



SUSTAINABLE Water Management Conference

Applying the Triple Bottom Line Analysis to Develop the Framework and Tools for Quantifying Green Infrastructure Co-Benefits

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Outline

- Introduction and acknowledgement
- Overview of technical approach
- Initial inputs from a survey of participating utilities
- Preliminary efforts to date
- Summary and path forward



The Water Research Foundation - WE&RF / WRF Integration

- Represents the evolution of water research
 - 1,200 subscribers
 - 2,300 research studies
 - \$700M integrated research portfolio
- Launched January 1, 2018



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Summary of Stormwater & Green Infrastructure Research



Performance Information

- * Stormwater BMP Database
- * Add Stream Restoration Module to BMP Database
- * Algorithm Development

Maintenance Information

- * Template to compare Green vs Gray Maintenance Costs
- * Update BMP Whole Lift Cost Tool

Co-Benefit Analysis

- * Workshop and Template for Co-Benefit Analysis
- * Subsequent Data Development and Sharing of Co-Benefit Values

Permitting Guidance

- * TCR for Stream Restoration as a BMP

**Stream Restoration
Crediting Guidance**

**Stormwater
Harvesting**

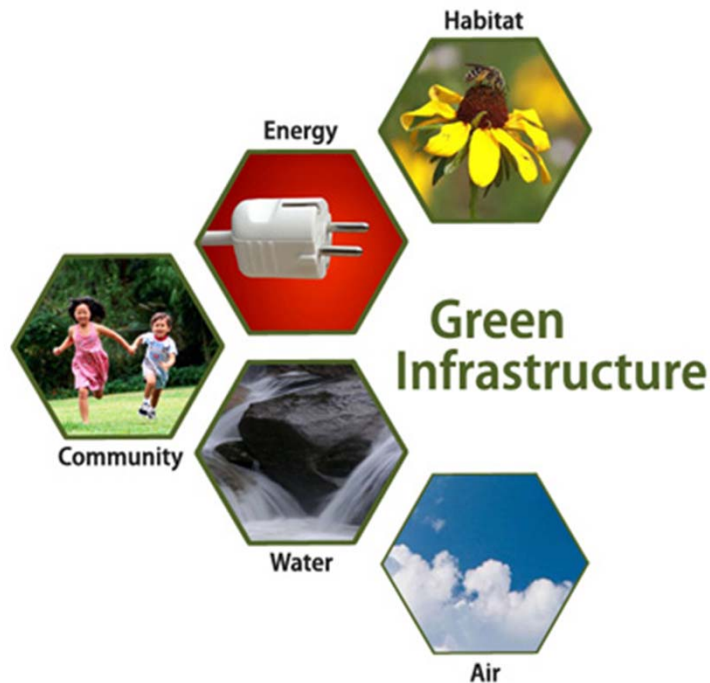
**Flood Management
/ Resiliency**



- *Integrated Decision Support System -
Community-enabled Lifecycle Analysis of
Stormwater Infrastructure Costs (CLASIC)*

Green Infrastructure Co-Benefits

- *Framework and Tools for Quantifying Green Infrastructure Co-Benefits and Linking with Triple Bottom Line Analysis*
- *Incentives for Green Infrastructure Implementation on Private Property: Lessons Learned*



Community and Ecosystem Benefits

Project Objectives



- Develop economic analysis framework and a supporting tool to help utilities quantify the multiple benefits of GI at the community level.
 - Developing a transparent and customizable process for a rigorous yet easy-to-follow framework
 - Focusing on methodology / algorithm for quantifying and monetizing the multiple benefits of GI
- Coordinate with Community-enabled Life Cycle Analysis for Stormwater Infrastructure (CLASIC) project.

