

Tap into Resilience: Pathways for Localized Water Infrastructure

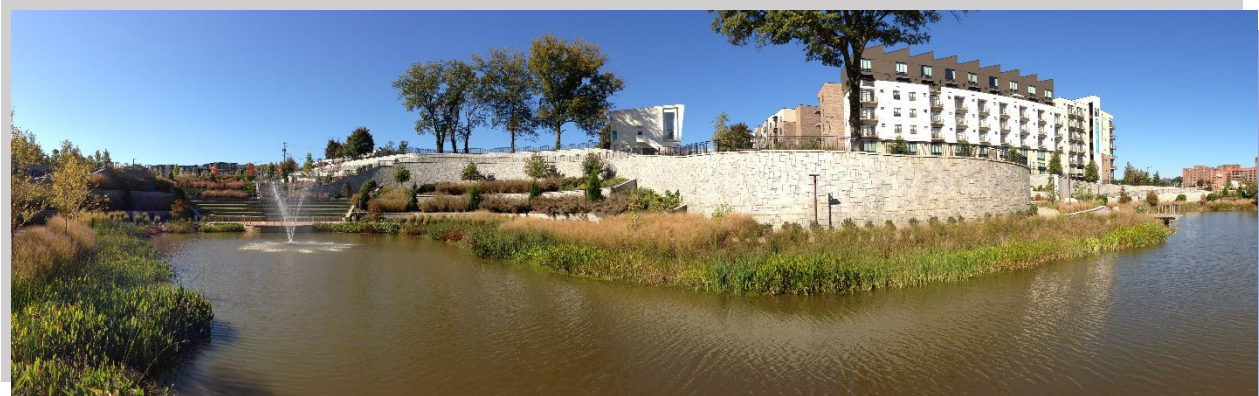


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Executive Summary

Introduction

The United States' need to radically increase investment in water infrastructure is well documented. Drinking water, stormwater, and wastewater systems are in crisis in communities nationwide. Addressing drought, urban flooding, and water quality impairments—all of which are intensified by climate change—are urgent priorities from Los Angeles to Peoria and Pittsburg to Santa Fe. The size and scale of the need dwarf federal and state water infrastructure loan and grant programs. Most infrastructure spending, approximately 96%, occurs at the local level—a reality unlikely to change soon.¹ The challenge for local entities and their political leadership is how to address these water management needs sustainably, create resilience to climate change, and protect water quality, all while securing local water supplies and services for everyone equitably.

¹ See, e.g., DEBRA KNOPMAN ET AL., NOT EVERYTHING IS BROKEN: THE FUTURE OF U.S. TRANSPORTATION AND WATER INFRASTRUCTURE FUNDING AND FINANCE 2 (2017), available at https://www.rand.org/content/dam/rand/pubs/research_reports/RR1700/RR1739/RAND_RR1739.pdf; Richard F. Anderson, *Local Government Investment in Water and Sewer, 2000-2015*, U.S. CONFERENCE OF MAYORS (Jan. 10, 2018), <https://www.usmayors.org/2018/01/10/local-government-investment-in-water-and-sewer-2000-2015/>; see also CONG. BUDGET OFF., *PUBLIC SPENDING ON TRANSPORTATION AND WATER INFRASTRUCTURE, 1956 TO 2014* (2015), <https://www.cbo.gov/sites/default/files/114th-congress-2015-2016/reports/49910-infrastructure.pdf>.

This report focuses on the considerable and largely overlooked opportunities presented by **localized water infrastructure** (LWI)—distributed systems that extend beyond centralized water infrastructure and are located at or near the point of use. These installations and technologies, some time-honored and others trailblazing, could be the most significant water infrastructure of the future. At scale, LWI performs the same functions as conventional water infrastructure—providing drinking water supply, treating wastewater, and capturing and managing stormwater. These strategies often perform these functions more equitably and affordably while also providing multiple co-benefits for communities such as permanent, green jobs, improved public health, and more green space. Yet, LWI’s full potential remains untapped for a wide variety of reasons.

To jumpstart the journey and explore the legal and policy reforms needed to address barriers to more widespread financing and implementation of LWI, the University of California, Irvine School of Law Center for Land, Environment, and Natural Resources (CLEANR) and WaterNow Alliance brought together water policy experts in September 2019 for a dialogue around community successes, lessons learned, and the financial, legal, and policy solutions needed to advance public water utilities’ full-scale adoption of LWI.

