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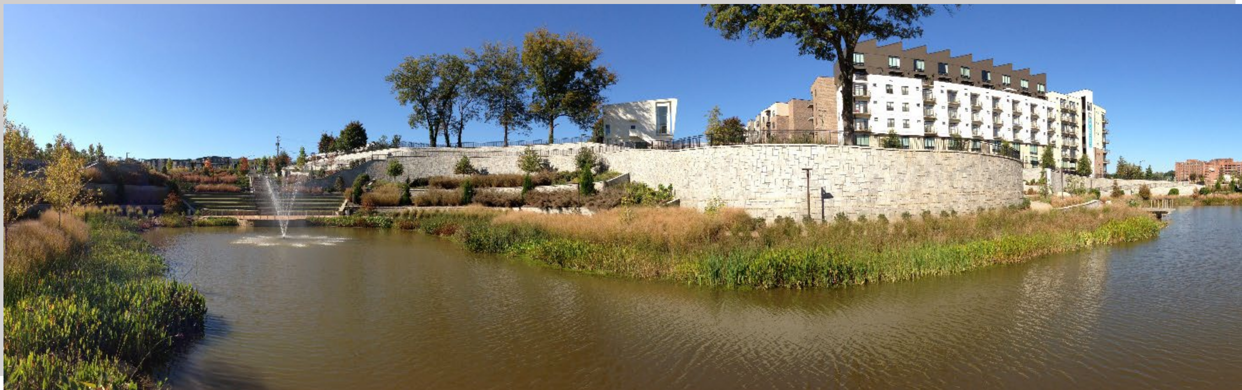

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Tap into Resilience:
Pathways for Localized Water Infrastructure

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Contents

I. Introduction

It is no secret that in order to tackle its ongoing and future water challenges spanning drinking water, wastewater, and stormwater systems, the nation needs to significantly increase its investments in water infrastructure and management solutions.[1]

- Our drinking water infrastructure is aging,[2] creating vulnerabilities in the systems that convey and store our water resources—systems simultaneously strained by a changing climate. High water use compounds the challenges facing these aging systems; several states in the U.S. experience "high" to "extremely high" water stress levels where more than 40% of available supply is withdrawn annually.[3]
- Hundreds of billions of gallons of untreated wastewater and stormwater are released as combined sewer overflows each year in the U.S.,[4] while polluted urban stormwater runoff continues to be a major cause of impairments to surface water quality and adverse impacts to public health.[5]

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1 While estimates of water infrastructure investment needs diverge widely and are based on vastly differing assumptions, there is a strong consensus that billions in annual investment is required at the local level. For example, the American Water Works Association estimates that a minimum of $40 billion per year is needed for water infrastructure investments, while the U.S. Water Alliance estimates the investment need is at least $123 billion annually. *See* Am. Soc'y Civil Eng'rs, *Overview* in *Drinking Water*, 2017 INFRASTRUCTURE REPORT CARD, https://www.infrastructurereportcard.org/cat-item/drinking_water/ (last visited Sept. 4, 2019); *see also* U.S. GLOB. CHANGE RESEARCH. PROGRAM, FOURTH NATIONAL CLIMATE ASSESSMENT CHAPTER 3: WATER (2018), https://nca2018.globalchange.gov/chapter/3/; *see also* U.S. GEOLOGICAL SURVEY, U.S. DEP'T INTERIOR, FACT SHEET 2018-3035, SUMMARY OF ESTIMATED WATER USE IN THE UNITED STATES IN 2015 (2015), https://pubs.usgs.gov/fs/2018/3035/fs20183035.pdf; AM. WATER WORKS ASS'N, BURIED NO LONGER: CONFRONTING AMERICA'S WATER INFRASTRUCTURE CHALLENGE 3 (2017), http://www.climateneeds.umd.edu/reports/American-Water-Works.pdf.

2 *See* Am. Soc'y Civil Eng'rs, *Overview* in *Drinking Water*, 2017 INFRASTRUCTURE REPORT CARD, https://www.infrastructurereportcard.org/cat-item/drinking_water/ (last visited Sept. 4, 2019); *see also* U.S. GLOB. CHANGE RESEARCH. PROGRAM, FOURTH NATIONAL CLIMATE ASSESSMENT CHAPTER 3: WATER (2018), https://nca2018.globalchange.gov/chapter/3/; *see also* U.S. GEOLOGICAL SURVEY, U.S. DEP'T INTERIOR, FACT SHEET 2018-3035, SUMMARY OF ESTIMATED WATER USE IN THE UNITED STATES IN 2015 (2015), https://pubs.usgs.gov/fs/2018/3035/fs20183035.pdf.

3 Rutger Willem Hofste, et al., *17 Countries, Home to One-Quarter of the World's Population, Face Extremely High Water Stress*, WORLD RES. INST. (Aug. 6, 2019), https://www.wri.org/blog/2019/08/17-countries-home-one-quarter-world-population-face-extremely-high-water-stress.

4 U.S. ENV'T PROT. AGENCY, REPORT TO CONGRESS ON IMPACTS AND CONTROL OF COMBINED SEWER OVERFLOWS AND SANITARY SEWER OVERFLOWS 4-18 (2004), https://www.epa.gov/sites/production/files/2015-10/documents/csossortc2004_full.pdf; *see also* Mary Anna Evans*, Flushing the Toilet Has Never Been Riskier*, THE ATLANTIC (Sept. 17, 2015), https://www.theatlantic.com/technology/archive/2015/09/americas-sewage-crisis-public-health/405541.

5 U.S. ENV'T PROT. AGENCY, NATIONAL WATER QUALITY INVENTORY: REPORT TO CONGRESS 20-21 (2017), https://www.epa.gov/sites/production/files/2017-12/documents/305brtc_finalowow_08302017.pdf; U.S. ENV'T PROT. AGENCY, PROTECTING WATER QUALITY FROM URBAN RUNOFF 1 (2003), https://www3.epa.gov/npdes/pubs/nps_urban-facts_final.pdf.

- The frequency of urban flooding—the most common natural disaster in the U.S.—is expected to increase by an additional 45% by the end of the century due to sea level rise and extreme weather caused by climate change.[6]

This list could go on.

Facing these ever-increasing stressors on water systems, communities are looking for ways to build sustainability, create resilience to climate change, protect water quality, and equitably secure local water supplies for everyone. Localized water infrastructure (LWI)—distributed systems that extend beyond centralized water infrastructure and are located at or near the point of use—offers these sustainable, resilient, and equitable solutions. LWI includes improvements, devices, and technologies installed onsite that enhance a utility system by deferring or delaying the need to expand centralized systems or reducing the scale of expansion needed. Yet, LWI's full potential remains untapped.

While there are many examples of public utilities nationwide deploying water use efficiency, reuse, green infrastructure, and other innovative LWI, few have done so beyond the demonstration phase or on a scale that truly maximizes their potential.[7] This is due to a wide variety of factors, ranging from perceived finance, accounting, and tax barriers, to institutional challenges facing the water sector as it works to embrace innovative solutions, to state and local legal and policy barriers slowing the implementation and deployment of LWI. To jumpstart the journey and explore the legal and policy reforms needed to address barriers to more widespread financing and implementation of innovative, localized water strategies, the University of California, Irvine School of Law Center for Land, Environment, and Natural Resources (CLEANR) and WaterNow Alliance convened a workshop roundtable in September 2019.[8] The roundtable brought together water policy experts, including leaders at the forefront of implementing such strategies 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 provides a foundation for expanding access to and understanding of LWI in an effort to catalyze and accelerate the shift towards these sustainable, resilient solutions. To that end, it identifies strategies for addressing various financing and institutional challenges, and legal and policy barriers to larger scale financing and implementation of LWI, and recommends solutions based on the roundtable discussion and follow-up interviews. It highlights successes nationwide and identifies concrete actions that can be taken to advance implementation of LWI. The report also responds to the overarching need for strong, local leadership in larger-scale adoption of LWI by providing motivated leaders with tools and strategies for action.

Following this introductory section, Section I, this report is organized into three primary sections. Section II describes various types of LWI, their potential as solutions to meeting water supply,

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6 Melissa Denchak, *Flooding and Climate Change: Everything You Need to Know*, NAT'L RES. DEF. COUNCIL (Apr. 10, 2019), https://www.nrdc.org/stories/flooding-and-climate-change-everything-you-need-know; *see also* Ellen Grey & Jessica Merzdorf, *Earth's Freshwater Future: Extremes of Flood and Drought*, NASA GLOBAL CLIMATE CHANGE (June 13, 2019), https://climate.nasa.gov/news/2881/earths-freshwater-future-extremes-of-flood-and-drought.

7 *See*, *e.g.*, CLEAN WATER AM. ALLIANCE, BARRIERS AND GATEWAYS TO GREEN INFRASTRUCTURE 8 (2011), *http://uswateralliance.org/sites/uswateralliance.org/files/publications/Barriers-and-Gateways-to-Green-Infrastructure.pdf*; *see also* Nancey Green Leigh & Heonyeong Lee, *Sustainable and Resilient Urban Water Systems*, 11 SUSTAINABILITY 2 (2019). *see also David A. Strifling, Integrated Water Resources Management and Effective Intergovernmental Cooperation on Watershed Issues,* 70 MERCER L. REV. 399, 404–05 (2019).

8 See Appendix A for agenda from the workshop roundtable.

stormwater, and wastewater management needs, and their multiple co-benefits. Section III identifies three primary categories of barriers to large-scale LWI adoption and deployment.: (1) Financing, (2) Institutional Challenges, and (3) Legal & Policy Challenges; and offers recommendations to overcoming these barriers. In Section IV, we match specific LWI (water use efficiency, reuse and other alternative non-potable water sources, green infrastructure (GI), and privately owned lateral line replacements) with each recommendation and identify potential actors (utilities; federal, state, and local governments; NGOs; and universities) to carry out actions to implement the corresponding recommendation.

