ALIGN, LEVERAGE, SHIFT

Understanding and Innovating Chicago's Water System

DESIGN FORESIGHT INITIATIVE

December 4, 2015

Overview

- Goal
- Methodology
- Optimized System
- Barriers, Principles, & Root Causes
- Key Interventions

Methodology

RESEARCH

PRIMARY

Stakeholder Interviews

SECONDARY

Literature Review

ANALYSIS

INVENTORY

Projects & Plans

VISUALIZATION

Diagrams

STRATEGIZE

Interventions

TESTING

CASE STUDY

Calumet Stormwater Collaborative

Methodology

WATER STAKEHOLDERS INTERVIEWED

Non Profit Sector
Alliance for the Great Lakes
Alliance for Water Efficiency
Center for Neighborhood Technology
Delta Institute
Elevate Energy
Environmental Law & Policy Center
Natural Resource Defense Council

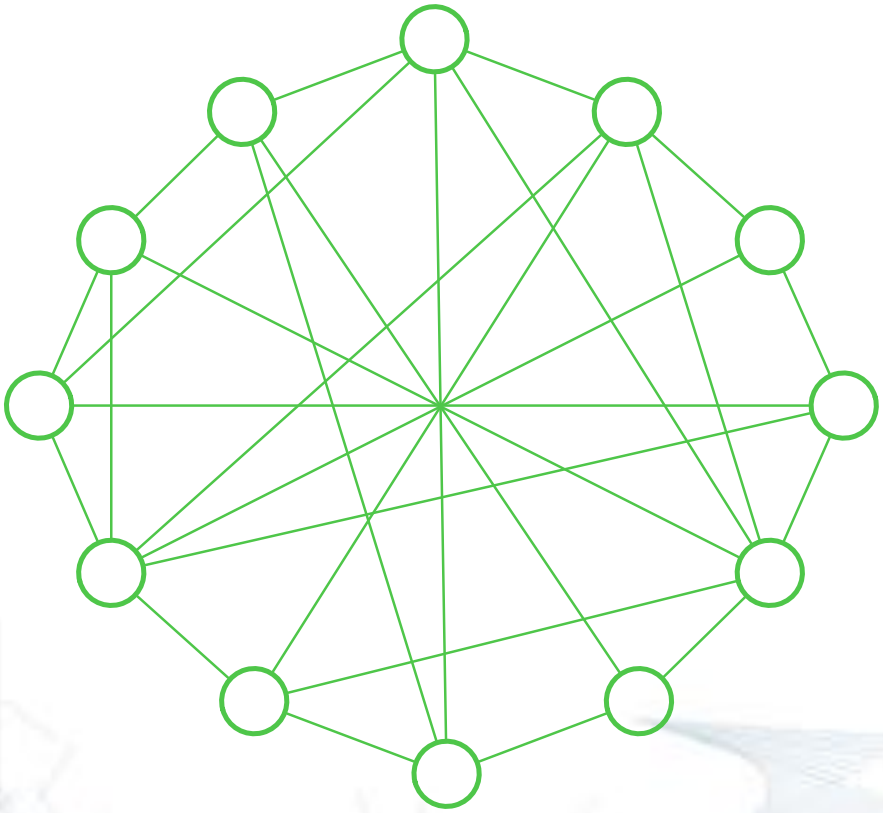
Private Sector
Delta Faucet Company
Skidmore, Owings & Merrill
Water Harvesting Solutions

Public Sector
Chicago Department of Planning and Development
Chicago Department of Transportation
Chicago Department of Water Management
Chicago Metropolitan Agency for Planning
Chicago Park District
Illinois Environmental Protection Agency
Metropolitan Planning Council
Metropolitan Water Reclamation District

Methodology

PROJECT INVENTORY

1. Waste & Inefficiency
2. Pollution
3. Invasive Species
4. Flooding
5. Habitat Loss & Degradation
6. Limited Recreational Opportunities



NATURAL

BUILT

SOCIAL

SOCIAL

NATURAL

BUILT

Optimized Natural System

- Capturing and using precipitation
- Healthy wetlands and natural areas
- Swimmable, drinkable, fishable water quality
- Maximized water infiltration
- Maximized natural capacity for evapotranspiration
- Treated water to original source

Optimized Built System

- Minimum leakage from potable water distribution pipes and infiltration and inflow into sewer pipes
- Pipe integrity is regularly maintained and monitored to improve efficiency of built infrastructure and reduce unnecessary demand
- Plumbing and foundations are fully retrofitted to mitigate basement backups and flooding
- All resources are recovered at treatment
- New pipe system for greywater reuse
- Rain harvesting offsets demand for irrigation and non-potable needs
- Robust green infrastructure network, operating at multiple scales, facilitates maximum infiltration and storage to mitigate flooding

Optimized Social System

- Regional authorities working towards a comprehensive and holistic integrated water management plan for the region, with shared vision, data, and metrics
- Standards and regulations are designed for watershed scale, which allow for flexibility and innovation among entities regulated, while maintaining overall environmental quality
- Adaptive approach to policy, planning and implementation that promotes monitoring and reevaluation and refinement over time
- Coordinate and collaborative advocacy that achieves the necessary scale for systems change
- Using updated reference data on storm events for planning and policy
- Detailed data on soils and infiltration rates at smallest scale possible
- Planning for future scenarios based on rainfall, lake level trends and projections
- Improved transparency and information sharing
- Leveraging real time data on water system to plan, monitor, adapt

Optimized Social System

- Build work and volunteer force for emerging green infrastructure design, construction and maintenance
- Ensure change management strategies are in place to evolve management of water system, address human side of change
- Develop design standards for green infrastructure and other innovative strategies
- Develop deeper understanding of cost-effectiveness of green infrastructure strategies
- Improve connections between researchers and practitioners
- Advance applied research in local research institutions
- Performance modeling and evaluation to inform decision making
- Full cost water utility rates (potable, waste, storm) reflect cost of modern and resilient infrastructure
- New incentive structures for property owners to take action
- Reduce burden of flooding on property owners

Barriers

TO SYSTEMIC CHANGE, AS IDENTIFIED BY STAKEHOLDERS

- *Data, feedback, research gaps*
- *Siloed, entrenched management*
- *Inflexible regulations*
- *Lack of incentive to change, adapt*
- *Personality conflicts*
- *Miscommunication*
- *Lack of collaboration, territorialism*
- *Competition for funding*