This report builds on these deliberations to make nine recommendations and identify roughly two dozen achievable, practical action items to overcome the **financing, institutional, and legal & policy barriers** to largescale adoption of LWI. These recommendations and action items set a foundation for expanding access to and understanding of LWI in an effort to catalyze and accelerate the shift towards sustainable, climate resilient, affordable and equitable water solutions.

Financing

The federal government played a major role in the development of local water infrastructure for many years. However, that support declined dramatically in the 1980s in line with a shift in Congressional policy to transition to full state and local responsibility for water investments. With their revenues largely limited to rates and fees, the cities, towns, and special water districts responsible for local water resources spend far more on annual operations than long-term investment in infrastructure, at a ratio of roughly 3:1.²

Most, although certainly not all, American cities, towns and utilities are adept at accessing capital markets to finance conventional water infrastructure. Fully realizing the benefits of LWI will require that they invest similarly in decentralized and onsite options involving private as well as public, non-utility-controlled sites. Such investment represents one of the major financing opportunities—and challenges—for scaling deployment of LWI options. Many, if not most, local and regional public water resource entities have the authority required to raise and invest capital in LWI, but are often held back by various barriers, perceived and otherwise, including most prominently the seven identified at the Roundtable:

² CONG. BUDGET OFF., *PUBLIC SPENDING ON TRANSPORTATION AND WATER INFRASTRUCTURE, 1956 TO 2014* (2015), <https://www.cbo.gov/sites/default/files/114th-congress-2015-2016/reports/49910-infrastructure.pdf>.

1. Perceptions regarding accounting limitations
2. State gift prohibitions
3. State and local laws limiting use of bond proceeds
4. Limits on tax-exempt governmental bonds
5. Lack of dedicated or sufficient revenue streams
6. Federal and state loan program priorities
7. Federal tax disincentives/lack of incentives

RECOMMENDATIONS: EXPAND PUBLIC FINANCING OPPORTUNITIES

Four of the most important opportunities to expand financing for LWI and begin to close the water infrastructure funding gap include:

1. Accessing municipal bonds for LWI
2. Establishing dedicated revenue streams for LWI
3. Prioritizing LWI projects for federal & state grants and loans
4. Leveraging state & federal tax codes

The first step in getting past LWI financing barriers is to expand our collective vision and definition of infrastructure. Once we appreciate that onsite reuse systems, permeable pavements, rain gardens, and high tech leak detection devices all function as water infrastructure, the generational equity case for using longer-term capital to pay for these investments, rather than operating cash, makes itself. Moreover, many of the financing barriers to such investments are now due more to perception than legal barriers. Municipal bonds, including Environmental Impact Bonds and green bonds, are now fully available to finance LWI using Regulated Operations accounting. Stormwater and other dedicated fees are becoming more politically palatable, and State Revolving Funds (SRFs) have more options than are currently being utilized to support LWI investments. And modest changes in federal and state tax codes can both provide new incentives and remove unnecessary barriers to local action.

FINANCING ACTION ITEMS

We have identified eight ways utilities, state and local governments, the federal government, and NGO and universities can begin to overcome barriers and carry out the recommendations for investing in LWI on par with conventional infrastructure approaches.

Utilities

1. Establish standards and/or targets for LWI in capital and other long-range planning; institutionalize the concept that these strategies can be debt-financed in the same way as conventional water infrastructure.

State and Local Governments

2. Exempt LWI investments from restrictions on the use of bond proceeds on private property, and/or recognize investments in LWI as authorized debt-financed investments.

Federal and State Government

3. Update tax codes to exempt consumer incentives designed to implement LWI from income tax.
4. Create tax incentives for residents and businesses to invest in LWI.

Federal Government

5. Create or update SRF eligibilities, and/or guidance and criteria to: (a) prioritize funding for LWI and (b) expand SRF financial assistance mechanisms that can lower costs and accelerate the pace of LWI funding on a national scale.
6. Update the IRS code to exempt LWI from the cap on “private activities” for purposes of tax-free governmental bonds.

NGOs and Universities

7. Create a database of state-level statutory and regulatory public finance rules that may operate as, or may be perceived to be, barriers to capitalizing LWI investments.
8. Conduct a literature review of EPA and other resources related to the use of SRF funds to finance LWI, and create a summary report that compiles and synthesizes the relevant information and provides case study examples of SRF-funded strategies.

If implemented, these actions would help clear the path to financing LWI in a way that realizes their full capability in providing drinking water, wastewater, and stormwater services.