As detailed below, when implemented at scale, LWI can address a myriad of water management challenges, including those related to drinking water supply, water quality, and urban runoff and wastewater overflows. LWI can also often serve more than one of these purposes simultaneously. 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 help counteract institutional inertia that keeps the bulk of water utilities' resources and decision-making flowing towards centralized infrastructure 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 regulatory frameworks 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. If federal, state, and local governments, utilities, municipalities, NGOs, universities, and other stakeholders carry out the 26 action items identified below, the finance, institutional, and implementation barriers can be overcome.

II. Localized Water Infrastructure

In urban settings, water infrastructure needs to perform three basic functions:

1. Provide clean, safe, and reliable drinking water supplies for homes, businesses, institutions, and industry;
2. Move wastewater away from these properties, treat it to meet water quality requirements, and safely reclaim or discharge it without contaminating rivers, lakes, streams, oceans, and estuaries; and
3. Manage stormwater to limit flooding and related damage and, again, ensure that it is safely reclaimed or discharged without harm to public health, water bodies, and ecosystems.

Centralized water infrastructure can perform these functions well in many cases and has been the conventional approach for the past 150 years.[9] Yet, centralized systems comprised of vast networks of pipes, pumps, tunnels, and treatment facilities that "require more than a decade to plan, build, [and pay for]" leave communities with "little flexibility as conditions change,"[10] and are thus limited in their capacity to meet 21st century water management needs. In particular, centralized systems do not have flexibility to adapt to changing conditions due to the "lack of inter-connectedness" between

[9] *See* Leigh & Lee, *supra* note 7, at 2.

[10] THE JOHNSON FOUNDATION AT WINGSPREAD, OPTIMIZING THE STRUCTURE AND SCALE OF URBAN WATER INFRASTRUCTURE: INTEGRATING DISTRIBUTED SYSTEMS 1 (2014), https://www.johnsonfdn.org/sites/default/files/reports_publications/CNW-DistributedSystems.pdf.

drinking water, wastewater, and stormwater systems and their "limited and specialized" functionality.[11] Many conventional facilities are designed for a singular purpose, which ultimately results in "wasted opportunities for more efficient and ecological urban water management."[12] Further, because centralized systems are designed for "a useful life of up to 100 years," they are highly inflexible with limited reconfiguration possibilities.[13] Further, the high costs of centralized systems contributes to water inequity.[14] Communities in rural and unincorporated areas may not have centralized water infrastructure to begin with and "their utilities often lack the resources to connect all residents to a centralized system."[15]

In light of these limitations and in response to the growing strain on our nation's water systems, communities are looking for ways to supplement and extend the life of conventional, centralized infrastructure[16] that are more integrated, equitable, and adaptive in order to build resilience and sustainability and provide multiple community co-benefits.[17] Local governments across the country have begun to explore LWI to expand their options in this regard.[18] More than a specific technology or legal term, LWI is a conceptual category referring to "dispersed facilities that extend beyond the central infrastructure and are located at or near the point of use."[19]

There is a growing recognition among water managers, decisionmakers, and experts that distributed, site-level infrastructure can complement, and in some instances, serve as an alternative to, centralized systems.[20] As detailed in the section below, even the modest investments in LWI to date demonstrate that these distributed approaches to water management are, indeed, water infrastructure, performing the basic functions needed in urban settings and more.

A. TYPES OF LOCALIZED WATER INFRASTRUCTURE

Localized water infrastructure can be grouped into four broad categories:

1. Water Use Efficiency
2. Reuse and Other Alternative Non-Potable Water Sources
3. Green Infrastructure
4. Privately-Owned Lateral Line Replacements

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11 *Id.*
12 Leigh & Lee, *supra* note 7, at 6 (explaining that current stormwater drainage systems designed for flood protection consider stormwater collection only in relation to drainage, while overlooking its potential as an alternative water source).
13 *Id*.
14 *See* VALERIE I. NELSON, NEW APPROACHES IN DECENTRALIZED WATER INFRASTRUCTURE 12 (2008), https://decentralizedwater.waterrf.org/documents/04-dec-5sg/04dec5report.pdf (noting that "using and reusing water at [a] local site costs less than piping water in, wastewater out, and treated water back in for reuse").
15 U.S. WATER ALL., AN EQUITABLE WATER FUTURE 16 (2017), http://uswateralliance.org/sites/uswateralliance.org/files/publications/uswa_waterequity_FINAL.pdf.
16 *See, e.g.*, CLEAN WATER AM. ALLIANCE, *supra* note 7, at 6; Leigh & Lee, *supra* note 7, at 2; PAC. INST., WATER USE TRENDS IN THE UNITED STATES 11 (2015), https://pacinst.org/wp-content/uploads/2015/04/Water-Use-Trends-Report-1.pdf; Rutger Willem Hofste, et al., *supra* note 3.
17 CLEAN WATER AM. ALLIANCE, *supra* note 7, at 7.
18 *See, e.g.*, *Meet Communities* in *Tap into Resilience*, WATERNOW ALL., https://tapin.waternow.org/meet-communities/#projectmap (last visited Sept. 4, 2019).
19 THE JOHNSON FOUNDATION AT WINGSPREAD, *supra* note 11, at 3.
20 *Id.* at 2.

Indicative of their multi-benefit and integrated nature, the strategies that fall within each of these categories may overlap, with some strategies fitting into multiple categories and simultaneously addressing multiple water management needs. These categories are described below.

1. Water Use Efficiency

While there are dozens of ways to increase urban water use efficiency,[21] we have organized them into four approaches that rely on localized methods that are applicable to residential, commercial, industrial, and institutional properties:

- Indoor, high-efficiency appliances and fixtures
- Turf replacement and water-wise landscape
- Smart irrigation controllers
- Customer-side leak detection devices

Indoor, high-efficiency appliances and fixtures include residential and commercial toilets, urinals, clothes washers, and dishwashers, as well as faucets, showerheads, and aerators.[22] In commercial and industrial settings, indoor water use efficiency appliances and fixtures also include cooling tower upgrades, heating and air conditioning system upgrades, industrial kitchen fixtures such as large-scale ice machines and rinse-spray valves, and "single pass" cooling systems.[23]

Widespread adoption of indoor efficiency measures presents significant water savings opportunities. As of 2019, cities and utilities participating in EPA's WaterSense program, which certifies water efficient appliances and fixtures, saved a total of 4.4 trillion gallons since 2006—equivalent to 6 months of water use by all U.S. households.[24] A five-states study analyzing water savings from residential high-efficiency toilets alone found replacing inefficient models with efficient toilets would save approximately 360 billion gallons, or about 1.1 million acre-feet, of potable water per year nationwide.[25] Another study found that for California, increased indoor water efficiency would save an estimated 1.6 million acre-feet per year; this would be equivalent to nearly a year's worth of water for 2 million families in California.[26] Further, these strategies are widely known, and have proven highly

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[21] The term "urban" as used throughout this report refers to all water use that is not irrigated agriculture and encompasses all water used for domestic water consumption, as well as water for commercial, industrial and commercial use. The water use efficiency strategies discussed here are often coupled with non-technological approaches to improving end-use efficiency aimed at educating customers about their water use and ways to become more efficient. *See infra* Section II.2; E-mail from David Feldman, Professor of Urban Planning and Pub. Policy & Dir. of Water UCI, UCI Sch. of Social Ecology, to Melissa Kelly, Staff Director and Attorney, UCI Law CLEANR (Dec. 11, 2020, 14:04 PST) (on file with author).

[22] *See, e.g. WaterSense Products* in *WaterSense*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/watersense/watersense-products (last visited Sept. 4, 2019).

[23] *See* U.S. ENV'T PROT. AGENCY, WATERSENSE SIMPLE WATER ASSESSMENT CHECKLIST FOR COMMERCIAL AND INSTITUTIONAL FACILITIES 1 (2016), https://www.epa.gov/sites/production/files/2017-01/documents/ws-commercial-water-assessment-checklist.pdf.

[24] U.S. ENV'T PROT. AGENCY, WATERSENSE ACCOMPLISHMENTS 2019 2 (2020), https://www.epa.gov/sites/production/files/2020-07/documents/ws-aboutus-2019_watersense_accomplishments.pdf.

[25] ALL. FOR WATER EFFICIENCY, A SATURATION STUDY OF NON-EFFICIENT WATER CLOSETS IN KEY STATES ii (2017), https://www.map-testing.com/assets/reports/AWE-PMI-Saturation-Study-Report-FINAL_Apr-2017.pdf.

[26] PAC. INST. & NAT. RES. DEF. COUNCIL, URBAN WATER CONSERVATION AND EFFICIENCY POTENTIAL IN CALIFORNIA 5 (2014) [hereinafter CONSERVATION & EFFICIENCY], https://www.nrdc.org/sites/default/files/ca-water-supply-solutions-urban-IB.pdf; *Urban Water Conservation and Efficiency – Enormous Potential, Close to Home*, PAC. INST., https://pacinst.org/nrdc-switchboard-urban-water-conservation-and-efficiency-enormous-potential-

effective at meeting water supply needs for residential, commercial, institutional, and industrial uses.[27] Tucson Water in Arizona, for example, has prioritized efficiency by deploying high-efficiency toilets and clothes washers, among other strategies.[28] Over a ten-year period, Tucson Water saved a total of 2.6 billion gallons (8,014 acre-feet); this is roughly equivalent to a year of water supply for 32,000 families in Tucson.[29]

Turf replacement and water-wise landscape involve changing out water-intensive grass or turf for water-efficient landscape appropriate to the climate using native plants.[30] This well-known strategy can be applied in residential, commercial, industrial, and institutional settings. Water-wise landscaping represents a major source of new water supply; a 2014 study found that in California alone landscape conversion could save an estimated 2.9 million acre-feet per year.[31] Several studies on specific turf change-out programs bear out this potential. Single family homeowners in San Diego, California, participating in a turf replacement program achieved water savings of just under 40%.[32] As of 2020, Southern Nevada Water Authority estimates that their Water Smart Landscapes water-wise landscape program has saved nearly 430,000 acre-feet of water since 1999; 100,000 acre-feet more than the amount of Colorado River water that the State of Nevada has the right to use consumptively each year.[33] Moulton Niguel Water District implements a robust turf replacement program that has saved 500 million gallons (1,535 acre-feet) of water since 2012, or approximately 6% of the District's total annual retail potable water demand in 2010.[34]

Smart irrigation controllers wirelessly and remotely operate outdoor irrigation systems based on customizable zones tailored to specific vegetation types, sun exposure, and hyperlocal weather

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close-to-home (last visited Sept. 4, 2019) (info graphic listing 1 million acre feet as generally enough to supply water to 2 million families for 1 year).