Community-enabled Lifecycle Analysis of Stormwater Infrastructure Costs (CLASIC)



- **Project Duration:** 4 Years (2016-2020);
- **Funding:** 2 Million Dollars (plus \$0.5M matching funds by Foundation);
- National Collaborating Partners (e.g. ASCE; WEF; American Rivers);
- **Life Cycle Cost Analysis of Stormwater Infrastructure Considers “Co-Benefits” of Green Infrastructure;**
- Community Engagement for Municipalities & Utilities.

Overview of Project Approach



- Literature/Data Review
- Initial inputs from a survey of participating utilities
- Web Meeting and Workshop
- Analysis Framework and Tool Development
- Case Studies and Beta-Test
- Draft and Final Work Products

16 Participating Utilities Nationwide



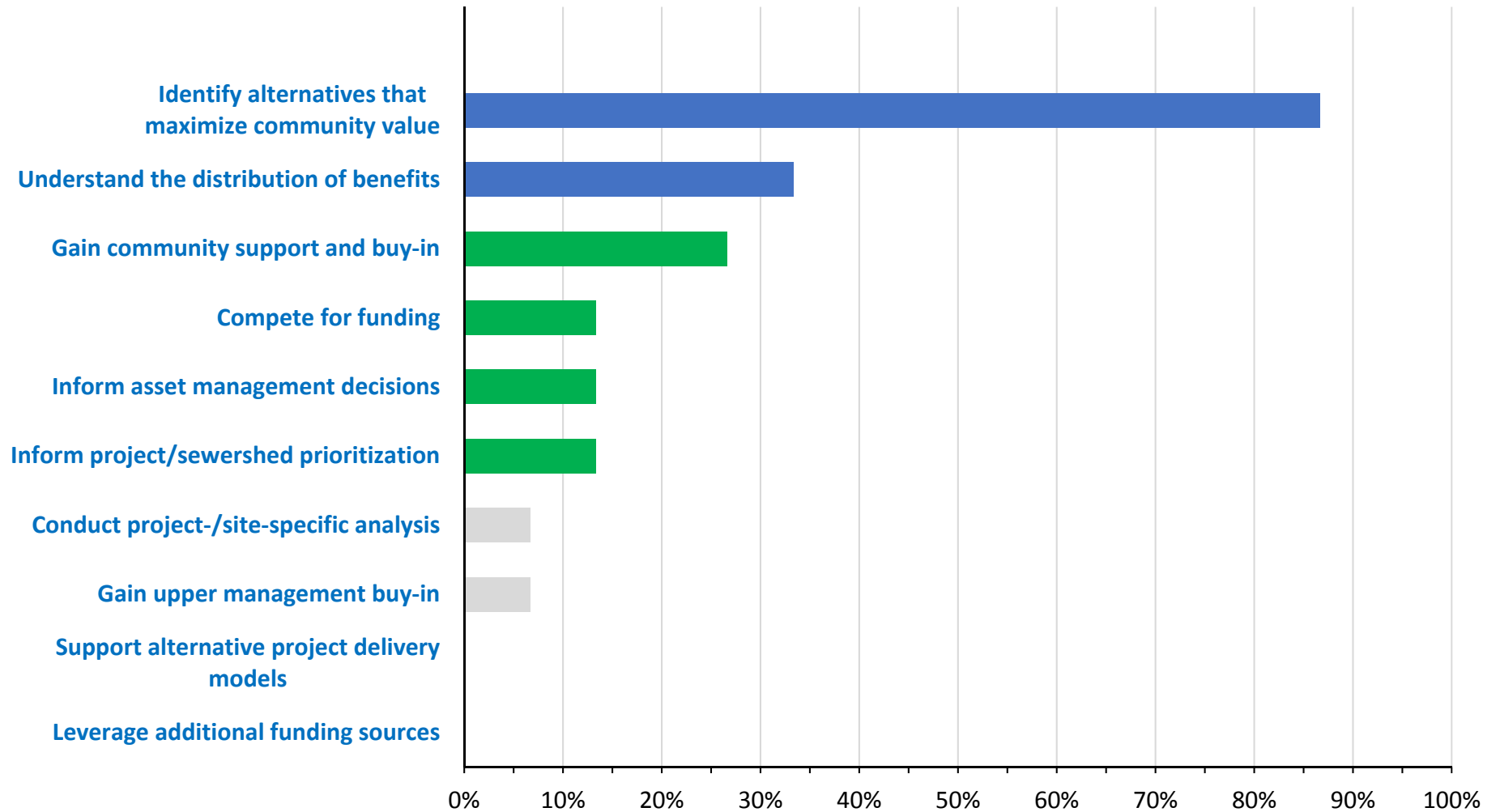
- Anne Arundel County (MD)
- Boston Water and Sewer Commission (MA)
- City of Calgary (AB)
- Capitol Region Watershed District (MN)
- Fort Collins Utilities (CO)
- L.A. Bureau of Sanitation (CA)
- City of Raleigh, Stormwater Program (NC)
- Metropolitan Sewer District of Greater Cincinnati (OH)
- Milwaukee Metropolitan Sewerage District (WI)
- Montgomery County DEP (MD)
- New York City DEP (NY)
- Philadelphia Water Dept. (PA)
- Anne Arundel County (MD)
- DC Water (DC)
- Metropolitan Water Reclamation District of Greater Chicago (IL)
- Northeast Ohio Regional Sewer District (OH)
- Seattle Public Utilities (WA)