Root Causes

OF LIMITED PROGRESS, AS IDENTIFIED BY STAKEHOLDERS

- *Scale of the Problem*
- *Social Complexity*
- *Resource Undervalued*
- *Lack of System Transparency*

Principles

FOR INTERVENING IN COMPLEX SYSTEMS

Smarter systems with transparent feedback loops

Adaptive management that promotes continuous improvement

Transformative interventions that lead to fundamental change

Collaborative action that crosses sectors

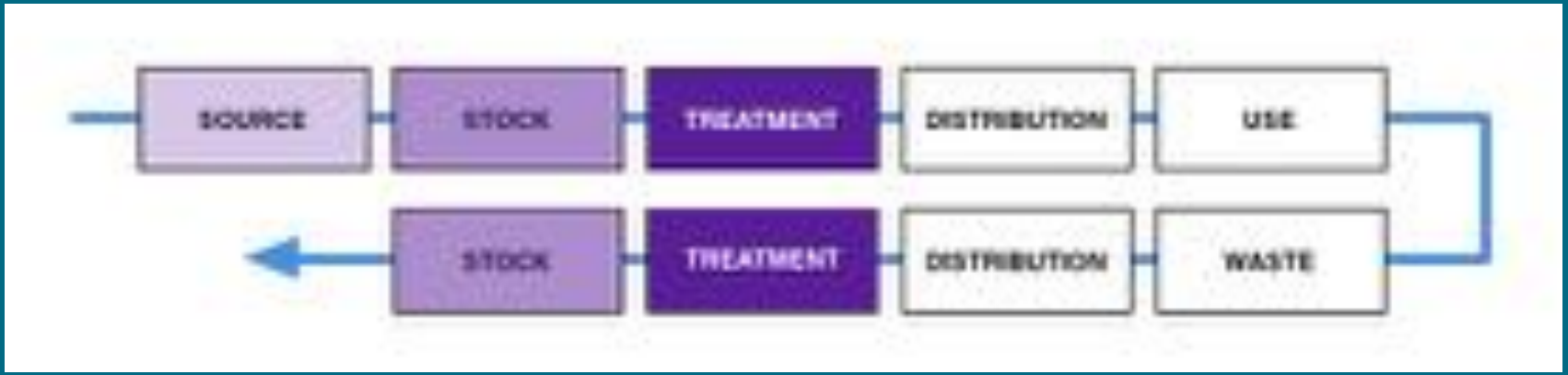
INTERVENTIONS FOR CHICAGO's WATER SYSTEM

1

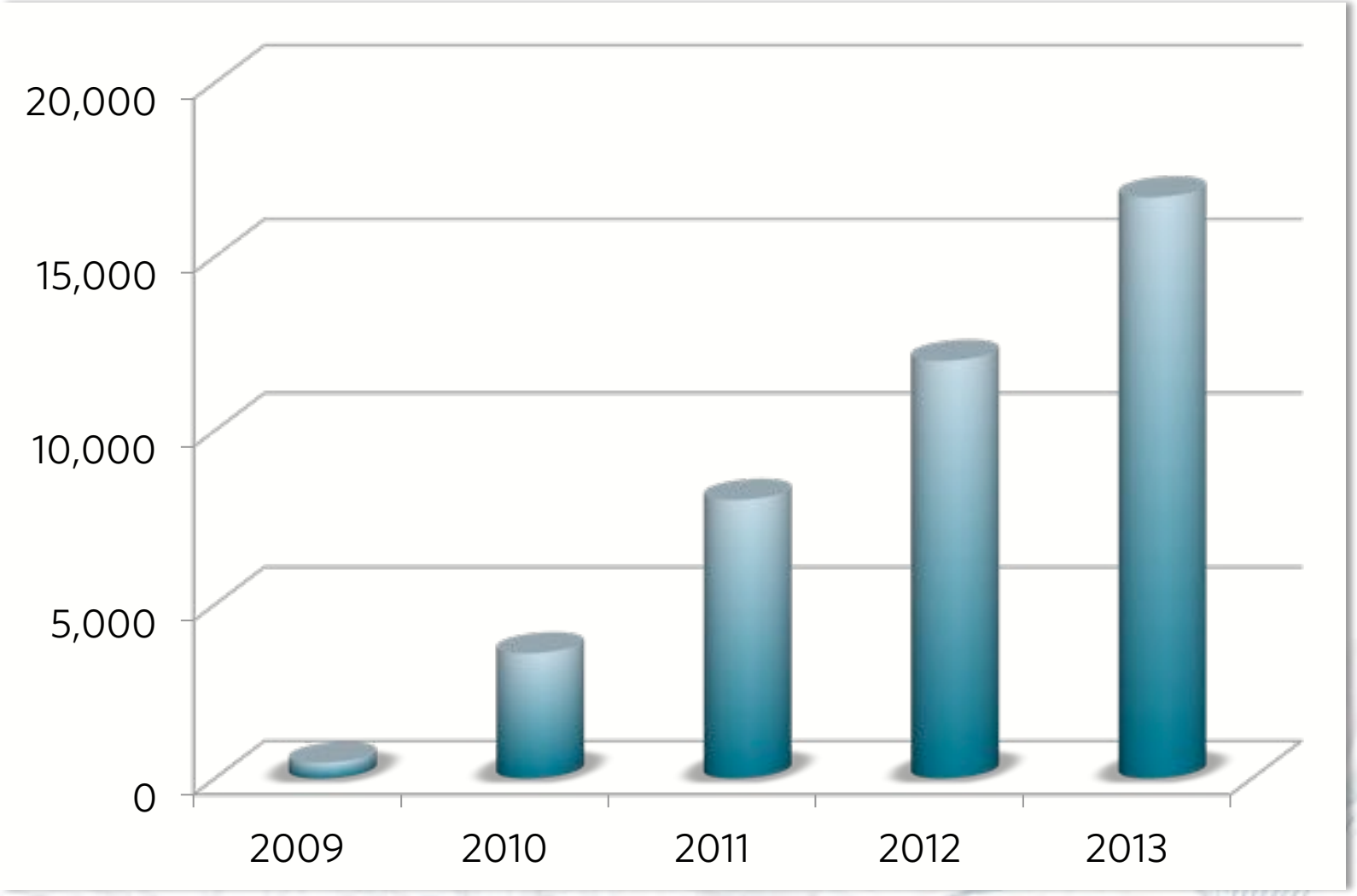
GET SMARTER

Intervention Establish critical information feedback loops within the water system, starting with water meters.