27 *See, e.g.*, ALL. FOR WATER EFFICIENCY, TRANSFORMING WATER: WATER EFFICIENCY AS INFRASTRUCTURE INVESTMENT 8 (2017); JOHN KOELLER, HIGH-EFFICIENCY PLUMBING FIXTURE DIRECT INSTALL WATER SAVINGS ANALYSIS FOR SONOMA COUNTY WATER AGENCY 11 (2011), https://www.map-testing.com/assets/reports/sonoma-final-report-rev1-2011-11-23(1).pdf; AM. RIVERS INC., HIDDEN RESERVOIR: WHY WATER EFFICIENCY IS THE BEST SOLUTION FOR THE SOUTHEAST 26–29 (2008), http://americanrivers.org/wp-content/uploads/2016/05/hidden-reservoir-report.pdf; PAC. INST. & NATURAL RES. DEFENSE COUNCIL, THE UNTAPPED POTENTIAL OF CALIFORNIA'S WATER SUPPLY: EFFICIENCY, REUSE, AND STORMWATER 6 (2014), https://pacinst.org/wp-content/uploads/2014/06/ca-water-capstone-1.pdf; CONSERVATION & EFFICIENCY, *supra* note 27, at 8.

28 *Residential Rebates* in *Tucson Water*, CITY OF TUCSON, https://www.tucsonaz.gov/water/residential-rebates (last visited Sept. 4, 2019).

29 According to the Tucson Water website, the average Tucson family uses 0.25 acre-feet of water per year. *See* CITY OF TUCSON, TUCSON WATER CONSERVATION PROGRAM FY 2018-2019 ANNUAL REPORT 5 (2020), https://www.tucsonaz.gov/files/water/docs/FY18-19-Conservation-Report-Final.pdf; *A Guide to Water Terms*, CITY OF TUCSON, https://www.tucsonaz.gov/water/water-terms#:~:text=It%20is%20defined%20as%20the,foot%20of%20water%20per%20year (last visited Sept. 4, 2019).

30 *See, e.g. Landscape Design and Plant Selection* in *Xeriscaping,* CAL. DEP'T RES. RECYCLING & RECOVERY, https://www.calrecycle.ca.gov/organics/xeriscaping (last visited Aug. 30, 2019).

31 ALL. FOR WATER EFFICIENCY, LANDSCAPE TRANSFORMATION STUDY: 2018 ANALYTICS REPORT 63–79 (2019).

32 *Id.* at 71.

33 S. NEV. WATER AUTH., JOINT WATER CONSERVATION PLAN 9 (2019), https://www.snwa.com/assets/pdf/reports-conservation-plan-2019.pdf.

34 MOULTON NIGUEL WATER DISTRICT, 2010 URBAN WATER MANAGEMENT PLAN 4-3 (2011), https://www.mnwd.com/app/uploads/2013/01/Urban-Water-Management-Plan-2011.pdf; *Moulton Niguel Water District* in *Case Studies*, WATERNOW ALL., https://tapin.waternow.org/resources/moulton-niguel-water-district (last visited Sept. 4, 2019).

monitoring to prevent over watering, among other features.[35] These systems can also enable local utilities to remotely regulate outdoor water use.[36] While results vary depending on the type of controller installed, historical outdoor water use, and other factors, early studies are promising with data showing average water savings up to 43%, and even 72% with soil moisture sensor-based controllers.[37] As of 2019, Spanish Fork, a community of about 40,000 in Utah, had installed 1,000 smart controllers through a grant program for residential customers. In the program's first year, average savings were 4,500 gallons and peak daily demand was reduced by 0.5%.[38] A BYU study found that even with these initial savings and peak demand reduction, for every 6 households with a controller, 1 new household can be added without needing to add capacity to the system.[39] Given these results, Spanish Fork has continued to grow the program.

Customer-side leak detection devices use developing technology to assist homeowners with identifying leaks in their plumbing systems. By providing detailed water use data in close to real-time, these devices can help change consumer behavior in ways that advance conservation.[40] These devices generally fall into two categories: whole home devices or distributed moisture sensors (which are placed strategically around a home and send an alert when moisture is detected).[41] Customer-side leak detection devices are typically installed in single-family homes but also have application in multi-family, commercial, industrial, and institutional settings. Several cities and water utilities are currently running pilot studies to evaluate the water savings potential from customer-side leak detection devices, including the Southern Nevada Water Authority. It is anticipated that these studies will provide cities and utilities with a more definitive understanding of the water saving potential of these innovative leak detection devices.[42]

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35 *See e.g.*, ALL. FOR WATER EFFICIENCY, PEAK DAY WATER DEMAND MANAGEMENT STUDY 6 (2017).

36 *Id.* at 27–28.

37 *See* M.D. Dukes, *Water Conservation Potential of Landscape Irrigation Smart Controllers,* 55 TRANSACTIONS AM. SOC'Y AGRIC. & BIOLOGICAL ENGINEERS 563, 565-66 (2012).

38 *See, Water Conservation Project,* SPANISH FORK, https://www.spanishfork.org/departments/public_works/pressirrig/conservation/index.php (last visited Aug. 20, 2019); *see also* Caroline Koch, *Spanish Fork: Adding Capacity for Peak Demand with Smart Irrigation*, WATERNOW ALL. (July 26, 2019), https://waternow.org/2019/07/26/spanish-fork-how-smart-irrigation-revolutionized-water-use.

39 JOSEPHINE PAXTON ET AL., SPANISH FORK IRRIGATION-WATER CONSERVATION STUDY 5 (2019), https://www.spanishfork.org/document_center/Public%20Works/Utilities/Water_Conservation_BYU_Study_042019.pdf.

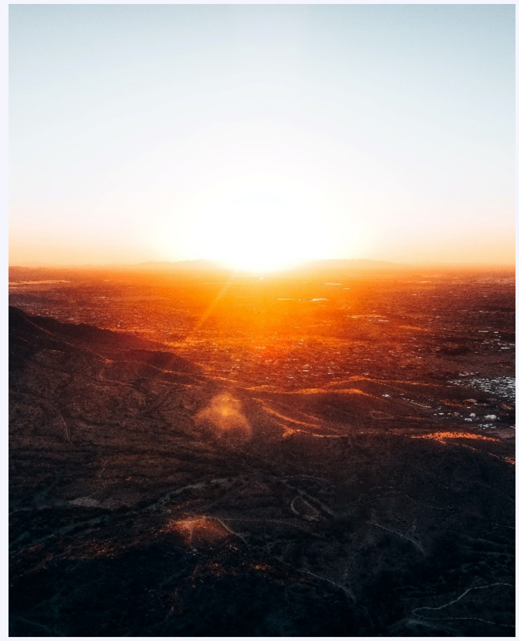
40 *See* Daniel Wroclawski, *Smart-Home Devices That Stop Leaks and Water Damage*, CONSUMER REPORTS (Jan. 18, 2018), https://www.consumerreports.org/home-maintenance-repairs/smart-home-devices-that-stop-leaks-and-water-damage/. *see also* David L. Mitchell & Thomas W. Chesnutt, *Evaluation of East Bay Municipal Utility District's Pilot of WaterSmart Home Water Reports,* https://www.financingsustainablewater.org/sites/www.financingsustainablewater.org/files/resource_pdfs/MCubed-Watersmart_evaluation_report_FINAL_12-12-13(00238356).pdf (2013).

41 *Id.*

42 *See Leak Detection Pilot Program*, WATERNOW ALL., https://waternow.org/our-work/our-work-projects/leak-detection-pilot-program/ (last visited Sept. 4, 2019); *see also Smart Leak Detector Rebate Coupon*, S. NEV. WATER AUTH., https://www.snwa.com/rebates/smart-device/index.html (last visited Sept. 4, 2019).

CASE STUDY

Water Use Efficiency: City of Flagstaff, Arizona



Challenges: Drought, limited local supply, and population growth

Localized Water Strategy: Water Use Efficiency

Water Use Efficiency Program: Like many cities in the American Southwest, Flagstaff treats conservation as a source of water supply. The City's comprehensive conservation programs include: free water consultations for homes and businesses; low water landscape rebate program; residential and commercial rebates for high-efficiency appliances and fixtures including toilets, aerators, and showerheads; Water Wise Business certificate program; Rainwater Container Program; Outdoor Watering Rules; Educational Programs and Water Awareness Month; and tiered residential rate structure.

Results: Since 1989, Flagstaff's water conservation program has helped customers reduce their water use by 52% even though population almost doubled in that time period.[43] This amounts to a savings of an estimated 95,800 acre-feet of water in 25 years.

2. Reuse and Other Alternative Non-Potable Water Sources

In addition to increasing efficiency in the use of water, LWI can be aimed at water reuse and tapping into other alternative non-potable sources. Such LWI strategies include:

- Advanced onsite reuse systems
- Greywater systems
- Rainwater harvesting

Advanced onsite reuse systems capture rainwater runoff, building foundation water, or even air condensation for repurposing.[44] These systems also treat some or all grey and "black" wastewater[45] generated onsite for non-potable uses at the building or neighborhood level, such as for toilet flushing

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43 CITY OF FLAGSTAFF WATER SERVICES DIV., 2020 REPORT TO THE WATER COMM'N 46 (2020), https://www.flagstaff.az.gov/DocumentCenter/View/63785/FINAL-REPORT-TO-WATER-COMMISSION.