Survey Response by Participating Utilities

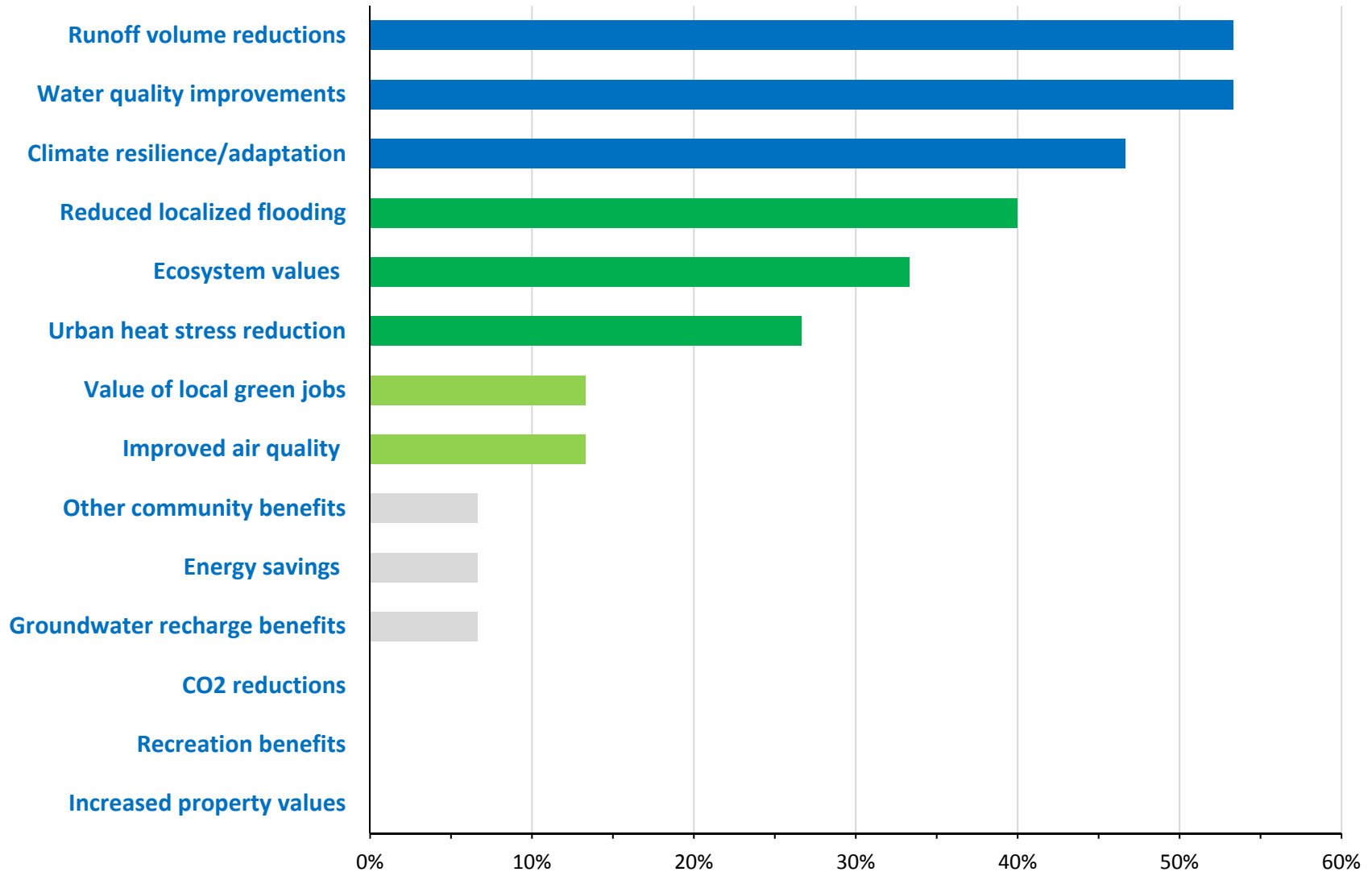
Question: Has your utility quantified/monetized stormwater/GI benefits and/or co-benefits?