Challenge Lack of transparency and data across the system.

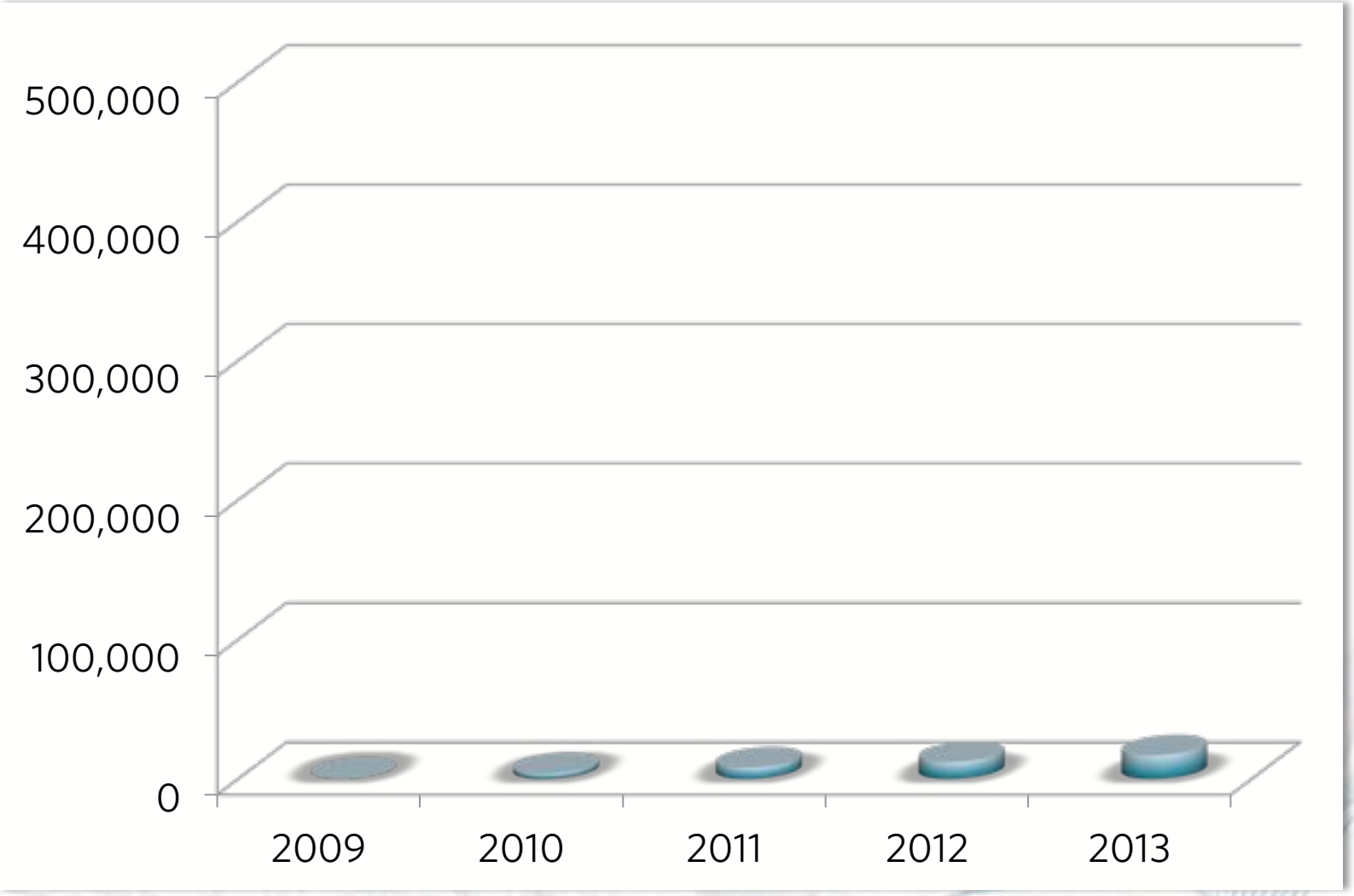


WATER METER ROLLOUT PER YEAR



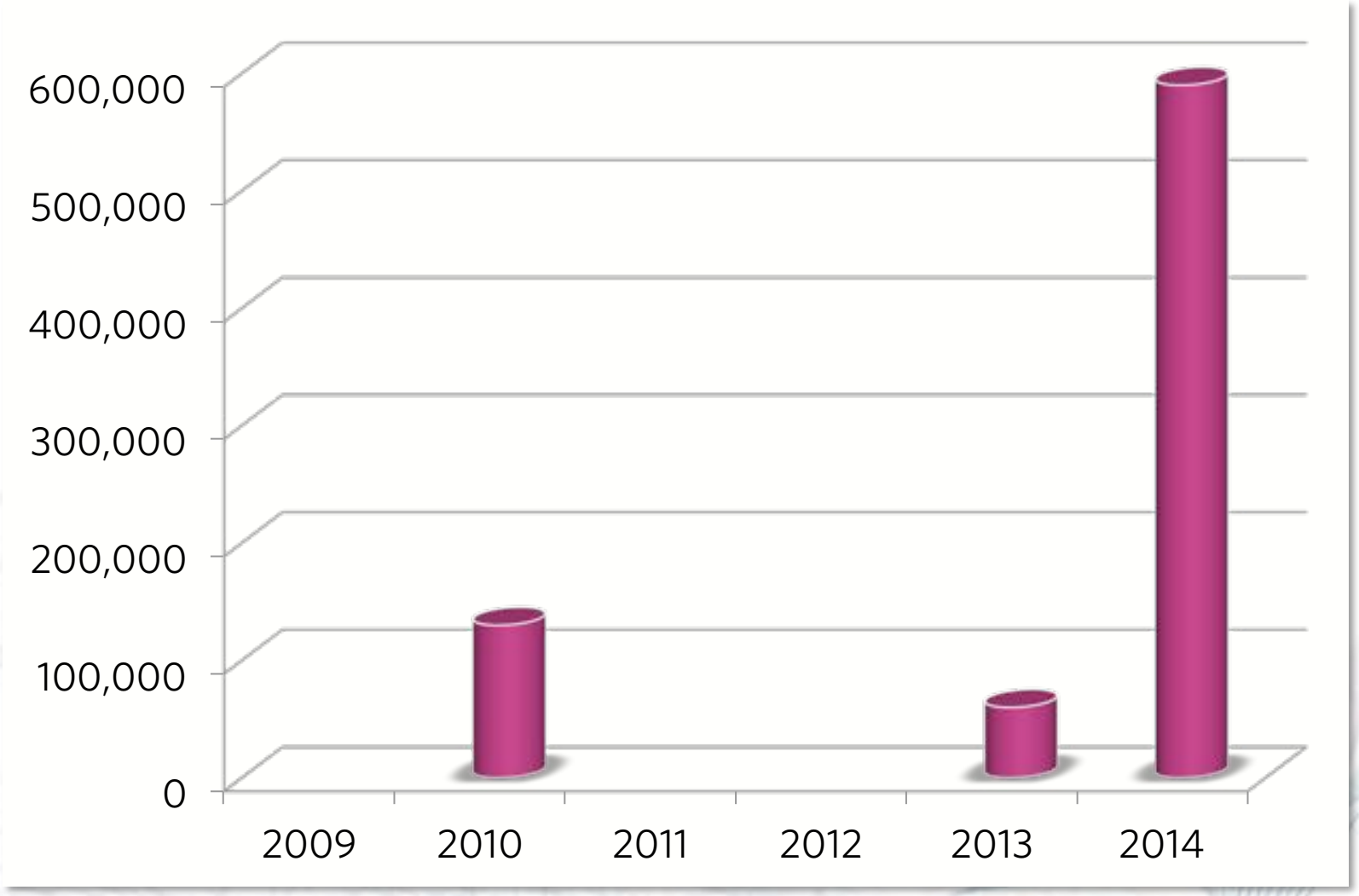
Source: Chicago Department of Water Management's Water Quality Reports (2010-2014)

WATER METER ROLLOUT PER YEAR



Source: Chicago Department of Water Management's Water Quality Reports (2010-2014)

SMART METER ROLLOUT PER YEAR



Source: Chicago Tribune, 2013; Market Watch, 2014

1

GET SMARTER

Intervention	Establish critical information feedback loops within the water system, starting with water meters.
Challenge	Lack of transparency and data across the system.
Outcome	Increase “system intelligence” through data collection and accessibility.
Project	Conduct feasibility assessment for mandatory meter rollout. Garner public support.

1

Implementation Mandate water meters and accelerate rollout.

Precedent IL Smart Meter Rollout

KEY STEPS

- Engage community-based organizations to elevate messaging
- Identify and address resistance to mandatory meters
- Accelerate installation
- Switch to AMI

2

COORDINATE RESEARCH

Intervention Bridge the divide between researchers and practitioners to identify and advance priority research needs.

Challenge Unfilled research needs inhibiting strategic, science-based approach.

70% **of interviewees identified the need for more research, monitoring, and modeling.**

2

COORDINATE RESEARCH

Intervention	Bridge the divide between researchers and practitioners to identify and advance priority research needs.
Challenge	Unfilled research needs inhibiting strategic, science-based approach.