Institutional Challenges

In addition to the financial barriers listed above, expanding the vision of water infrastructure from conventional pipes, tanks, and tunnels to include decentralized, onsite strategies and technologies spread over a community faces significant institutional challenges as well. Predominant among these is the compartmentalized way in which water resources have traditionally been managed and regulated in most communities.³ Drinking water, wastewater, and stormwater are often under the jurisdictional purview of separate local entities and rarely fully integrated. It is even more rare for land use and water resource management to be integrated. This siloing favors centralized water infrastructure because it is designed to serve a limited purpose.⁴ Creating an endless feedback loop, utility’s roles, responsibilities, and capacities have historically been aligned to implement

“Most people look at a building and see concrete; I see a sponge.”

San Francisco Water Resources
Director

³ See Nancey Green Leigh & Heonyeong Lee, *Sustainable and Resilient Urban Water Systems*, 10 SUSTAINABILITY 2 (2019).

⁴ See CLEAN WATER AM. ALLIANCE, BARRIERS AND GATEWAYS TO GREEN INFRASTRUCTURE 6 (2011), <http://uswateralliance.org/sites/uswateralliance.org/files/publications/Barriers-and-Gateways-to-Green-Infrastructure.pdf>, *id.* at 2; THE JOHNSON FOUNDATION AT WINGSPREAD, OPTIMIZING THE STRUCTURE AND SCALE OF URBAN WATER INFRASTRUCTURE: INTEGRATING DISTRIBUTED SYSTEMS 18 (2014), https://www.johnsonfdn.org/sites/default/files/reports_publications/CNW-DistributedSystems.pdf.

these centralized approaches. Further, due to the large fixed costs of centralized water infrastructure, agencies favor maintenance and upgrades to existing, centralized systems over introducing new LWI, which is innately about partnerships with a broad array of private property owners, from businesses, to institutions, to residences. Further, full-scale LWI that results in significant water savings can threaten the fiscal stability of utilities with outdated business models that rely on selling water as a commodity. Underpinning these structural challenges is the need for new or updated guidance and data-driven decision-support tools to inform policymakers' and water managers' shift from conventional systems to LWI. Pivoting to large-scale adoption of LWI is feasible, but will require an intentional approach to institutional issues that can operate as barriers, including most prominently six identified in the Workshop:

1. Lack of appropriate decision support tools and guidance
2. Compartmentalized water management, i.e., water agency silos
3. Lack of collaboration with other city departments and community groups
4. Difficulty accessing water management potential of private property
5. Outdated business models
6. Limited scope of water utility role and capacity

RECOMMENDATIONS: BUILD INSTITUTIONAL CAPACITIES TO FOSTER ADOPTION OF LOCALIZED WATER INFRASTRUCTURE

Addressing the institutional challenges to LWI entails long-term transformation of deep-rooted municipal and utility *modus operandi*. We have identified three strategy sets with meaningful potential to open pathways to greater acceptance and adoption of LWI in the near term, and in doing so, pave the way to a broader expansion of the concept of investment-worthy infrastructure:

1. Development of new decision-support tools
2. Creation of alternative water service business models
3. Creation of new pathways for collaboration

Valuable decision-support tools are already available, and utilities that have begun to find new pathways for interdisciplinary coordination and collaboration and update their business models, which serve as vital examples for others.

INSTITUTIONAL ACTION ITEMS

We have identified 10 action items for utilities, state and local governments, the federal government, and NGO and universities to take to begin to overcome identified institutional barriers to LWI and carry out the recommendations for operationalizing utility adoption of LWI.

Utility & Local Government

1. Establish alternative business models designed to maintain fiscal health without relying on volumetrically-driven water sales, e.g., budget-based rate structures, repeal of volume discounts, flat fee combined with a variable, tiered rate, fixed variable rates.

2. Update institutional hierarchies and traditional roles to reflect 21st century needs by refreshing utilities' stated missions—shift away from the single-purpose service provider model to a multi-purpose model that provides a variety of services at different scales informed by community values, evaluating where staff capacities are most impactful on meeting utility and community goals, and realigning departments and roles to match utilities' priorities.
3. Provide LWI job training programs that can create new local jobs, including for vulnerable youth, garner greater confidence in LWI, reduce the costs associated with acquiring skilled personnel to implement, operate, and monitor LWI systems.

