private

20 EPA, "Managing Wet Weather with Green Infrastructure."

21 Michigan Department of Environmental Quality. "Financing Green Infrastructure in Michigan."

22 State of Tennessee. 2017. "Green Development Grants."

23 Environmental Finance Center Network. 2014. *Green Infrastructure in the Mid-South: Recommendations for Implementing and Financing Green Infrastructure Elements of the Mid-South Regional Greenprint Vision Plan*.

24 S. K. Sinha, R. Pettit, J. Ridgway, A. Eidson, J. Silfen, G. Peralta, and G. Cannito. 2017. *Public Private Partnerships and Finance of Large-scale Green Infrastructure in the Great Lakes Basin*. Environmental Consulting & Technology, Inc., Report, January.

25 Sinha et al., "Public Private Partnerships and Finance."

partnerships begin with a well-thought-out plan that tells the story of a project, demonstrating community and agency consensus with pieces that appeal to multiple funders to show them how the project lines up with their priorities²⁶.

Philadelphia's successful Green City, Clean Waters program is retrofitting 10,000 acres of impervious land to manage a volume of one inch of stormwater runoff on-site²⁷. Their parcel-based stormwater billing structure provides a credit of up to nearly 100 percent for property owners who can demonstrate sufficient on-site stormwater management, providing a strong incentive for property owners to install their own green stormwater retrofits²⁸. Facilitating the aggregation of numerous small stormwater projects into a larger portfolio would create a more attractive green infrastructure capital market, enabling Philadelphia to encourage more private green infrastructure financing and improvements by managing risk and benefiting from economies of scale²⁹.

Many communities and regions, such as Durham, North Carolina, Memphis, Tennessee, and the Great Lakes are finding that a combination of funding sources that includes private dollars is the most sustainable approach to long-term funding of green infrastructure³⁰. Durham County, North Carolina, has found that a one-size-fits-all approach is unsuitable for green infrastructure, as it often involves assets owned by different organizations on property that is also owned by different organizations, and that co-funding and experimentation with innovative financing strategies is a preferable option³¹.

Conclusion

Financing options for green infrastructure encompass both traditional funding sources for gray infrastructure as well as nontraditional sources that seek to support the various co-benefits provided by green infrastructure. Despite the experience of a very successful, 10-year green infrastructure implementation program, those who drafted the Milwaukee Metropolitan Sewerage District's Regional Green Infrastructure Plan identified funding for green infrastructure improvements as their top concern³². As with so many other green infrastructure programs, the Milwaukee plan recommends a broad range of funding and financing models that include a combination of taxes, utility fees, grants, loans,

26 LIDC, *Convening Summary Report*.

27 Valderamma and Yeh, "Financing Stormwater Retrofits."

28 *Ibid*.

29 Natural Resources Defense Council. 2013. *Creating Clean Water Cash Flows: Developing Private Markets for Green Stormwater Infrastructure in Philadelphia*.

30 Hughes, Jeff. 2014. *Methods and Strategies for Financing Green Infrastructure In the City and County of Durham, North Carolina*. UNC Environmental Finance Center; Environmental Finance Center Network, "Green Infrastructure in the Mid-South;" Sinha et al., "Public Private Partnerships and Finance."

31 Hughes, "Methods and Strategies for Financing."

32 Milwaukee Metropolitan Sewerage District (MMSD). 2005. *The Application of Stormwater Runoff Reduction Best Management Practices in Metropolitan Milwaukee*.

and private funding to achieve its vision of “zero basement backups, zero overflows, and improved water quality”³³. Upon review of a number of municipal and regional green infrastructure stormwater management and implementation programs across the country, a primary measure of success is to plan and implement such projects based on a partnership model of multiple funding sources that combine local, federal/state, and private dollars.

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This briefing paper was written by Jennifer Henaghan, AICP, Deputy Research Director and Green Communities Center Manager at the American Planning Association.

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33 *Ibid.*

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