Outcome	Research agenda focused on pressing regional needs to fill information and knowledge gaps.
Project	Host an annual research summit.

2

Implementation Host annual, one-day summit convening researchers, policymakers, practitioners, and funders.

Precedent Chicago Nature & Wildlife Committee's Research Summit (2009), Calumet Research Summit (2006)

3

IDENTIFY HOTSPOTS

Intervention Gain a clear understanding of the scale, scope, and root cause of issues and leverage data make more informed decisions.

Challenge Lack of information on the location, extent, and scale of problem areas.

3

Quotes From Interviews

"Data-driven strategies in Chicago are underdeveloped."

"We don't have enough resources for basic scientific research that can guide decision-making, we don't have the staff to perform data collection."

"Problems are underestimated, because they are invisible."

"A key barrier is the lack of knowledge around the risks and costs of flooding."

3

IDENTIFY HOTSPOTS

Intervention	Gain a clear understanding of the scale, scope, and root cause of issues and leverage data make more informed decisions.
Challenge	Lack of information on the location, extent, and scale of problem areas.
Outcome	Strategic resource allocation and intervention at key hotspots.
Project	Build a hydrologic and hydraulic (H&H) model for the Chicago region.

3

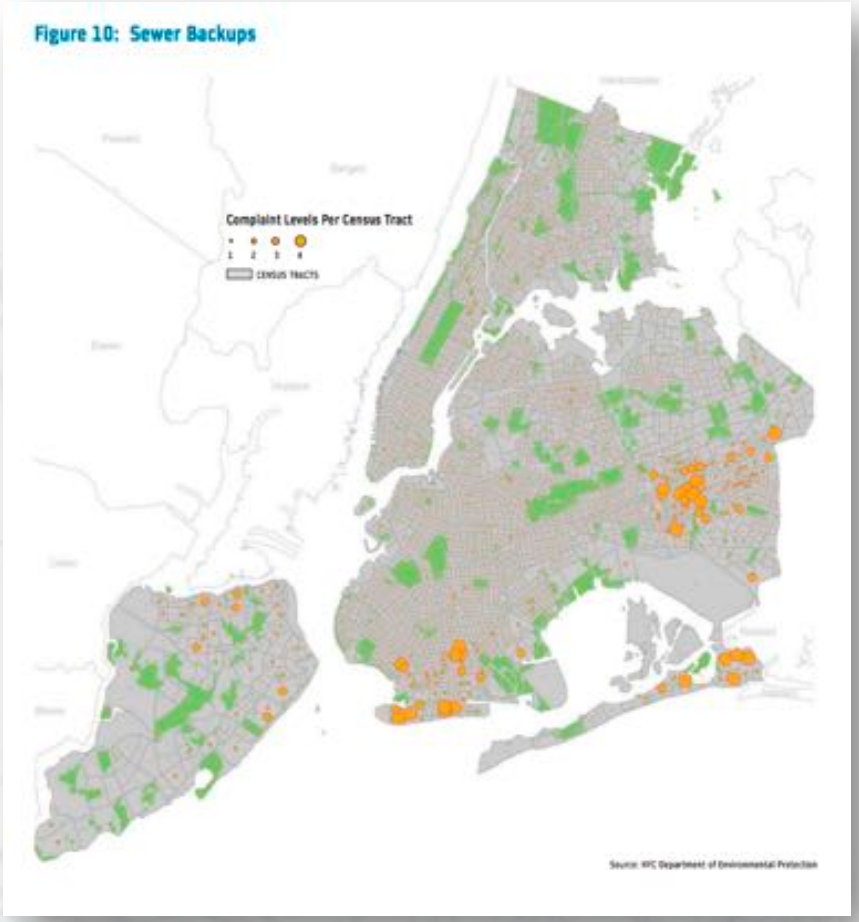
Implementation Invest in research, modeling, and information sharing efforts to improve understanding around the scale, scope, and root causes of water-related issues.