Utilities working with Technology, University & NGO Partners

4. Identify and coordinate with key intra-city agencies, agencies entirely separate from the city or utility implementing the LWI, as well as NGOs and universities.
5. Invest in tools and technologies that harness real-time data to inform improved rate modeling and decision-making.
6. Create a “data dictionary” for public water data that includes definitions, standards, and data collection protocols to “promote interoperability, efficiency, and user-flexibility.”

State Governments

7. Adopt and/or update urban water use planning requirements to include guidelines on how to conduct demand forecasting to reflect the reality that water demand is trending downward.

NGOs, Universities, and the Federal Government

8. Develop tools for local utilities to use to better evaluate the efficacy and benefits of localized water strategies, including head to head comparisons with conventional approaches
9. Develop a matrix to match localized water strategies with the different applications (residential, commercial, etc.), the various challenges the strategies can address, data needs, and financing tools.
10. Generate, collect, and analyze data on: (a) how LWI meet water supply, stormwater, and wastewater management needs; (b) environmental, economic, and social benefits of LWI; (c) how LWI meet public health and safety standards; (d) how capital costs, performance, and resiliency characteristics of LWI compare to centralized systems; and (e) the job creation potential of various LWI.

If implemented, these actions would help institutionalize LWI as core strategies for providing drinking water, wastewater, and stormwater services.

Legal & Policy Challenges

In addition to financing and institutional barriers, certain types of legal and regulatory requirements can hinder, or effectively preclude, implementation and deployment of LWI. While these barriers and disincentives can occur at all levels of government, state and local rules, regulations, and policies represent the majority of the laws and policies that govern whether, how, and where LWI can be implemented; federal rules primarily concern the funding issues addressed above.

Municipal codes and ordinances can limit LWI because they were not drafted with localized solutions in mind and expressly or implicitly prohibit deploying LWI to meet water supply, wastewater, and stormwater management needs.⁵ For example, local rules such as parking lot requirements may specify use of conventional curbing or specific types of plants, which can restrict the use of bioswales, bioretention areas, or drought tolerant plants.⁶ Similarly, state and local public health regulations can directly prohibit LWI. These regulations can restrict laundry-to-landscape greywater reuse for single family homes as well as complex, campus-wide, advanced onsite reuse systems that treat black water. They may also include prohibitions on rainwater harvesting and the use of reclaimed stormwater,⁷ restrictions on soils used for infiltration,⁸ and requirements for vector control such as mosquito abatement rules.⁹ The absence of policies, rules, and regulations that recognize LWI as available water management measures can operate as barriers to implementation as well. For example, absence of language about LWI in codes and ordinances may result in water managers not even entertaining the possibility of using such strategies.¹⁰ In other words, if a city's stormwater code makes no mention of bioswales, rain gardens, or other onsite GI solutions as ways developers can meet

⁵ See, e.g., also David A. Strifling, *Integrated Water Resources Management and Effective Intergovernmental Cooperation on Watershed Issues*, 70 MERCER L. REV. 399, 427 (2019); CLEAN WATER AM. ALLIANCE, *supra* note 4, at 16; *TACKLING BARRIERS TO GREEN INFRASTRUCTURE*, WIS. SEA GRANT 8 (2017), <https://publications.aqua.wisc.edu/product/tackling-barriers-to-green-infrastructure-an-audit-of-municipal-codes-and-ordinances/>.

⁶ WIS. SEA GRANT, *supra* note 5, at 13; see also, e.g., Denis Cuff, *East Bay Homeowner Fined for Replacing Grass With Drought-Tolerant Plants*, MERCURY NEWS (Aug. 12, 2016), <https://www.mercurynews.com/2014/08/20/east-bay-homeowner-fined-for-replacing-grass-with-drought-tolerant-plants/>; see also Chris Nichols, *'Brown is Beautiful' Landscaping Bill Signed by Governor*, SAN DIEGO TRIBUNE (Sept. 18, 2014), <https://www.sandiegouniontribune.com/news/politics/sdut-hoa-drought-lawns-water-ab2104-gonzalez-2014sep18-story.html>.

⁷ CLEAN WATER AM. ALLIANCE, *supra* note 4, at 19; see also *State Rainwater Harvesting Laws and Legislation*, NAT'L LEAGUE OF CITIES (Feb. 2, 2018), <http://www.ncsl.org/research/environment-and-natural-resources/rainwater-harvesting.aspx>; Zita L.T. Yu, et al., *Critical Review: Regulatory Incentives and Impediments for Onsite Graywater Reuse in the United States*, 85 WATER ENV'T. RES. 650, 651–52 (2013).

