

Aging Water Infrastructure Research Program SAB Consultation Innovation & Research for the 21st Century

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National Problem

President Obama has called for water and wastewater infrastructure projects with an investment of \$6 billion

- One of the top national water program priorities
- Anticipating an increase in water and wastewater infrastructure projects as a result of economic stimulus package
- Top priority of the U.S. Conference of Mayors
- Wastewater and drinking water systems rated **D-** by the American Society of Civil Engineers (2009)

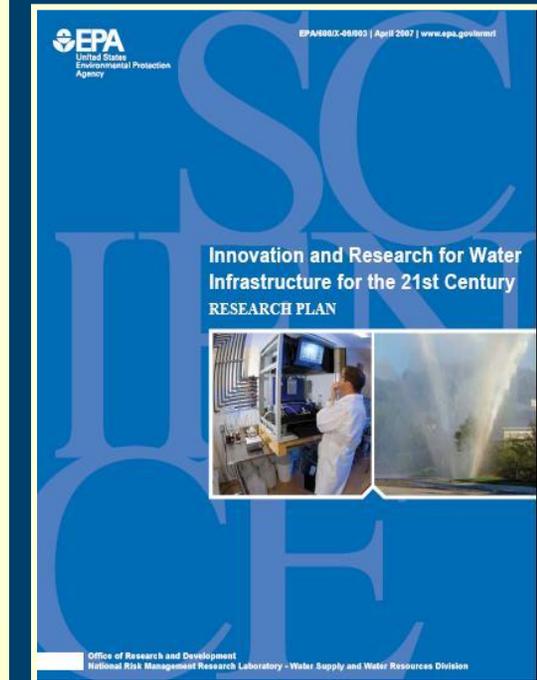


The Infrastructure funding gap could reach beyond \$500 billion in 20 years.

Source	Cost / Year (Billions)		
	Drinking Water	Wastewater	Total
Congressional Budget Office	8	11	19
Water Infrastructure Network	9	9	18
EPA Gap Analysis Report	13	14	27

AWI Research Plan

- **Experts Workshop:** March 2006 - Provided input and established the foundation for the development and focus of this national water infrastructure research initiative.
- **Research Issues Report:** July 2006 - Supported the development of the Research Plan by revealing gaps between research priorities identified by stakeholders and current on-going/planned research.
- **AWI Research Plan:** April 2007 - Externally peer reviewed research plan completed.
- **AWI Research Program:** August 2007- Program Initiated.
- **Science Advisory Board Consultation:** July 2009 - Meeting
- **Science Advisory Board Consultation:** September 2009 - Anticipated SAB consultation report.



EPA/600/X-09/003

AWI Research Program

Goal: To evaluate and demonstrate innovative technologies and improve the cost effectiveness of operation, maintenance, and replacement of aging and failing water infrastructure

Strategies

- Provide critical research results and outputs:
 - that support the Office of Water's Sustainable Water Infrastructure Initiative.
 - that can be provided to drinking water and wastewater utilities.
- Determine the innovative technologies that can cost-effectively improve performance and extend the life of existing infrastructure.
- Conduct national assessments to identify the effects of major influencing factors on future system threats and demands.
- Develop new designs and approaches that will maintain the long-term performance of water infrastructure.
- Determine the factors that affect infrastructure deterioration to predict and prevent system failure.

CONDITION ASSESSMENT



SYSTEM REHABILITATION



Research Areas



ADVANCED CONCEPTS



INNOVATIVE TREATMENT
TECHNOLOGIES FOR
WASTEWATER & WATER REUSE

AWI Research Program

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Impact on Costs

Based on national estimates of infrastructure funding needs, a 1% cost savings equates to \$9 billion.

Cost Comparison of Traditional and Green Infrastructure			
Project	Traditional Cost	Green Cost	Savings
Laurel Springs, WI	\$1,654,021	\$1,149,552	30%
Gap Creek, AR	\$4,620,600	\$3,942,100	15%
Prairie Glen, IL	\$1,004,848	\$599,536	40%

2007 OWOW report

CONDITION ASSESSMENT



SYSTEM REHABILITATION



Research Areas



ADVANCED CONCEPTS



INNOVATIVE TREATMENT
TECHNOLOGIES FOR
WASTEWATER & WATER REUSE

Expected Impacts

CONDITION ASSESSMENT

Improved methods of determining the structural, operational and performance status of capital infrastructure assets by...