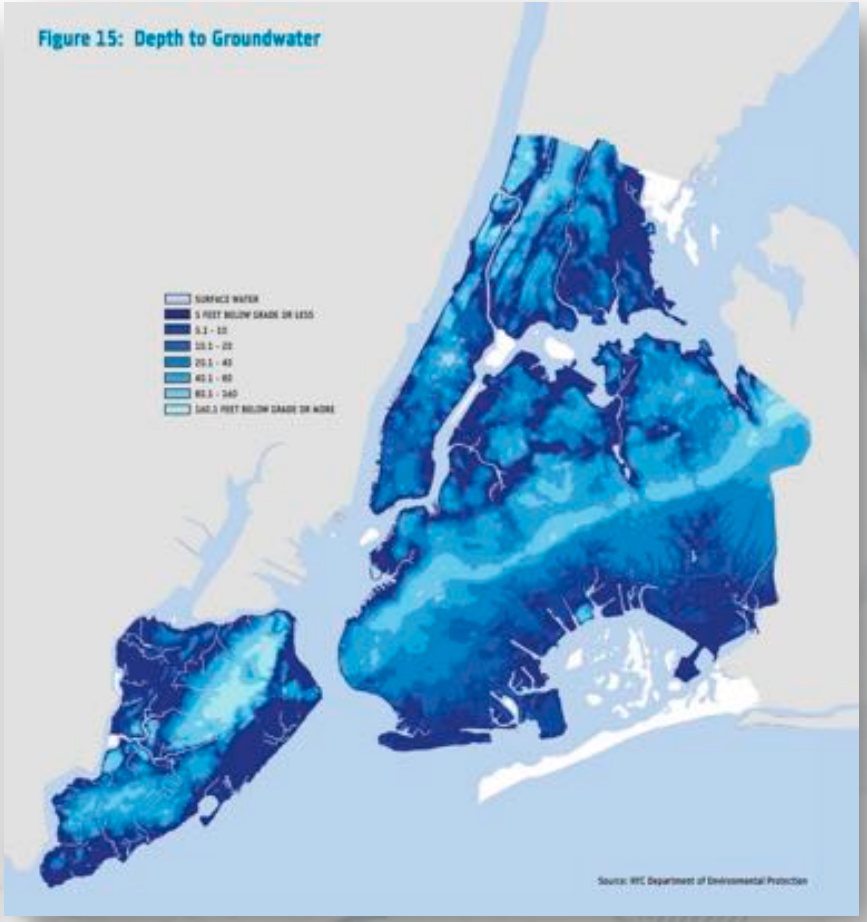
KEY RESEARCH EFFORTS TO BE FUNDED

- Extent of water loss through leak detection audits.
- Extent of infiltration and inflow into sewer system through smoke tests.
- Extent and location of concentrated basement backups and flooding.
- Hydrologic and hydraulic model for the Chicago region.

3

Precedent plaNYC's Sustainable Stormwater Management Plan





Source: plaNYC's Sustainable Stormwater Management Plan (2008)

4

INTEGRATE EVALUATION

Intervention Develop the necessary evidence base to determine what is working and what is not, and reveal cost-effective strategies.

Challenge Lack of feedback loop on effectiveness of strategies employed.

4

Quotes From Interviews

"Grants aren't available for monitoring, which makes it hard to establish feedback loops."

"Everybody thinks they are doing the right thing, but nobody agrees 100% on solutions to common problems."

"We have to demonstrate the cost-effectiveness of green infrastructure."

"Nobody is looking at the cost of operating and maintaining green infrastructure systems."

4

INTEGRATE EVALUATION

Intervention	Develop the necessary evidence base to determine what is working and what is not, and reveal cost-effective strategies.
Challenge	Lack of feedback loop on effectiveness of strategies employed.
Outcome	Strong evidence base for effective interventions to guide strategic investments.
Project	Fund monitoring and evaluation on existing and future investments.

4

Implementation Dedicate portion of funding for monitoring and evaluation to inform long-term impact of strategies and improve effectiveness of investments over time.

Precedent Clean Water Act Section 319 (Nonpoint Source Program) Grants

SUPPORTS

- Technical assistance
- Education
- Training
- Technology transfer
- Demonstration projects
- Monitoring to assess the success of specific nonpoint source implementation projects

5

ALIGN OVERSIGHT

Intervention Reduce social complexity in the system by integrating management of the potable, waste, and stormwater systems.

Challenge Fragmented authority and decision-making across the water system.

5

ALIGN OVERSIGHT

Intervention	Reduce social complexity in the system by integrating management of the potable, waste, and stormwater systems.
Challenge	Fragmented authority and decision-making across the water system.
Outcome	Integrated, holistic approach towards a shared vision with common metrics for measuring success.
Project	Consensus building process to create shared and integrated vision.

5

Implementation Engage stakeholders around a holistic planning process that integrates multiple objectives (i.e., regulatory, policy, societal).

Precedent Integrated Water Resource Management in Philadelphia's Water System

INTEGRATED PLANNING AND MANAGEMENT OF

- Stormwater management
- Degraded waterways
- Infrastructure management
- Source water quality and quantity
- Flooding

6

EVOLVE MANAGEMENT

Intervention Improve effectiveness of interventions by continually learning, adapting, and reducing uncertainties.