44 *See, e.g.*, NAT'L BLUE RIBBON COMM'N FOR ONSITE NON-POTABLE WATER SYS., MAKING THE UTILITY CASE FOR ONSITE NON-POTABLE WATER SYSTEMS 7 (2018), http://uswateralliance.org/sites/uswateralliance.org/files/publications/NBRC_Utility%20Case%20for%20ONWS_032818.pdf.pdf.

45 "Black water" or "domestic wastewater" is wastewater originating from toilets, urinals, and/or kitchen counters (i.e., kitchen sinks and dishwashers). *Id.; See also* Zita L.T. Yu, et al., *Critical Review: Regulatory Incentives and Impediments for Onsite Greywater Reuse in the United States*, 85 WATER ENVT. RES. 650 (2013); *Glossary*, WATEREUSE, https://watereuse.org/educate/water-reuse-101/glossary/ (last visited Aug. 30, 2019).

and irrigation. In California, alone, there is potential to reuse an estimated 1.2 million to 1.8 million acre-feet of water per year based on average indoor water use.[46] Of the LWI identified, these systems are the most technologically complex and are best adapted for large buildings, new developments, or campuses.[47] In September 2012, San Francisco became the first municipality in California to require certain buildings and industrial customers to collect, treat, and use non-potable water to meet demands such as toilet flushing, irrigation, and industrial processes. The City's Non-potable Water Program established a permitting process for reuse of stormwater, rainwater, greywater, blackwater, and foundation drainage in commercial, mixed-use, and residential buildings and for industrial applications facilitating the ability to reduce water usage in a building by 25% to 75%.[48]

Greywater systems reuse "grey" or soapy water from sinks, tubs, showers, and washing machines primarily for outdoor residential irrigation and can be used by businesses, institutions, or residences. Reusing household greywater represents a significant alternative source of supply. It is estimated that 40% of wastewater generated from households can be reused as greywater for non-potable purposes.[49] The City of Santa Rosa, for example, began permitting greywater systems in 2010. The City offers rebates to incentivize on-site capture and reuse systems of $75 for single-fixture systems or a sustained rebate of $200 for every 1,000 gallons saved per month for more complex systems.[50] As of 2020, the City had issued 57 laundry to landscape rebates.[51] In 2020, Santa Rosa's greywater rebate program was estimated to save 7.6 acre-feet per year, up from an estimated savings of 0.03 acre-feet per year when the program began in 2010.[52]

Rainwater harvesting involves capturing and storing rainwater for reuse. Rain barrels and rain gardens[53] can be used for this purpose. Studies analyzing rainwater harvesting potential in various U.S. cities found that capturing the volume falling on rooftops could meet the annual water needs of 21% to 75% of each city's population.[54] Rainwater harvesting systems can be used by businesses,

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46 PAC. INST. & NATURAL RES. DEFENSE COUNCIL, WATER REUSE POTENTIAL IN CALIFORNIA 3 (2014), https://pacinst.org/wp-content/uploads/2014/06/ca-water-reuse.pdf.

47 NAT'L BLUE RIBBON COMM'N FOR ONSITE NON-POTABLE WATER SYS., *supra* note 44, at 7–8.

48 *OneWaterSF,* S.F. PUB. UTIL. COMM'N, https://www.sfwater.org/index.aspx?page=1091 (last visited Sept. 4, 2019); *see also San Francisco Public Utilities Commission WaterNow Case Study*, WATERNOW ALL., https://tapin.waternow.org/resources/san-francisco-public-utilities-commission (last visited Sept. 4, 2019).

49 Leigh & Lee, *supra* note 7, at 9.

50 CITY OF SANTA ROSA WATER, GREYWATER REBATE PROGRAM (2020), *https://srcity.org/DocumentCenter/View/6854/Greywater-Rebate-Program-PDF?bidId=*; *see also Rebates & Free Services* in *WaterSmart Center*, CITY OF SANTA ROSA, https://srcity.org/834/Rebates-Free-Services (last visited Sept. 4, 2019) (showing all the different rebates available).

51 Telephone Interview with Teresa Gudiño, Water Resource Analyst, City of Santa Rosa (May 3, 2017); CITY OF SANTA ROSA, *2020 Urban Water Management Plan,* CITY OF SANTA ROSA 9–11, Table 5-4 (2021), https://srcity.org/DocumentCenter/View/32782/UWMP---Complete-document-Final-PDF.

52 CITY OF SANTA ROSA, *supra* note 51, at Table 5-4 (2021).

53 Rain gardens are landscaping depressions designed to capture and store rainwater planted with deep rooted native plants, and passively harvest and reuse rainwater by using rain to irrigate the plantings eliminating the need for additional irrigation with potable water or other sources. As detailed below, rain gardens are also a type of green stormwater infrastructure. *See* Allison Watkins, *Harvest Rainwater Passively with a Rain Garden*, GOSANANGELO (Sept. 22, 2018), https://www.gosanangelo.com/story/news/local/2018/09/22/harvest-rainwater-passively-rain-garden/1396086002.

54 NAT. RES. DEF. COUNCIL, CAPTURING RAINWATER FROM ROOFTOPS 4 (2011), https://www.nrdc.org/sites/default/files/rooftoprainwatercapture.pdf (analyzing rainfall capture capacity in Atlanta, Georgia; Austin, Texas; Chicago, Illinois; Denver, Colorado; Fort Meyers, Florida; Kansas City, Missouri; Madison, Wisconsin; and Washington, D.C.).

institutions, or residences, and can be integrated with advanced onsite reuse or greywater systems. Since 2012, Tucson Water in Arizona has offered rebates of up to $2,000 for qualifying households for rainwater harvesting systems, and in 2017, Tucson Water began an income-based rainwater harvesting grant and loan program.[55] As of 2019, over 100 rainwater harvesting systems had been installed under this income-based program.[56]

By accessing these alternative sources, communities can more appropriately match the resource with the particular need and reduce their reliance on potable drinking water supplies overall through a fit-for-purpose approach. Such LWI can help communities stabilize water supplies and build resiliency.

3. Green Infrastructure

Rain and snow are the life blood of the planet's water supply systems, but rainfall also collects harmful contaminants as it runs over impervious surfaces in urban areas, ultimately reaching the nation's rivers, lakes, streams, estuaries and other waterways. Federal and state laws recognize that stormwater pollution degrades water quality and the surrounding ecosystems, and contributes to urban flooding, particularly in combination with stressed sewer systems.[57] As many cities and utilities are coming to recognize, green, onsite, localized strategies can serve vital stormwater management infrastructure functions by capturing runoff, storing it for potential reuse and/or groundwater recharge, and reducing flooding. These nature-based solutions can also foster watershed and drinking water protection.

i. Stormwater and Flood Management

Localized water strategies aimed at stormwater and flood management typically employ natural elements that restore or mimic the natural water cycle and are referred to as green infrastructure (GI). Common GI strategies include:

- Green roofs
- Urban forests / trees
- Rain gardens
- Bioswales
- Permeable pavement
- Stream and wetland restoration
- Coastal restoration
- Low impact development

These **GI strategies** can supplement or replace conventional, grey infrastructure to address urban stormwater challenges, including flooding, municipal separate storm sewer discharges, and combined sewer overflows. For example, Philadelphia Water Department is investing in GI on public and private property to address combined sewer overflows and come into compliance with the CWA. The City of Eugene Public Works Stormwater Department has also funded local commercial property owners' installation of stormwater retention ponds and a local university's upgrades to the brick planters at their historic building to host native species and manage roof runoff from nearly 2,000 square-feet of

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55 *Residential Rebates* in *Tucson* Water, *supra* note 29; CITY OF TUCSON, WATER CONSERVATION PROGRAM FY 2017-18 ANNUAL REPORT 43 (2018), https://www.tucsonaz.gov/files/water/docs/FY17-18_TW_Conservation_Report_FINAL.pdf.

56 CITY OF TUCSON, *supra* note 54, at 6.

57 *See* Melissa Denchak, *Green Infrastructure: How to Manage Water in a Sustainable Way*, NAT. RES. DEF. COUNCIL (Mar. 4, 2019), https://www.nrdc.org/stories/green-infrastructure-how-manage-water-sustainable-way.

impervious surface onsite. These types of projects are key elements of Eugene's urban stormwater management plan required to be implemented under the city's municipal separate storm sewer system (MS4) permit.

ii. Source Watershed Protection

For hundreds of years, people have recognized that, as the Nature Conservancy has put it, "healthy source watersheds are vital natural infrastructure for nearly all cities around the world."[58] Strategies for ensuring access to the highest water quality possible do not need to be limited to investments in centralized water treatment facilities. Increasingly, protection and restoration of source water lands is being seen as a form of water infrastructure investment. Strategies for protecting and restoring source watersheds include but are not limited to:

- Conservation easements
- Revegetation
- Riparian buffers
- Wetlands restoration and creation

These nature-based strategies can be considered LWI because they are dispersed over many properties and are often located on property not owned or controlled by water utilities or municipalities.

Conservation easements are legal vehicles that enable both public and private landowners to voluntarily accept permanent restrictions on land use in a source watershed to protect habitat and/or source water quality, while retaining ownership of the property. Active ecosystem restoration strategies, such as **revegetation, riparian buffers, and wetlands** rebuild nature's ability to "treat" polluted water before it even reaches a conventional water treatment plant.

These strategies can be combined to make up a comprehensive sustainable water management program to address a community's drinking water, wastewater treatment, and stormwater management needs.