Have not quantified or monetized stormwater/GI benefits	27%
Have quantified and/or monetized stormwater/GI benefits	60%
Have quantified and/or monetized GI co-benefits	33%

Reasons why you are interested in quantifying and/or monetizing GI co-benefits



Priorities for types of GI benefits you are most interested in quantifying and/or monetizing



General Expectation from Participating Utilities

- Information on the TBL benefits of GI can help utilities/municipalities to:
 - Identify stormwater management alternatives that maximize community values;
 - Compete for scarce funding (e.g. green vs. gray);
 - Leverage private capital and alternative funding sources;
 - Support alternative project delivery models;
 - Gain community support and buy-in.

What is Triple Bottom Line (TBL) Analysis?

- Comprehensive benefit-cost analysis that accounts for the full range of
 - *financial*
 - *social*
 - *environmental*



costs and benefits of a project or program *over time*, and *to whom they accrue*.

- Reflects the fact that public agencies aim to provide the **greatest total value to their communities**

Example Category of GI Co-Benefits



Co-Benefits of Green Infrastructure Program include:

- **Hydrology / Water Quantity;**
- **Water Quality / Pollutant Loading;**
- **Ecosystems** (e.g. biodiversity, habit and wildlife);
- **Energy Saving and Heat Mitigation;**
- **Climate Resilience / Flood Management;**
- **Air Quality** (air pollution mitigation and the decrease of carbon footprint);
- **Community Benefits** (including social impacts; more green space and parks; increasing property values; green jobs);
- **Traffic** (e.g. reducing noise impact by damping traffic; the use of green streets).

TBL Benefits of Green Infrastructure

Social

- ✓ Improved quality of life
- ✓ Increased property values
- ✓ Green job creation
- ✓ Increased economic development
- ✓ Increased recreational space
- ✓ Increased resiliency

Financial

- ✓ Capital costs (and potential savings over lifecycle)
- ✓ Maintenance and replacement costs
- ✓ Avoided gray infrastructure (e.g., stormwater pumping and treatment costs)

Environmental

- ✓ Improved air and water quality
- ✓ Groundwater recharge
- ✓ Improved habitat/ecosystem benefits
- ✓ Decreased GHG emissions
- ✓ Reduced urban heat stress
- ✓ Greater flood protection