Challenge Emphasis on finding fixed, definitive solutions does not account for unintended consequences and changing conditions.

50% **of interviewees identified the need for adaptive and flexible approach to management.**

6

EVOLVE MANAGEMENT

Intervention	Improve effectiveness of interventions by continually learning, adapting, and reducing uncertainties.
Challenge	Emphasis on finding fixed, definitive solutions does not account for unintended consequences and changing conditions.
Outcome	Flexible, adaptive management increases impact through continuous improvement of interventions.
Project	Adaptive management training for utilities, municipalities, and non-profit organizations.

6

Implementation Train governmental agencies, non-profit organizations, and others working on complex water issues in adaptive management.

Precedent Great Lakes Restoration Initiative's New funding priority for 2015-2019: Science-based Adaptive Management

Foundations for Future Restoration Actions	Ensure climate resiliency of GLRI-funded projects	• Develop and incorporate climate resiliency criteria in project selection processes
	Educate the next generation about the Great Lakes ecosystem	• Promote Great Lakes-based ecosystem education and stewardship, with a focus on educator training
	Implement a science-based adaptive management approach for GLRI	• Evaluate the effectiveness of GLRI-funded projects • Assess the overall health of the Great Lakes ecosystem and identify the most significant remaining problems • Identify watersheds, habitats, and species to be targeted by the GLRI • Report on GLRI progress and Great Lakes ecosystem health

Source: Great Lakes Restoration Initiative's Action Plan II (2014)

7

COORDINATE GRANTS

Intervention Better coordinate grant funded work related to water efforts in the region, working with public agencies, foundations, and current and potential grantees.

Challenge Uncoordinated and often redundant investments from multiple sources.

$22.6M grants on water-related issues in Chicago region in 2013.

7

COORDINATE GRANTS

Intervention	Better coordinate grant funded work related to water efforts in the region, working with public agencies, foundations, and current and potential grantees.
Challenge	Uncoordinated and often redundant investments from multiple sources.
Outcome	Clear and transparent investment landscape that informs further strategic, impactful investing.
Project	Grants database and visualization tool.

7

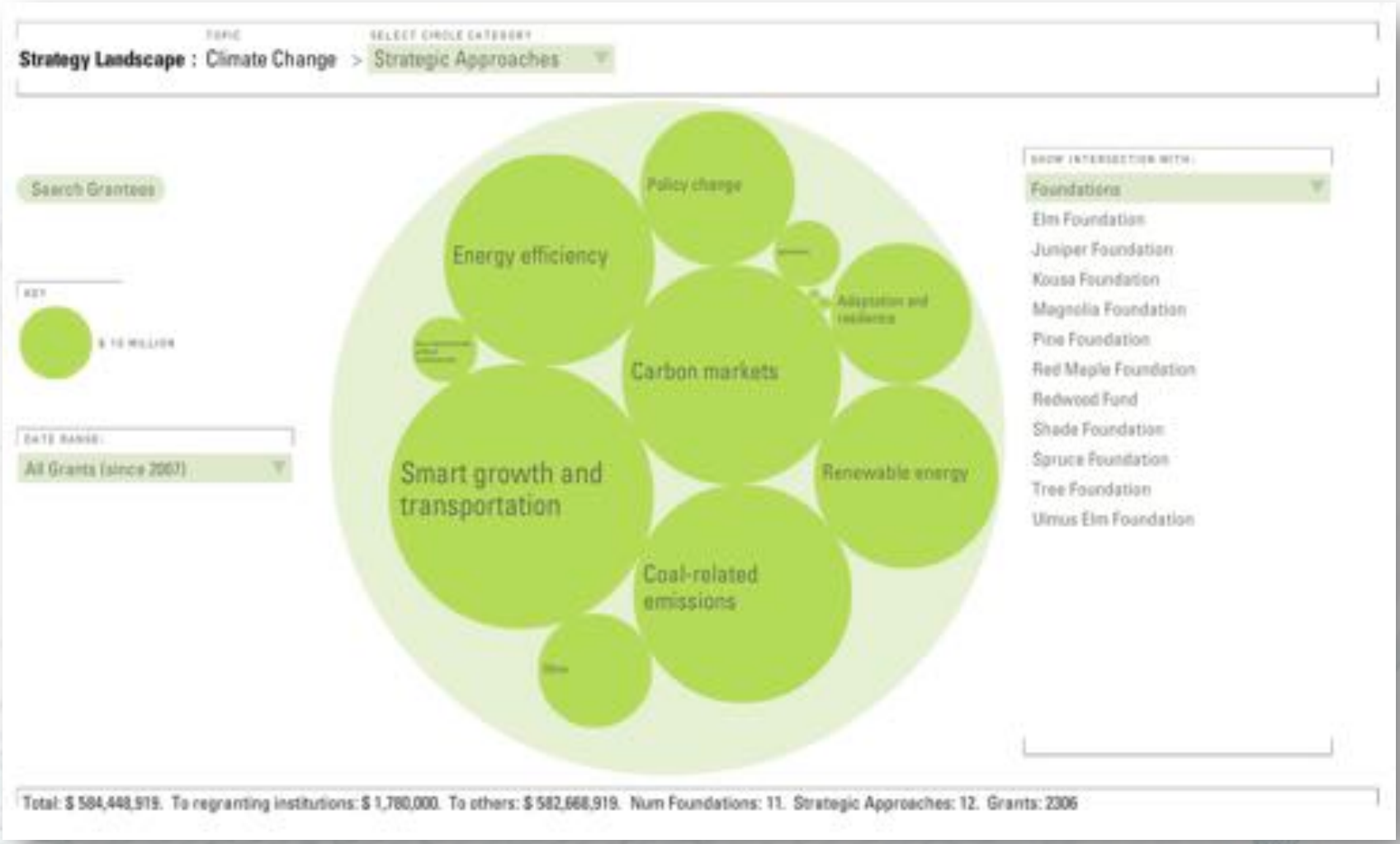
Implementation Local funders working on water-related issues to invest in shared grants database, to be accessible to current and potential grantees.