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[58] A source watershed is the area defined by topography, soil, and drainage characteristics within which drinking water sources are contained, or in other words, "natural and working lands around our water sources." ROBIN ABELL ET AL., THE NATURE CONSERVANCY, BEYOND THE SOURCE: THE ENVIRONMENTAL, ECONOMIC, AND COMMUNITY BENEFITS OF SOURCE WATER PROTECTION ES 1 (2017), https://www.nature.org/content/dam/tnc/nature/en/documents/Beyond_The_Source_Full_Report_FinalV4.pdf.

CASE STUDY

Source Watershed Protection: Central Arkansas Water, Arkansas

Challenges: Development pressure, nutrient runoff, and aging reservoir

Localized Water Strategy: Watershed conservation easements

Source Watershed Protection Program: As of 2017, 52% of the land in the Lake Maumelle watershed was privately owned, and 91% was still forested.[59] To protect this watershed from the impacts of development and preserve drinking water quality of Lake Maumelle, the major source of supply for 450,000 people in Central Arkansas, in 2007, Central Arkansas Water[60] made land conservation a key component of its multi-pronged approach to water quality management and established a goal of protecting 1,500 acres of watershed land by 2017. The utility accomplished this by paying private land owners for conservation easements that protect source water and buying land outright. The utility has bond financed these land and easement purchases with municipal bond proceeds secured by a watershed protection fee. The fee ranges from $0.45 to $36 per month depending on meter size, generating approximately $1 million annually. Bond financing has enabled the utility to invest upfront in this natural green water quality infrastructure, while amortizing the costs over time. This both minimizes the burden on ratepayers while also advancing 'generational equity,' that is, sharing the costs of the investment with newcomers to the community who are also benefitting from the investment.

Results: A 2015 analysis by Earth Economics estimated that land purchases and conservation easements would result in upwards of $90 million per year in water quality, conveyance, and supply benefits to the utility as well as more than $360 million annually in co-benefits including improved air quality, recreation, and wildlife habitat.[61] As of 2017, Central Arkansas Water had purchased 2,654 acres of property with an additional 295 acres under conservation easements, almost double its initial conservation goal.[62] In December 2020, the utility set a goal to acquire an additional 4,500 acres in the watershed, which will result in 45% of the Lake Maumelle watershed being conserved forestland and will be financed with a green bond.[63]

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59 AmericanRivers, *Source Water Protection – What It Is and How to Fund It*, YOUTUBE (Sept. 27, 2017), https://www.youtube.com/watch?reload=9&v=t65jF1btUEE.

60 Central Arkansas Water, a public utility created by Arkansas state law, is the largest drinking water utility in the state providing drinking water to ~500,000 Arkansans in eight counties including the communities of Little Rock, North Little Rock, Alexander, Cammack Village, College Station, Sherwood, Wrightsville, and Un-incorporated Pulaski County. *About Us*, CENT. ARK. WATER, https://carkw.com/about/ (last visited Sept. 4, 2019); *see also* ARK. CODE ANN. § 25-20-301 (2010).

61 EARTH ECON., THE ECONOMIC VALUE OF THE LAKE WINONA AND MAUMELLE WATERSHEDS 3 (2016), https://drive.google.com/file/d/0ByzlUWI76gWVZ3NIMXZGWGNVV0U/view.

62 *Id.*

63 *Central Arkansas Water is First in World with Certified Green Bond To Protect Drinking Watershed For Water Quality*, CENT. ARK. WATER (Mar. 15, 2021), https://carkw.com/news/announcements/central-arkansas-water-is-first-in-world-with-certified-green-bond-to-protect-drinking-watershed-for-water-quality.

4. Privately-Owned Lateral Line Replacements

Because, as explained above, LWI is a broad conceptual term, we characterize private property lateral line replacement as a type of localized infrastructure because they extend beyond the centralized infrastructure and are located at the point of use, and financing and implementing these measures raises the same issues as with the other distributed strategies described above. The most critical lateral line issue is the need to replace lead service lines, which represent a major public health threat particularly in under-resourced areas and communities of color nationwide. Private sewer lateral service line replacement raises similar issues as well.

Lead service line replacement involves removal and replacement of lead pipes that extend from the main drinking water utility pipeline to the customer's property.[64] Lead service lines can exist in any number of settings, including single and multi-family homes, businesses, schools, and commercial buildings, and are often found in older buildings as lead pipes were once commonly used in water systems.[65] It is estimated that 6.1 million lead service lines are still in operation across the country.[66] Recognizing that lead service line replacement protects public health and is cost-effective, states across the country, including Michigan and Illinois, are beginning to mandate that these lines be replaced over varying periods of time, and states including New Jersey, Pennsylvania, Wisconsin, Missouri, and Indiana have adopted new laws that allow utilities to use ratepayer dollars to pay for the replacements.[67] In 2011, the City of Madison, Wisconsin, completed the nation's first city-wide lead service line replacement program replacing 8,000 lead service lines, 5,600 of which were on private property.[68] By replacing these service lines rather than using ongoing chemical treatment, as of 2018, Madison had saved $2.5 million.[69] Denver Water launched its lead service line replacement program in 2019, and plans to replace 64,000-84,000 lead service lines by 2035.[70] In 2020, the utility replaced 4,500 replaced lead service lines prioritizing the most vulnerable and at-risk neighborhoods.

Private sewer laterals are the portion of sewer line that connects a customer's property to the main sewer pipe. As with drinking water service lines, this lateral portion of the sewer line is owned by the customer. All property types connected to a centralized sewer system have private sewer laterals. EPA estimates that there are 500,000 miles of private sewer laterals in the U.S.—enough to wrap around the Earth ~20 times.[71] The condition of these privately-owned pipes can have a significant

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64 *Lead Water Service Lines* in *Environment and Natural Resources*, NAT'L CONFERENCE OF STATE LEGISLATURES, http://www.ncsl.org/research/environment-and-natural-resources/lead-water-service-lines.aspx (last visited Sept. 4, 2019).

65 *Id.*

66 David Cornwall, et al., *National Survey of Lead Service Line Occurrence*, 108 J. AM. WATER WORKS ASS'N E187 (2016).

67 *State efforts to support LSL replacement* in *Lead Service Lines*, ENV'T DEF. FUND, https://www.edf.org/health/state-efforts-support-lsl-replacement (last visited Sept. 4, 2019).

68 *Information for Utilities on Lead Service Replacement* in *Madison Water Utility*, CITY OF MADISON, https://www.cityofmadison.com/water/water-quality/lead-service-replacement-program/information-for-utilities-on-lead-service (last visited Sept. 4, 2019); *see also* WATERNOW ALL., MADISON WATER UTILITY WATERNOW CASE STUDY 1 (2019), https://tapin.waternow.org/wp-content/uploads/sites/2/2019/02/WaterNow_Madison_CaseStudy_FINAL.pdf.

69 WATERNOW ALL., *supra* note 67, at 1.

70 *Lead Service Line Replacement, Lead Reduction Program*, DENVER WATER, https://www.denverwater.org/your-water/water-quality/lead/lead-service-line-replacement-program (last visited Aug. 10, 2021).

71 RAY STERLING, ET AL., U.S. ENV'T PROT. AGENCY, STATE OF TECHNOLOGY FOR REHABILITATION OF WASTEWATER COLLECTION SYSTEMS 4 (2010), https://nepis.epa.gov/Adobe/PDF/P1008C45.pdf; U.S. ENV'T PROT. AGENCY, PRIVATE SEWER LATERALS 1 (2014), https://www3.epa.gov/region1/sso/pdfs/PrivateSewerLaterals.pdf.

impact on the performance of the overall sewer system. As part of its Clean Water Act (CWA) Consent Decree, for example, East Bay Municipal Utility District is implementing a private sewer lateral replacement program to replace aging pipes that allow infiltration and inflow from rainwater causing sanitary sewer overflows.[72]

LWI offer a diverse array of water management strategies that can meet drinking water, wastewater, and stormwater needs. Many of these strategies are well known to the water sector, e.g., water efficient appliances, turf replacement, and green roofs, while others represent emerging technologies, e.g., customer-side leak detection devices. In either instance, cities and utilities that have deployed LWI even on modest scales have realized the water management benefits they provide making the case for accelerating and expanding LWI investments in communities nationwide on par with conventional systems. The next section further bolsters the argument for increased in LWI investment given the multiple benefits LWI provide, many of which conventional systems do not offer.

B. BENEFITS OF LOCALIZED WATER INFRASTRUCTURE

LWI serves many of the same functions as conventional, centralized infrastructure—providing water supply, treating contaminants, and managing stormwater. In addition, these localized strategies have the advantage of being more environmentally sustainable and climate resilient due to their more efficient use of resources (and the resulting water and cost savings) and greater flexibility to respond to environmental change given that they are dispersed throughout a community.[73] Indeed, the National Drinking Water Advisory Council has identified use of distributed infrastructure as a key element of water resource management by climate-ready utilities given its flexibility and cost-effectiveness.[74]

1. Localized Infrastructure Generates "New" Local Water Supply

LWI such as water use efficiency, rainwater capture, and reuse can substantially reduce demand, essentially creating new sources of local water supply. They also address system inefficiencies that do not match the level of service with the end use, e.g., current systems that use potable water for non-potable uses.[75] Augmenting local water supply through LWI results in multiple benefits including:

- Deferred or delayed development of new sources
- Groundwater recharge
- Reduced need for storage
- Reduced need for conveyance systems
- Climate change resilience
- Increased drought preparedness

As described above in Section II.A.1, taking an "efficiency first" approach to water supply as many communities throughout the Western U.S. have done, can result in significant offsets to water supply needs as well as cost savings.

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72 *Protecting Our San Francisco Bay*, E. BAY REG'L PRIVATE SEWER LATERAL PROGRAM, http://www.eastbaypsl.com/eastbaypsl/ (last visited Sept. 4, 2019).

73 *See* Leigh & Lee, *supra* note 7, at 8–9; THE JOHNSON FOUNDATION AT WINGSPREAD, *supra* note 11, at 5.

