

Planning and monitoring techniques to enhance water use efficiency and to integrate stormwater control in the urban community

21st Century Water Municipal Issues and Concerns (INFR5SG09a)

Tools for Evaluating the Benefits of Green Infrastructure for Urban Water Management (INFR5SG09b)

The Central Issue

Urban communities are increasingly looking to green infrastructure as a means of meeting not only stormwater management objectives, but multiple environmental, social, and economic goals. Urban planners are striving to integrate water treatment into their sustainable development goals. This report reviews the criteria, metrics, and protocols being used to measure such integrated systems.

Context and Background

This research:

- Summarizes the most pressing stormwater issues currently facing urban communities obtained in dialogues and discussions with communities.
- Includes a discussion of the materials available to guide officials, regulators, and managers in the use and evaluation of low impact development and green infrastructure.
- Provides overviews for life cycle cost analysis and triple bottom line analysis – as they apply to stormwater and urban water management.
- Outlines some of the practical challenges encountered when collecting data and measuring for performance.

Findings and Conclusions

This research continued WERF's efforts to identify and define the most prevalent municipal issues pertaining to water today. As expected, water use, climate change, and aging infrastructure have emerged at the top. These challenges are no longer contained within the traditional confines of water "issues" but are intertwined



Green infrastructure is gaining priority as a means to reduce stormwater volume, improve water quality, conserve water resources, and reduce flooding, as well as provide additional social and economic benefits, such as improved aesthetics and community livability.

with energy, development, infrastructure, and overall issues of sustainability.

Green infrastructure, in combination with a more holistic, desegregated approach to water use, can possibly result in more efficient systems. However, two issues remain:

- Proper prediction of green infrastructure performance. Accepted protocols and methods exist for gray infrastructure, but uncertainty remains for predicting how the distributed and decentralized system of green infrastructure will operate and perform.
- How this uncertainty will be handled with regards to permit compliance. Cities researched expressed hesitancy at how current uncertainty in predictive methods would impact future permit compliance. This uncertainty was identified as a significant impediment to more enthusiastic implementation of green infrastructure.

Life cycle costs assessments and the triple bottom line approach are two means by which local city and county managers can better weigh the benefits of traditional versus green infrastructure practices over the life of such projects. This research provides some examples of the parameters that can be used in life cycle cost analyses.

Management and Policy Implications

Green infrastructure approaches can often be difficult to justify due to a lack of information or understanding of their benefits, or an inability to compare it to traditional approaches using traditional costing methods. This research provides recommendations for making those justifications.

Executive Summary



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Tools for Evaluating the Benefits of Green Infrastructure for Urban Water Management

Related WERF Research	
Project Title	Research Focus
International Stormwater BMP Database (03SW1CO)	The International Stormwater Best Management Practices (BMP) database is an important tool that allows for continued improvement in design and implementation of BMPs. It provides a mechanism for scientifically based collection and management of data needed to evaluate the effectiveness of stormwater runoff BMPs
Using Rainwater to Grow Livable Communities Website (04SW1)	Economic Evaluations of Stormwater BMPs – retrieved from the Livable Communities website is designed to encourage and facilitate the integration of stormwater BMPs into development projects in local areas by providing tools and resources for effective communication and implementation. The website includes case studies that examine BMP integration in several cities across the U.S.
BMP and LID Whole Life Cost Models, Version 2.0 and User's Guide (SW2R08)	Spreadsheet tools help users identify and combine capital costs and ongoing maintenance expenditures so they can estimate whole life costs for stormwater management. The models provide a framework for calculating capital and long-term maintenance costs of individual best management practices and low-impact development techniques. Includes models for retention ponds, extended detention basins, swales, permeable pavement, green roofs, large commercial cisterns, residential rain gardens, curb-contained bioretention, and in-curb planter vaults.
SIMPLE: Sustainable Infrastructure Management Program Learning Environment (03CTS14)	From the 10 Steps to Asset Management: Determine Life Cycle and Replacement Costs. This step compares objectives and methods for asset valuation, presents the methodology, and provides guidelines to assist in the valuation process.
Decentralized Stormwater Controls for Urban Retrofit and Combined Sewer Overflow Reduction (03SW3)	Helps define the current state of decentralized source controls for capturing rainwater where it falls and presents a plan for implementation of decentralized controls in an urban environment specifically for the goal of CSO mitigation. Demonstrates how decentralized controls can reduce the volume of rainwater runoff generated and from entering combined sewer systems in urban areas.
Decentralized Stormwater Controls for Urban Retrofit and Combined Sewer Overflow Reduction Phase II (03SW3a)	Evaluates strategies for incorporating decentralized controls into an infrastructure management system. Case studies provide alternatives for adoption of decentralized controls. Evaluates economic methods for assessing environmental costs and benefits and provides guidance for modeling decentralized controls with commonly used stormwater models.
Transforming Our Cities: High-Performance Green Infrastructure (INFR1R11)	Examines dynamic controls in various types of onsite stormwater systems. Projects will demonstrate dynamic models and cost analysis of high-performance green infrastructure.
21st Century Water Asset Accounting (INFR6R12)	Research will look at how utilities adjust infrastructure investments by reconsidering the accounting process to include cost savings provided by green infrastructure and watershed protection in a format that parallels current accounting principles. A standard process for adding these cost savings will be defined for addition to the balance sheet. The researchers will work with utilities to develop a tool that can be used in the accounting process.

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