POTENTIAL DATABASE ELEMENTS

- Organizations, issues, and strategies are being funded
- Proportion of funding dedicated to organizations, issues, and strategies
- Metrics and measures of success
- Gaps in funding areas

7

Precedent Monitor Group's Strategy Landscape.



8

VALUE WATER

Intervention Advocate for a significant increase in water rates to help bring water system into the 21st Century.

Challenge Current price of water services undervalue cost of maintaining resilient infrastructure systems.

8

VALUE WATER

Intervention	Advocate for a significant increase in water rates to help bring water system into the 21st Century.
Challenge	Current price of water services undervalue cost of maintaining resilient infrastructure systems.
Outcome	Funding available to build a smart and resilient water system.
Project	Market research on public support for increasing water rates.

8

Implementation Determine necessary public messaging for increasing water rates to invest in more significant infrastructural interventions. Metered consumption is a necessary first step.

Precedent Marin Municipal Water District, California

FULL-COST WATER PRICING MAKES POSSIBLE

- Comprehensive integrated management plan
- Sophisticated demand management
- Pioneering purple pipe system for greywater reuse
- Customers aware of true value of water
- New capital improvement funds dedicated to improve resiliency in face of wildfires and seismic activity

9

BROKER RELATIONSHIPS

Intervention Stronger, more productive relationships through better navigation and negotiation between key stakeholders, facilitated by a neutral party.

Challenge Relationships between stakeholders are weak or strained, thus inhibiting coordination and collaboration.

75% **of interviewees identified the need for better communication, coordination, and collaboration.**

9

BROKER RELATIONSHIPS

Intervention Stronger, more productive relationships through better navigation and negotiation between key stakeholders, facilitated by a neutral party.

Challenge Relationships between stakeholders are weak or strained, thus inhibiting coordination and collaboration.

Outcome Strong relationships built on trust and open communication leading to more impactful collaborations.

Project Co-creation process of new mechanisms to broker relationships.

9

Implementation Pursue a co-creation process with key stakeholders to identify the best arrangement, be it a strategically-oriented person or group to serve as a broker or a joint council structure to develop a shared, overarching mission.

Precedent Cleveland Water Alliance

THANK YOU

Questions?

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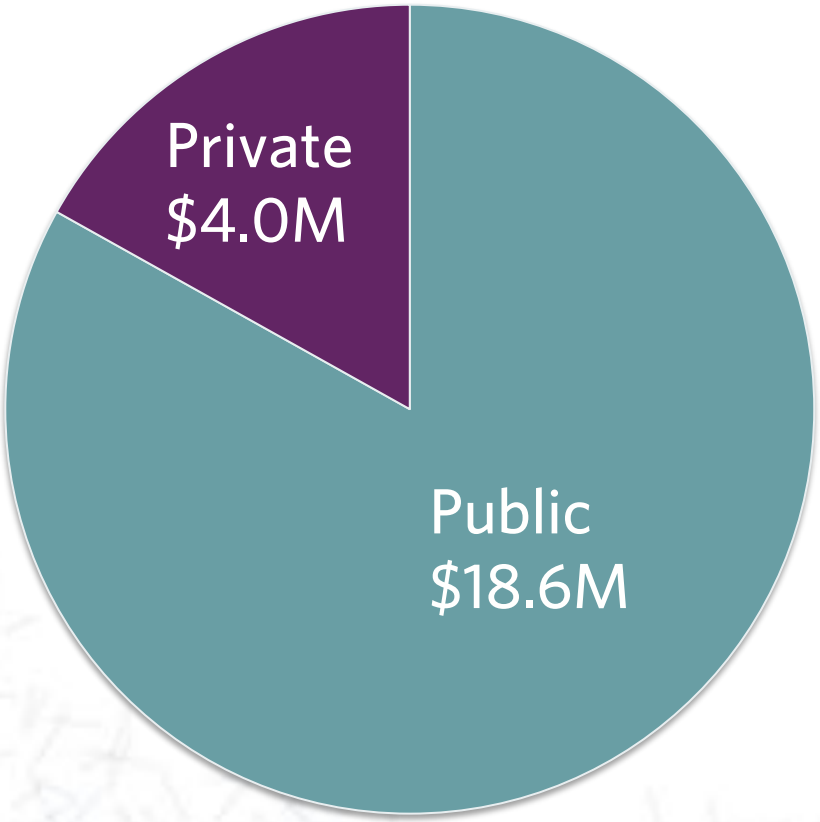
DISCUSSION QUESTIONS

- Do these interventions resonate with your experience working on these issues?
- Are there interventions missing here?
- Do you have ideas on how best to move on these interventions?