⁸ CLEAN WATER AM. ALLIANCE, *supra* note 4, at 20.

⁹ Yu, *supra* note 7, at 652–53, 659–60; NAT'L BLUE RIBBON COMM'N FOR ONSITE NON-POTABLE WATER SYS., *MAKING THE UTILITY CASE FOR ONSITE NON-POTABLE WATER SYSTEMS* 6 (2018), http://uswateralliance.org/sites/uswateralliance.org/files/publications/NBRC_Utility%20Case%20for%20ONWS_032818.pdf.pdf; see, e.g., New Orleans Municipal Code, Sec. 82-352 (prohibits the creation of “artificially induced mosquito breeding areas” without exception for stormwater management systems).

¹⁰ See WIS. SEA GRANT, *supra* note 5.

the city's post-construction stormwater standards, it is likely many, if not most, developers will use only conventional stormwater management options.

Granular scale state and local policies are crucial to LWI deployment—they govern on-the-ground adoption of LWI and present the main legal and policy implementation barriers when it comes to large-scale LWI adoption. We have identified two sets of legal and policy challenges to LWI implementation at state and local levels:

1. Laws and policies expressly or implicitly prohibiting LWI implementation
2. Absence of LWI from state and local laws and policies

RECOMMENDATIONS: UPDATE STATE AND LOCAL LAWS AND POLICY TO SUPPORT WIDESPREAD ADOPTION OF LWI

State and local laws and policies present key leverage points for decisionmakers and advocates working to eliminate implementation barriers and establish flexible pathways for water resource entities to advance adoption of LWI at large scale. There are two important ways to apply these leverage points:

1. Create new laws and policies to support LWI
2. Update existing laws and policies to clear barriers to LWI

Establishing new state and local guidelines, regulations, and policies or promoting LWI in existing laws and policies would just begin to scratch the surface of the many ways that cities, towns, utilities, and their states can create the policy pathways to accelerate adoption of these strategies. These modest changes would, however, have an outsized impact on getting to scale.

LEGAL AND POLICY ACTION ITEMS

We have identified nine action items for utilities, state and local governments, and NGOs and universities to take to begin to overcome identified legal and policy barriers and to foster large-scale adoption of LWI.

Utilities & Other Local Governmental Entities

1. Develop internal/external teams to review municipal codes to identify unintentional barriers to LWI adoption as well as gaps in policies and ordinances needed to support larger scale deployment.
2. Revise building codes and other relevant local ordinances, polices, and guidance to require use of LWI in new development including, but not limited to, water use efficiency measures, onsite reuse systems, and GI.
3. Establish criteria and monitoring guidelines in health and safety codes for onsite reuse of stormwater, graywater, and blackwater.
4. Revise ordinances or incentive programs to ensure private property owners maintain onsite facilities, and establish dedicated utility staff to ensure proper operation and maintenance of privately-owned LWI through oversight and inspection.

5. Incorporate LWI objectives into comprehensive master plans and sustainability plans.

State & Local Government

6. Update water supply planning regulations and policies to ensure that water savings from water use efficiency, conservation, and water reuse is treated as a source of supply.

State Governments

7. Eliminate state-level prohibitions to LWI technologies and strategies such as rain cisterns, onsite reuse and graywater systems; and/or establish state-level guidance for deploying such systems safely while protecting public health.
8. Leverage regulatory requirements, e.g., municipal stormwater permits and wastewater treatment plant permits, by identifying LWI as authorized best management practices, as well as encouraging the use of LWI by, e.g., setting different deadlines for permittees that deploy LWI to meet permit terms and allowing for stormwater credit-trading systems.

NGOs and Universities

9. Create a repository of local ordinances, policies, and programs that facilitate LWI such as building, plumbing, and land use codes, climate action or sustainability plans, and water supply and comprehensive plans.

Conclusion

LWI implementation at scale is possible. Public utilities have access to mechanisms to finance large-scale localized water infrastructure investments just as they do for conventional infrastructure. The tools to counteract institutional inertia that keeps the bulk of water utilities' resources and decisionmaking flowing exclusively towards conventional approaches are already available or are readily achievable with the support from water industry partners, NGOs, and academia. Finally, a growing number of federal, state, and local policies that authorize, incentivize, and prioritize LWI provide solid models for other communities as they work to shift towards these sustainable, resilient water resource management options.