Key Components of Technical Approach

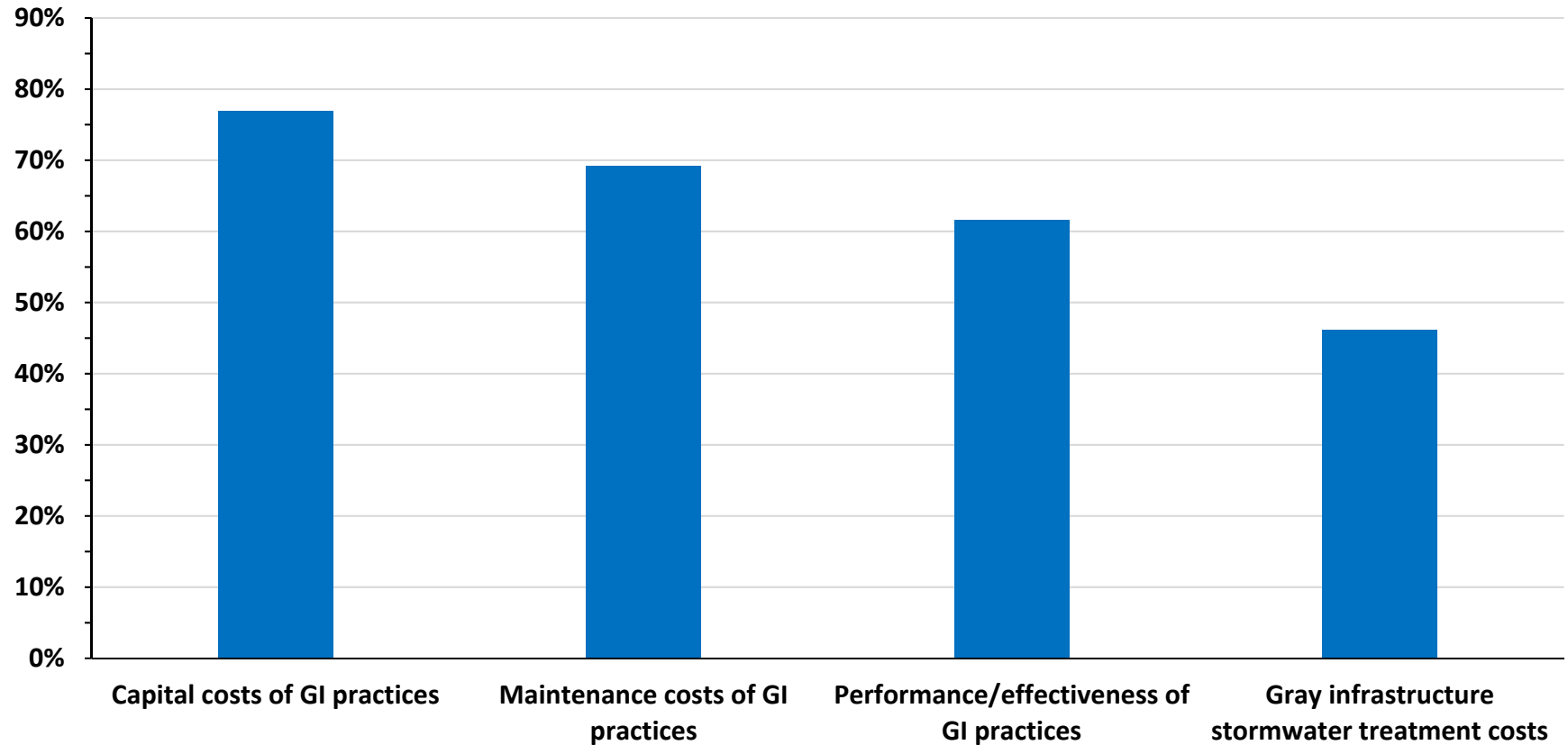
- Work with utility partners to understand information and data needs
- Develop transparent process and rigorous method rather than “one size fits all” approach or calculator
- Focus on benefits methodology
- Address existing research gaps (e.g., “*hard-to-quantify*” benefits)
- Provide a range of outputs to meet user’s needs
- Conduct sensitivity analysis and document uncertainties