- Reducing infrastructure failures and their adverse public health, safety, environmental, and economic effects by improved condition assessment technologies.
- Reducing water loss in distribution systems by providing more reliable leak detection.
- Enabling the prioritization of critical infrastructure to inspect, monitor, and assess the performance of rehabilitation activities.
- Increasing the Agency effectiveness by establishing an adaptation research framework.
- Incorporating corrosion research into regulatory guidance and technical assistance for various clients and stakeholders.



Expected Impacts

SYSTEM REHABILITATION

Increased effectiveness of infrastructure repair, renewal, and replacement of drinking water or wastewater systems by...

- Lowering the cost and increasing effectiveness of design, operation, maintenance, rehabilitation, and replacement of aging water infrastructure.
- Extending the service life and functionality of existing conveyance systems and reducing their life cycle cost.



Expected Impacts

ADVANCED CONCEPTS

Increased adoption of new and innovative infrastructure designs, management procedures and operational approaches by...

- Lowering the national cost for CSO control by using green infrastructure, and improving the aesthetic value of drainage infrastructure.
- Increasing the acceptance of permeable surfaces, such as permeable asphalt, porous concrete, and paver stone systems.
- Enhancing acceptance of new and innovative technologies for retrofitting green roofs on existing building.
- Improving the understanding of the performance, limitations, and costs of dual distributions systems.
- Assessing the effectiveness of advanced drinking water quality monitoring-modeling-control approaches.



Expected Impacts

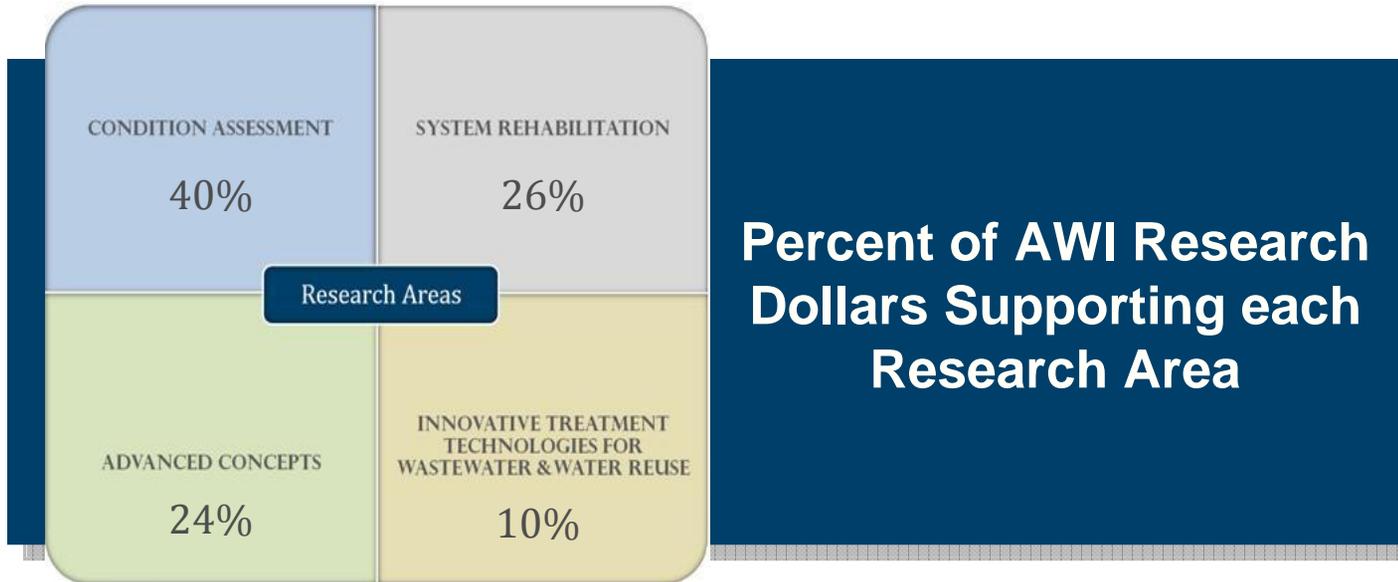
INNOVATIVE TECHNOLOGIES FOR WASTEWATER & WATER REUSE

Improved water quality and increased reliance on safe and dependable reclaimed wastewater and storm water by...

- Increasing acceptance of new and innovative technologies by decision makers who adopt, regulate, and design infrastructure technologies.
- Updating engineering design guidance for nutrient and emerging contaminant removal at municipal wastewater treatment plants.
- Improving guidance to state, regional, and local governments on water reuse technologies.