74 *See* NAT'L DRINKING WATER ADVISORY COUNCIL, CLIMATE READY WATER UTILITIES: FINAL REPORT 17 (2010), https://www.epa.gov/sites/production/files/2015-10/documents/6crwu-ndwac-final-report-12-09-10-2.pdf.

75 *See* Leigh & Lee, *supra* note 7, at 8–9.

Relatedly, utilities nationwide are increasingly adopting a One Water approach—the concept of managing drinking water, wastewater, and stormwater in a fully integrated way—and viewing wastewater and stormwater runoff as valuable resources. The Los Angeles Sanitation District's "One Water Plan" identifies stormwater capture and groundwater recharge as essential local supplies that build reliability and resilience into the city's water system.[76] Austin Water's 100-year integrated water plan, aptly named "Water Forward," projects that community-scale, onsite reuse will ultimately provide one third of the city's new water supply.[77] Austin will not only diversify its water supplies, but is looking to local sources matched to the specific, identified need as an important component of its water planning.[78]

2. Localized Infrastructure Supports Compliance with Regulatory Requirements

Drinking water and wastewater providers must meet numerous federal, state, and local regulatory requirements. LWI, particularly those strategies aimed at stormwater management and watershed protection as described in Section II.A.3 above, can support regulatory compliance with the major federal and related state clean water requirements by reducing pollution and improving water quality.

i. The Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) was adopted in 1974 to ensure the safety of the nation's public drinking water supplies.[79] Similar to other federal environmental laws adopted in the 1970s, the SDWA sets up a cooperative federalism regulatory approach. The EPA is responsible for establishing performance standards that, among other mandates, place limits on contaminants, while the states are tasked with administration, implementation, and enforcement.

Municipalities are finding that localized, onsite strategies are effective in supporting their efforts to comply with SDWA requirements.[80] Indeed, as highlighted in Madison, Wisconsin, distributed water infrastructure is well suited to enable utilities to meet these regulatory requirements faster and more effectively than conventional, centralized infrastructure. By replacing lead service lines on private property in the community rather than adding chemicals to its drinking water, Madison Water was able to comply with the Lead and Copper Rule over an eleven-year period completing its project in 2011.[81] Had they taken the more conventional approach, Madison Water would still be using chemical treatment. Employing LWI saved Madison Water $2.5 million dollars as of 2018; savings that will continue to accrue.[82]

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76 *See e.g.*, CITY OF L.A. SANITATION DIST., ONE WATER LA 2040 PLAN ES-9 (2018), https://www.lacitysan.org/cs/groups/sg_owla/documents/document/y250/mdmx/~edisp/cnt031540.pdf.

77 *WaterForward* in *Austin Water*, CITY OF AUSTIN, TEX., http://austintexas.gov/waterforward (last visited Aug. 31, 2019).

78 *Id.*

79 *See* 42 U.S.C. § 300f(1) (1974); OFFICE OF WATER, U.S. ENV'T PROT. AGENCY, UNDERSTANDING THE SAFE DRINKING WATER ACT 1 (2004), https://www.epa.gov/sites/production/files/2015-04/documents/epa816f04030.pdf.

80 Safe Drinking Water Act Amendments of 1986, Pub. L. No. 99-339, 100 Stat. 642 (1986); *see also* William E. Cox, *Evolution of the Safe Drinking Water Act: A Search for Effective Quality Assurance Strategies and Workable Concepts of Federalism*, 21 Wm. & Mary Env't L. & Pol'y Rev. 69, 70, 79–80 (1997).

81 *See generally* CITY OF MADISON, *supra* note 68.

82 *Case Study*: *Madison Water Utility: Leading the national charge on lead line replacement* 2-3 (2019), WATERNOW ALL., https://tapin.waternow.org/wp-content/uploads/sites/2/2019/02/WaterNow_Madison_CaseStudy_FINAL.pdf.

ii. The Clean Water Act

As amended in 1972, the purpose of the CWA is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters."[83] The CWA regulates the discharge of pollutants from point sources into waters of the U.S. through the National Pollutant Discharge Elimination System (NPDES) permit program.[84] The CWA regulates MS4s, combined sewer systems, industrial stormwater discharges, and wastewater treatment plants, among other things.

As with the SDWA, the CWA establishes a complex statutory and regulatory scheme. Notably, EPA "strongly encourages the use of green infrastructure approaches to manage wet weather" and is increasingly including green stormwater infrastructure and other GI solutions in their consent decrees.[85] In addition, EPA has developed the "Green Long-Term Control Plan-EZ Template" as a planning tool for small communities that are required to comply with the Combined Sewer Overflow Policy (CSO Policy) designed to eliminate combined sewer overflows using both green and grey infrastructure. Large cities such as Philadelphia and Washington, D.C. also rely on GI to meet the requirements of the CSO Policy.[86] In addition, according to EPA, "[a]n increasing number of cities and states are integrating green infrastructure provisions into their MS4 permits."[87] Philadelphia, Washington D.C., and Eugene provide examples, below, of how investing in LWI can help cities comply with CWA requirements, typically on a shorter timeline than would be possible with conventional infrastructure alone.

The Philadelphia Water Department has made a commitment to invest $1 billion over a 25-year period in GI strategies to reduce its combined sewer system overflows. The utility made this decision to invest in decentralized and green strategies because their detailed analysis indicated that these strategies would provide quicker, cost-effective improvements to water quality.[88] Similarly, in 2015, the District of Columbia Water and Sewer Authority (DC Water) amended its plan to address combined sewer overflows (CSOs) by shifting away from grey infrastructure toward GI.[89] This shift is expected to allow DC Water to achieve CSO reduction earlier than would have been achieved with grey

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[83] 33 U.S.C. § 1251(a) (2011).

[84] 33 U.S.C. § 1311(a), 1342.

[85] *See e.g.* U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-17-750, STORMWATER MANAGEMENT: EPA PILOT PROJECT TO INCREASE USE OF GREEN INFRASTRUCTURE COULD BENEFIT FROM DOCUMENTING COLLABORATIVE AGREEMENTS 3, 8-9, 10 (2017), https://www.gao.gov/assets/gao-17-750.pdf; *Examples of Settled Clean Water Act Enforcement Cases that Include Green Infrastructure*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/green-infrastructure/enforcement (last visited Apr. 7, 2021).

[86] *Green Long-Term Control Plan-EZ Template: A Planning Tool for Combined Sewer Overflow Control in Small Communities*, U.S. ENV'T PROT. AGENCY 4 (2012), https://www.epa.gov/sites/production/files/2015-10/documents/final_green_ltcpez_instructionswithpoecacomments_2.pdf.

[87] *Integrating Green Infrastructure into Federal Regulatory Programs*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/green-infrastructure/integrating-green-infrastructure-federal-regulatory-programs (last visited Aug. 8, 2021).

[88] SUSTAINABLE BUS. NETWORK OF GREATER PHILA., THE IMPACT OF GREEN CITY, CLEAN WATERS ON PHILADELPHIA: MEASURING THE TRIPLE BOTTOM LINE IMPACT OF GREEN STORMWATER INFRASTRUCTURE 15-31 (2019) [hereinafter GCCW TRIPLE BOTTOM LINE IMPACT], https://tapin.waternow.org/wp-content/uploads/sites/2/2019/06/PWD-Impact-Analysis.pdf; *see also* SUSTAINABLE BUS. NETWORK OF GREATER PHILA., THE ECONOMIC IMPACT OF GREEN CITY, CLEAN WATERS: THE FIRST FIVE YEARS 8-9 (2016) [hereinafter GCCW ECONOMIC IMPACT], https://gsipartners.sbnphiladelphia.org/wp-content/uploads/2014/07/Local-Economic-Impact-Report_First-Five-Years-GCCW_full-downloadable-web2.pdf.

[89] DIST. OF COLUMBIA WATER & SEWER AUTH., LONG TERM CONTROL PLAN MODIFICATION FOR GREEN INFRASTRUCTURE 2–4 (2015), dcwater.com/sites/default/files/green-infrastructure-ltcp-modificaitons.pdf.

infrastructure alone.[90] Eugene also uses GI to achieve CWA compliance. To reduce pollutant discharges from its MS4 system, Eugene amended its Stormwater Development Standards to "promote the use of natural and built systems for infiltration, evapotranspiration and reuse of rainwater that use or mimic natural hydrologic processes while capturing and treating approximately 80% of the average annual rainfall."[91]

Indeed, Congress amended the CWA in January 2019 to require EPA to "promote the use of green infrastructure in, and coordinate the integration of green infrastructure into, permitting and enforcement under this Act, planning efforts, research, technical assistance, and funding guidance of the Environmental Protection Agency."[92] With this legislative endorsement, the use of GI as best management practices for reducing pollutant discharges from MS4 systems is becoming mainstream

3. Localized Infrastructure Can Avoid or Reduce the Cost of Conventional Infrastructure

Municipalities and utilities can avoid or reduce the typically high costs of conventional infrastructure by elevating and expanding the use of LWI. And LWI can enhance a utility system by reducing the need for or scale of expansion.[93]

For example, San Antonio Water Systems' (SAWS) water use efficiency measures, implemented through a combination of customer rebates and other programs, saved the utility billions of dollars that would have been needed to develop additional water supplies to provide drinking water for San Antonio's rapidly growing population.[94] In fact, SAWS' conservation programs are so successful that they decommissioned one of their drinking water treatment plants, saving the associated costs of operating that plant.[95]

In Spanish Fork, Utah, the City's modest, approximately $300,000 investments in smart irrigation controllers provided to homeowners through a grant program have delayed the City's need to purchase costly new water rights because of the reduction in peak demand as well as overall water use.[96]

Water use efficiency investments in Westminster, Colorado, and Tucson, Arizona, have avoided millions of dollars in costs. For Westminster, an Alliance for Water Efficiency study estimated that the City's 21% reduction in water resulted in an average of $1,238,000 per year avoided in additional

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90 *Id.* at ES-6.