Example of Analysis Framework

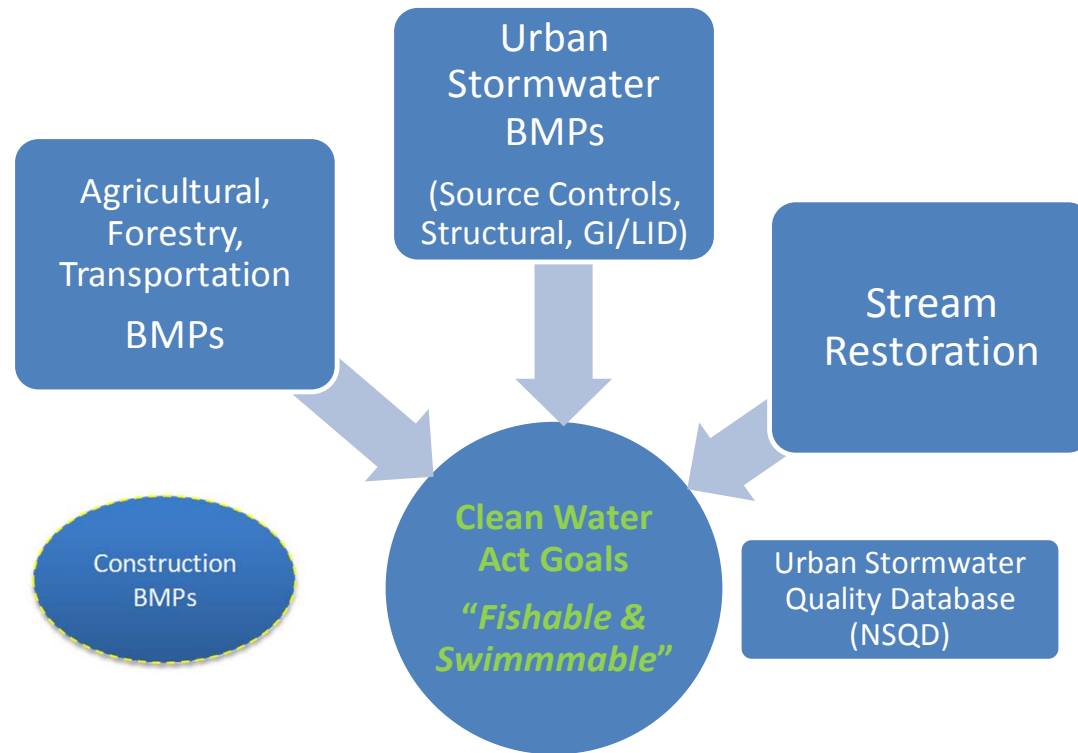
Data Availability Relating to “GI Co-Benefits”

(Based on an Initial Survey)



International Stormwater Best Management Practice Database

2016 was the 20 Years' Anniversary of "BMP Database"!



Leaders Innovation Forum for Technology (LIFT)