Resources



EPA/ORD FTE Supporting the AWI Research Program

Area	FY				
	2008	2009	2010	2011	2012
Drinking Water	3.1	3.1	3.1	3.1	3.2
Water Quality	5.7	5.7	6.5	7.2	7.5
Total	8.8	8.8	9.6	10.3	10.7

Accomplishments to Date

Agreements & Grants

- \$10M Cooperative Agreement - *Innovation and Research for Water Infrastructure for the 21st Century (2009)*
- STAR Grants - *\$1.5M awarded in 2009*

Ongoing Projects

- 26 research projects in support of the Program

State of Technology and Assessment Reports:

1. **Nutrient Control Design Manual** (EPA/600/R-09/012)
2. **Rehabilitation of Wastewater Collection and Water Distribution Systems** (EPA/600/R-09/049)
3. **Condition Assessment of Wastewater Collection Systems** (EPA/600/R-09/048)
4. **Condition Assessment of Water Transmission and Distribution Systems** (EPA/600/R-09/055)
5. **Advanced Drainage Concepts** (7/30/2009)
6. **National Assessment on Water Infrastructure Adaptation to Climate Change** (7/31/2009)

Presentations & Publications

- 15 publications & over 60 presentations

Forums/Workshops

- First National Expert and Stakeholder Workshop on Water Infrastructure Sustainability and Adaptation to Climate Change (2009)
- EPA Asset Management Workshop (2008)
- Three National EPA forums on condition assessment and rehabilitation of conveyance systems (2008)
- Two International EPA forums on advanced/green drainage concepts (2008)
- Green infrastructure research forum, cosponsored by OW and ORD (2007)
- Workshop on Innovation and Research for Water Infrastructure in the 21st Century (2006)

Leveraging

Enhanced Program's research capabilities by leveraging with outside entities...

... by more than doubling research investment to date.

- **\$5 Million** - Kansas City National Green Infrastructure Demonstration Project
- **\$4.5 Million** - NCER STAR Grants Solicitation
- **\$3.3 Million** - Cooperative Agreement Awarded to WERF
- **\$1.8 Million** - B & F funds for Porous Pavement Parking Lot Demonstration Site

...by leveraging personnel and resources from Agency Offices.

- **OW, OAR, 4 Regions** - First National Expert and Stakeholder Workshop on Water Infrastructure Sustainability and Adaptation to Climate Change
- **Region 2** - Porous Pavement Testing Facility at the Edison Environmental Center
- **OW, OST, Regions 1, 5, & 10** - Nutrient Control at POTWs – State of the Technology Review Report and Technology Transfer Seminars
- **Region 2, OW** - Green Roof Project at the Edison Environmental Center

...by leveraging technical expertise and facilities from national municipalities, universities, and associations.

- **City of Cincinnati/University of Cincinnati/Metropolitan Sewer District** - EPA AWBERC green infrastructure demonstration project
- **City of Kansas City** - National green infrastructure demonstration project
- **City of Louisville Water Company** - Innovative condition assessment and leak detection technology demonstration
- **University of Houston** - Multi-vendor grouting verifications
- **National Asphalt Pavement Association, Northeast Cement Shippers Association, and Interlocking Concrete Pavement Institute** - Porous Pavement Testing Facility at the Edison Environmental Center

...by collaborating with governments, organizations, and universities from other nations.

- **New Zealand** - Green Roof Project at the Edison Environmental Center with the University of Auckland
- **United Kingdom** - Application of SUSTAIN to new urban community in England by Penine Water Group and Sheffield University

Future Possibilities...

- Full-scale condition assessment and rehabilitation demonstration projects with multiple municipalities across the nation.
- Full-scale demonstrations of green technologies to control CSO for broader application.
- Forensic studies for investigation of infrastructure failures for a wider range of pipe materials under different environmental settings.
- Expanded test facilities to enhance in-house capabilities
- Infrastructure decision support/asset management, including life-cycle cost analysis and engineering risk assessment.



In Conclusion

The AWI Research Program...

- will put EPA on the forefront of addressing the nationwide high priority need for drinking water and wastewater infrastructure research.
- will allow EPA to play a national and international leadership role by cooperating and collaborating with its federal, national and international research partners.
- outputs will assist utilities to more effectively implement comprehensive asset management, provide reliable service to their customers, and meet the Clean Water Act and Safe Drinking Water Act requirements.
- supports and will enhance OW's Sustainable Water Infrastructure Initiative.
- has helped foster communication between ORD and OW.



Questions?