91 EUGENE, ORE., ORDINANCE 20521 § 9.6792 (2014).

92 Water Infrastructure Improvement Act, Pub. L. No. 115-436, § 5(b) (2019).

93 SHARLENE LEURIG AND JEREMY BROWN, BOND FINANCING DISTRIBUTED WATER SYSTEMS: HOW TO MAKE BETTER USE OF OUR MOST LIQUID MARKET FOR FINANCING WATER INFRASTRUCTURE 4 (2017), https://www.ceres.org/sites/default/files/reports/2017-05/Ceres_WaterBondFinancing_082814.pdf (referencing the "many improvements, practices, and devices that conserve water and retain stormwater onsite").

94 *See Conservation*, SAN ANTONIO WATER SYSTEMS, https://www.saws.org/conservation/ (last visited Aug. 8, 2021); *see also* WATERNOW ALL., *San Antonio Water System: Scaling drought resilience with community-wide conservation*, *WaterNow Case Study* 3-4 (2019), https://tapin.waternow.org/wp-content/uploads/sites/2/2019/02/WaterNow_SanAntonio_CaseStudy_013019.pdf, (last visited Aug. 10, 2021.)

95 Telephone Interview with Karen Guz, Dir. of Water Conservation & Darren Thompson, Dir. of Water Res., San Antonio Water Systems (Nov. 14, 2018).

96 *Spanish Fork Utah Case Study*, WATERNOW ALL., https://tapin.waternow.org/resources/adding-capacity-for-peak-demand-with-smart-irrigation/.

operating costs that would have been incurred had water demand risen.[97] A similar Alliance for Water Efficiency study found that as of 2017, Tucson's water use efficiency programs had led to a decline in per capita water use by 31%, which kept rates 11.7% lower than they would otherwise have been.[98] An update to that study in 2020 found that Tucson's efficiency measures had saved $155 million in avoided grey infrastructure costs and kept rates 15% lower.[99]

As to costs savings from GI investments, Lancaster, Pennsylvania's investment in GI to address its stormwater challenges avoided more than $120 million in grey infrastructure capital costs and provided nearly $5 million in annual benefits according to an EPA study.[100] Milwaukee Metropolitan Sewerage District (MMSD) estimated that GI will save $44 million in infrastructure costs in the combined sewer service area compared to constructing more Deep Tunnel storage.[101]

For lead service line replacements, as detailed above, as of 2018, Madison, Wisconsin's program had saved $2.5 million in avoided water treatment costs, savings which will continue to accrue because Madison will continue to avoid the need for additional treatment costs related to lead lines.

4. Localized Infrastructure Can Provide Significant Community Co-Benefits

Far more than conventional water infrastructure, decentralized water strategies provide multiple benefits for local communities and the environment.[102] These co-benefits fall into at least five categories, each with their own subset of advantages, summarized below. This overview is not intended to be exhaustive and additional co-benefits can manifest when applied in a particular setting.

i. Equity and Affordability

Investments in localized strategies can provide substantially greater social equity benefits than conventional built approaches. In a recent report on evaluating multiple benefits of water management options, Pacific Institute defines equity as "the just distribution of costs and benefits among stakeholders."[103] WaterNow Alliance defines water equity as:

> universal access to secure, affordable, safe, and healthy drinking water, and wastewater and stormwater management services. Equitable water infrastructure investment should support the long-term sustainability of our waterways, water systems, and utilities.[104]

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97 Stuart Feinglas, Christine Grey, Peter Mayer, *Conservation Limits Rate Increases for a Colorado Utility*, ALL. FOR WATER EFFICIENCY, https://www.allianceforwaterefficiency.org/sites/www.allianceforwaterefficiency.org/files/highlight_documents/AWE-Colorado-Article-FINAL-%28Ver7%29.pdf

98 Peter Mayer, *Water Conservation Keeps Rates Low in Tucson, Arizona,* ALL. FOR WATER EFFICIENCY, https://www.financingsustainablewater.org/sites/www.financingsustainablewater.org/files/resource_pdfs/Final_AWE_tucson_cosnrates-az-web3.pdf

99 Candice Rupprecht et al., *Tucson Examines the Rate Impacts of Increased Water Efficiency and Finds Customer Savings*, 112 J. AM. WATER WORKS ASS'N 32 (2020).

100 *The Economic Benefits of Green Infrastructure A Case Study of Lancaster,* U.S. ENV'T PROT. AGENCY 1 (2014), https://www.epa.gov/sites/production/files/2015-10/documents/cnt-lancaster-report-508_1.pdf.

101 Partners for a Cleaner Environment, *MMSD Regional Green Infrastructure Plan,* https://www.uni-groupusa.org/PDF/Milwaukee%20GI%20Final_Benefits_and_Costs.pdf

102 *See, e.g.*, SARAH DIRINGER ET AL., PAC. INST., MOVING TOWARD A MULTI-BENEFIT APPROACH FOR WATER MANAGEMENT VII-VIII, 17, 27–28, 34–35 (2019).

103 DIRINGER ET AL., *supra* note 102.

104 *About WaterNow Alliance*, WATERNOW ALL., https://waternow.org/about-us-2/.

Water use efficiency, distributed GI, onsite reuse, and the full range of LWI represent major opportunities to site needed improvements in neighborhoods and communities that disproportionately bear the impacts of combined sewer overflows, polluted urban runoff, contaminated drinking water, flooding, and drought. These communities are also often the most in need of the co-benefits that localized solutions provide, such as urban greening, permanent well-paying jobs, and reduced heat islands. Because localized strategies, by their nature, are distributed across the community, they provide significant opportunities to ensure the just distribution of costs and benefits among water utilities' stakeholders.[105]

Investments in water efficiency and sustainable wastewater and stormwater management programs are also often more affordable when compared to traditional solutions. For example, a reservoir can cost $4,000 per 1,000 gallons of capacity, while water efficiency costs between $0.46 to $250 per 1,000 gallons saved or new capacity—up to an 8,500% price difference.[106] In addition, LWI paid for, at least in part, by local utilities can make water, wastewater, and stormwater services more affordable. LWI can thus provide a formula for affordability where utilities use grant, direct installation, or rebate programs to install water use efficiency measures, onsite reuse systems, or distributed GI in single-family and multi-family households, which reduce these households' utility bills while also making water use more sustainable on a system-wide basis. Westminster, Colorado, is applying this formula. With equity and affordability as a key driver, in 2020, the City launched a pilot program to upgrade water fixtures in multi-family, affordable housing buildings, free of charge. Eighty-three toilets, 20 kitchen aerators, 84 bathroom aerators, and 8 showerheads across 72 residential units at an affordable-housing complex in Westminster were replaced in the first year. Evaluation of water savings show a 48% reduction of indoor water use that translates into ~$65,000 in savings from reduced water and sewer bills. While the reduced water usage is likely not solely the result of the efficiency upgrades, they certainly played an important role.[107]

Equity and affordability benefits of investments in LWI include:

- Addressing water management and quality problems in communities most heavily impacted
- Providing co-benefits of localized water strategies in communities of greatest need
- Keeping water rates low
- Helping customers further reduce their bills through rebates, loans, and grants for efficiency, conservation, or green infrastructure projects
- Workforce development and job training

Several examples illustrate the potential for LWI to advance equity and affordability:

- Seattle Public Utilities has provided 6,800 free toilets to low-income residents,[108] not only addressing a key local water saving goal, but bringing down costs and improving the quality of life for thousands of low-income residents

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[105] *The Tap Into Resilience Toolkit,* WATERNOW ALL., https://tapin.waternow.org/toolkit/?item=equity-challenges. (As of 2021, WaterNow is conducting additional research into the ways LWI can help provide more equitable outcomes to communities. The toolkit section cited here will be updated to reflect this ongoing research.)

[106] AM. RIVERS INC., *supra* note 27, at 14.

[107] *Affordable Housing Water Fixture Upgrades,* WATERNOW ALL., https://tapin.waternow.org/resources/affordable-housing-water-fixture-upgrades/ (last visited July 30, 2021).

[108] *Seattle Public Utilities,* WATERNOW ALL., https://tapin.waternow.org/resources/seattle-public-utilities/ (last visited July 30, 2021).

- Aurora, Colorado's Low-Income Water Efficiency Program helps low-income households become more water efficient by replacing old fixtures with new, high efficiency models.[109] The program is implemented in partnership with the Mile High Youth Corps, which has installed hundreds of toilets, showerheads, and faucet aerators while also training 1,600 youth between the ages of 16 and 24 to conduct the change-outs.[110]
- Philadelphia's GI program prioritizes projects in vulnerable neighborhoods where the co-benefits of stormwater management and urban greening, including increasing access to green spaces that encourage tenants to interact with nature and making visible investments in the property that drive economic development, are most needed.[111]
- Tucson has documented that prioritizing water conservation kept its customers' water and wastewater rates 15% lower than they would have otherwise been.[112]

ii. Environmental

Localized water strategies provide a variety of environmental benefits including but not limited to:[113]

- Increased wildlife and pollinator habitat
- Improved water quality
- Improved air quality
- Less impactful development
- Decreased pressure on scarce water resources and habitat
- Reduced heat island effect
- Resilience to wildfires

Some examples include:

- The City of Eugene, Oregon, planted more than 20,000 native trees and plants as part of its GI projects, which, in addition to capturing stormwater, will also protect local wetlands, natural habitats, and wildlife.[114]
- San Antonio Water System's turf replacement program increases wildlife habitat for monarch butterflies and other pollinators by using water-wise native plants.[115]

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109 *Low-income Water Efficiency Program,* CITY OF AURORA, COLO. https://www.auroragov.org/cms/One.aspx?portalId=16242704&pageId=16599648 (last visited Aug. 8, 2021).