Utility Peer Network



Technology Scans



LIFT Link



FAST Water Network



Technology Survey



SEE IT

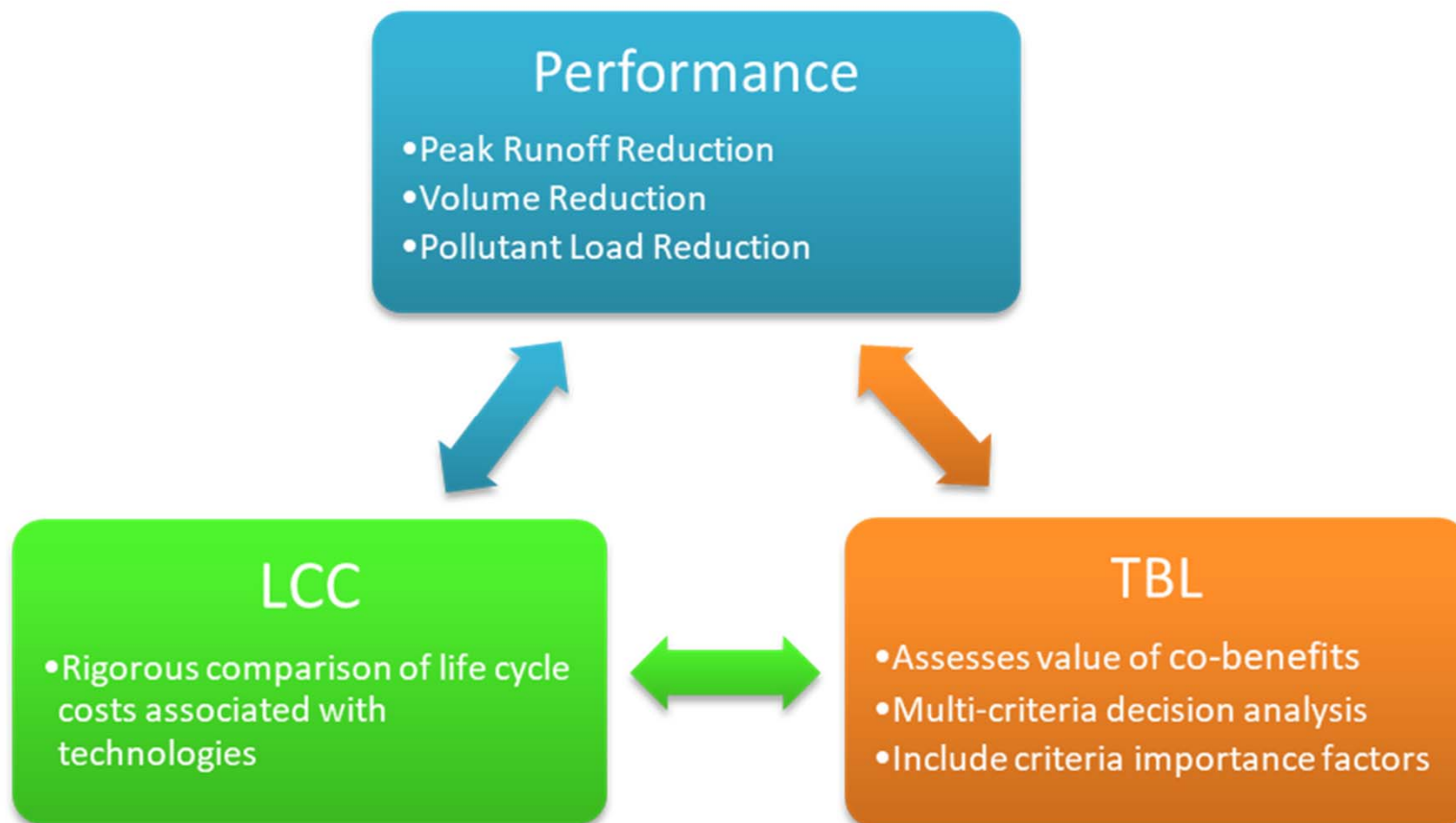


University-Utility Partnership



Hubs, Partners, and Affiliates

Example Output of Stormwater Infrastructure Life Cycle Cost Tool (1)



Example Output of Stormwater Infrastructure Life Cycle Cost Tool (2)



Summary and Path Forward

- **Objective:** To identify stormwater management and GI practices that maximize community value by considering co-benefits
- **Framework:** Develop a Rigorous Framework for Quantifying / Monetizing the Multiple Benefits of GI via TBL Analysis
- **Tool:** Develop an User-Friendly Supporting Tool for Quantifying GI Co-Benefits
- **Linkage:** To coordinate with Life Cycle Cost Analysis for Stormwater Infrastructure at Community Level





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Questions?
Suggestions?

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