Water-Related Funding

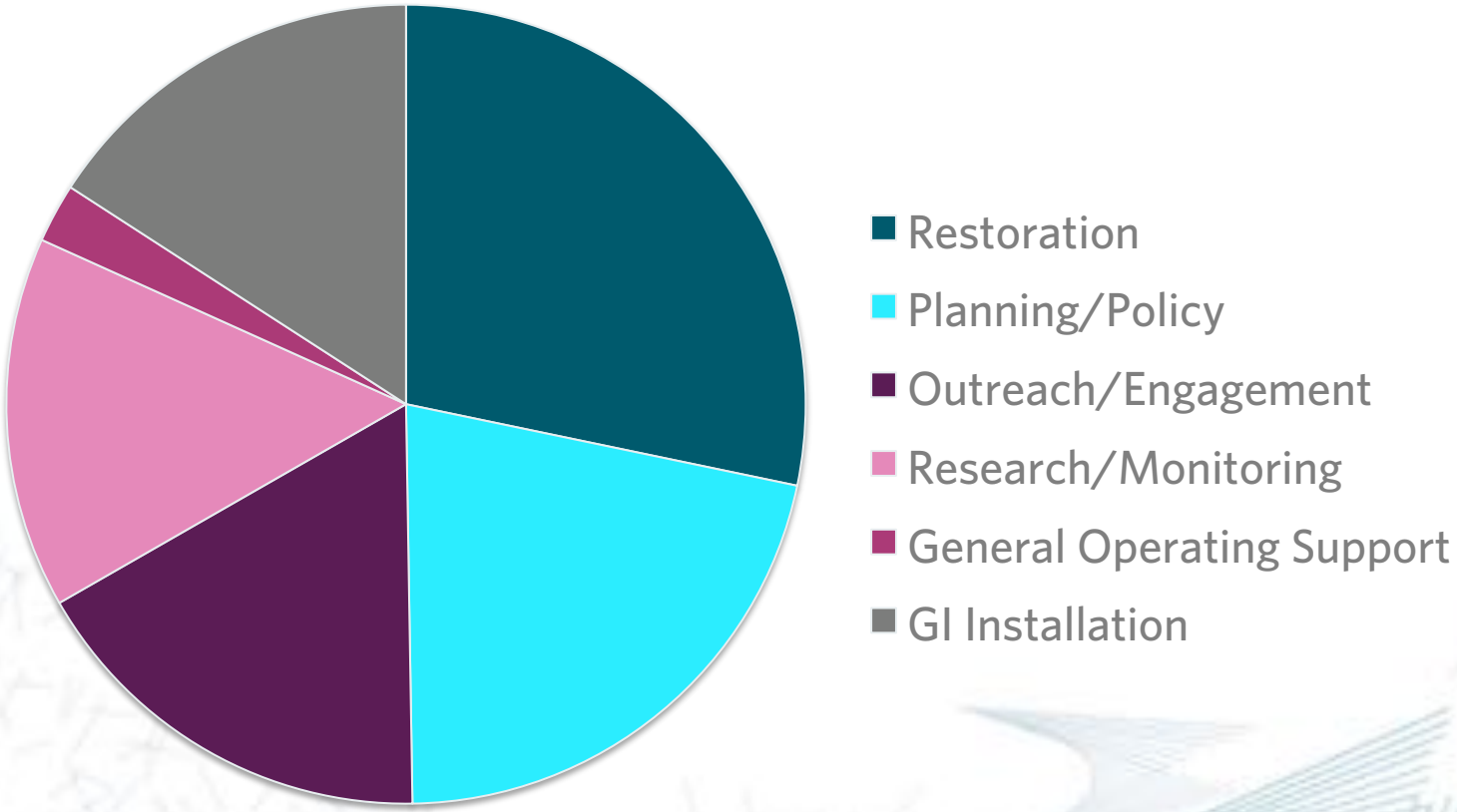
2013 GRANTS ON CHICAGO'S WATER ISSUES



Total
$22.6M

Water-Related Funding

2013 GRANTS ON CHICAGO'S WATER ISSUES



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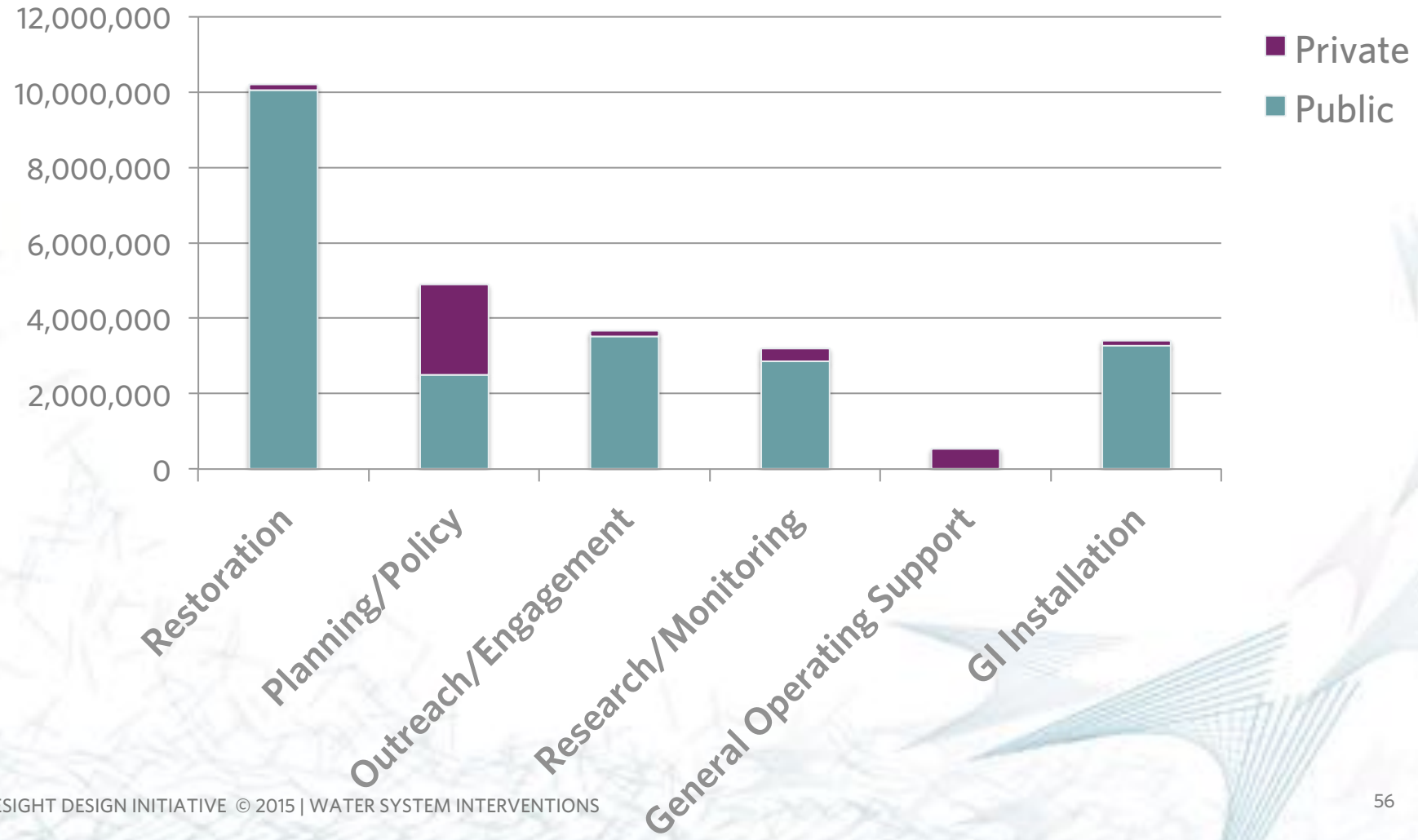

Water-Related Funding

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