110 *Id.*

111 *Philadelphia Water Department,* WATERNOW ALL., *https://www.sbnphiladelphia.org/wp-content/uploads/2021/06/GSI_A-Tool-for-Economic-Recovery-and-Growth-in-PA_doubleview.*

112 ALL. FOR WATER EFFICIENCY, WATER CONSERVATION KEEPS RATES LOW IN TUCSON, ARIZONA 5, 21, 28 (2017), https://www.financingsustainablewater.org/sites/www.financingsustainablewater.org/files/resource_pdfs/Final_AWE_tucson_cosnrates-az-web3.pdf; *see also* Candice Rupprecht et al., *Tucson Examines the Rate Impacts of Increased Water Efficiency and Finds Customer Savings,* American Water Works Assoc., https://awwa.onlinelibrary.wiley.com/doi/10.1002/awwa.1429?elq=b7dc1974762c4cbe9ad080b8706fe59d&elqCampaignId=26338&elqCampaignId=26338&elqTrackId=34271c43817e4c4dafdd942a74f7b1b8&elq_cid=18604945&elq_mid=41798&elqaid=41798&elqat=1&utm_campaign=26338&utm_content=Email-Research-IssueAlert-JAWWA_1-9-20&utm_medium=email&utm_source=eloquaEmail

113 *Benefits of Green Infrastructure*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/green-infrastructure/benefits-green-infrastructure (last visited Aug. 20, 2019).

114 *See* CITY MANAGER'S OFFICE, EUGENE ORE., *COMMUNITY CLIMATE AND ENERGY ACTION PLAN: 2013 PROGRESS REPORT* 54 (2013), https://www.eugene-or.gov/ArchiveCenter/ViewFile/Item/2385.

115 *Case Studies: San Antonio Water System,* WATERNOW ALL., https://tapin.waternow.org/resources/san-antonio-water-system-2/

- MMSD's GI investments have helped reduce combined sewer overflows by 96%, keeping raw and partially treated sewage out of area waterways and improving water quality.[116]

iii. Economic

There are also economic benefits associated with investing in water infrastructure, including localized strategies. These include:

- Green jobs
- Ongoing employment for operation and maintenance
- Increased property values

Examples include:

- MMSD estimates that its GI program will, in addition to capturing 740 million gallons of stormwater runoff per storm:
    - increase property values region-wide by an estimated $667 million
    - produce 160 construction jobs annually; and
    - create 500 long-term green maintenance jobs.[117]
- An analysis of Philadelphia Water Department's *Green City, Clean Waters* initiative, found that as of 2019, after five years of implementation, its GI program has supported a total of 927 new jobs for a total of $30 million in employee compensation over the five years.[118] And updated 2021 study of Philadelphia's program and of Pennsylvania's GI industry more generally found that after ten years of implementation there are up to 34,000 GI workers across Pennsylvania, more workers than middle school teachers, and that 52% of GI workers earn at least $15/hour, even without a high school diploma or equivalent.[119]
- Los Angeles' One Water Plan, which includes large scale investments in centralized and decentralized GI is expected to produce almost 7,000 new jobs and induce $1.97 in economic activity per every dollar spent.[120]
- Atlanta's Historic 4th Ward Park GI project saved the City $15 million over the alternative (an underground tunnel), while contributing to over $500 million in economic development in the surrounding area.[121]
- Replacing all lead service lines in Illinois is estimated to create from 87,841 to 224,500 jobs, as well as an additional $9 billion to $23 billion in economic activity.[122]

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[116] *Milwaukee Metropolitan Sewerage District, Weathering the Storm Where Rain Falls,* WATERNOW ALL. 4 (2019), https://tapin.waternow.org/wp-content/uploads/sites/2/2019/03/WaterNow_MilwaukeeMetropolitan-_CaseStudy_FINAL.pdf.

[117] *Id.*

[118] SUSTAINABLE BUS. NETWORK OF GREATER PHILA., *THE ECONOMIC, SOCIAL, AND ENVIRONMENTAL CASE FOR GREEN CITY, CLEAN WATERS* (2019).

[119] GREEN STORMWATER INFRASTRUCTURE, SUSTAINABLE BUS. NETWORK, 6 (2021), https://www.sbnphiladelphia.org/wp-content/uploads/2021/06/GSI_A-Tool-for-Economic-Recovery-and-Growth-in-PA_doubleview.pdf.

[120] ONE WATER LA, ONE WATER LA 2040 PLAN, 8-4 (2018) https://www.lacitysan.org/cs/groups/sg_owla/documents/document/y250/mdmw/~edisp/cnt030190.pdf.

[121] WATERNOW ALL., *City of Atlanta Department of Watershed Management,* https://tapin.waternow.org/wp-content/uploads/sites/2/2019/05/WaterNow_Atlanta-Case-Study_FINAL.pdf.

[122] Justin Williams, *Data Points: How Replacing Lead Water Lines Will Put People Back to Work,* METRO. PLANNING COUNCIL, https://www.metroplanning.org/news/9988/Data-Points-How-replacing-lead-water-lines-will-put-people-back-to-work (last visited July 30, 2021).

- Investments in consumer-side leak detection devices are estimated to create 28% more jobs than investments in a water treatment plant.[123]

iv. Energy

The numerous intersections between the nation's water and energy systems create what is commonly referred to as the "water-energy nexus."[124] The water/energy connections pertinent here include 1) the energy used to transport water along the country's various water projects, which are mostly operated in the west by the Bureau of Reclamation; 2) the energy needed to treat drinking water, wastewater, and stormwater; and 3) the energy needed to operate household and business fixtures and appliances.[125] Given this interconnectedness, when water is used more efficiently, there are corresponding energy benefits such as:

- Increased energy efficiency
- Reduction in greenhouse gas emissions

Several examples illustrate how LWI, and water use efficiency in particular, can lead to substantial local energy savings:

- During the last California drought, statewide conservation resulted in water savings of 24.5% over 2013 levels. This translated into electricity savings of 1,830 GWh or the electricity use of 274,000 average Californian homes for a year,[126] and 521,000 metric tons in avoided GHG emissions—the equivalent of taking 111,000 cars off the road for a year.[127]
- MMSD estimates that meeting its goal to use GI to capture 740 million gallons of stormwater per storm could annually reduce carbon in the atmosphere equivalent to removing emissions from 14,000 vehicles and could save enough energy to power 1,400 homes.[128]

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[123] *Water Infrastructure Jobs Calculator,* WATERNOW ALL., https://jwildish.shinyapps.io/JobsCalculator/?mc_cid=a1fbca05cb&mc_eid=[UNIQID] (last visited July 30, 2021).

[124] *See, e.g.,* WATER IN THE W., WATER AND ENERGY NEXUS*,* 7, 10 (FIG.1), 21 (FIG. 11), 29 (FIG. 15), 39 (FIG. 19) (2013), http://waterinthewest.stanford.edu/sites/default/files/Water-Energy_Lit_Review_0.pdf.

[125] *See* DAVID RIBEIRO ET AL., THE 2017 ENERGY EFFICIENCY SCORECARD 72–75 (2017), https://tapin.waternow.org/wp-content/uploads/sites/2/2019/06/u1705.pdf.

[126] Edward S. Spang et al., *The Estimated Impact of California's Urban Water Conservation Mandate on Electricity Consumption and Greenhouse Gas Emissions* 13 ENV'T RES. LETT. 2, 5–6 (2018).

[127] *Id.* at 2, 7.

[128] MILWAUKEE METRO. SEWERAGE DIST., REGIONAL GREEN INFRASTRUCTURE PLAN 60 (2012), https://www.uni-groupusa.org/PDF/Milwaukee%20GI%20Final_Benefits_and_Costs.pdf.

v. Social

Sustainable, localized water strategies can also provide societal benefits.[129] These include:

- Community engagement
- Open space
- Connection with nature
- Improved public health
- Increased access to public transit
- Improved pedestrian safety through traffic calming
- Increased job satisfaction
- Reduced heat island effect
- Reduced crime

While these intangible community benefits can be challenging to quantify, there are some analyses available. For example, an evaluation of the first five years of the Philadelphia Water Department's *Green City, Clean Waters* initiative showed that the GI strategies implemented under the initiative resulted in social benefits including a reduction in heat stress-related fatalities, increased recreation access to public open spaces and greened sites, and a reduction in crime within a quarter mile of green stormwater infrastructure sites.[130]

The City of Hoboken, New Jersey, the densely populated "square mile city," is installing three new GI park projects designed to capture at least 2,500,000 million gallons of stormwater. With the installation of this GI, the City will double its open space—an amenity that provides recreation opportunities and improves residents' quality of life.[131]

The American Public Health Association reports that urban greening, including with green roofs, pervious pavers, and increased trees, when installed on a community-wide basis can significantly result in cooler, healthier communities by reducing urban heat island effect.[132] For example, trees can make the urban environment feel ~10ºF cooler while also helping manage stormwater runoff.[133]

LWI takes many different forms, whether as water use efficiency measures, reuse and other alternative non-potable water sources, GI, or private property lateral line replacements. This suite of LWI options provide communities an opportunity to generate "new" local water supply, achieve compliance with regulatory requirements, avoid or reduce costs associated with centralized water

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[129] *E.g.*, CTR. FOR NEIGHBORHOOD TECHNOLOGY & AM. RIVERS, THE VALUE OF GREEN INFRASTRUCTURE 49–50 (2010) (explaining that GI has been shown to increase recreational opportunities and build "community cohesion"); *Benefits of Green Infrastructure*, U.S. ENV'T PROTECTION AGENCY (accessed Aug. 20 2019), https://www.epa.gov/green-infrastructure/benefits-green-infrastructure.

[130] GCCW TRIPLE BOTTOM LINE IMPACT, *supra* note 84, at 14; GCCW ECONOMIC IMPACT, *supra* note 84, at 40–41, 43 (crime reduction is attributed to the "powerful counter-symbol of aesthetic beauty and active maintenance" greened sites can convey in contrast to "vacancy, abandonment, and blight" that "provide refuge for criminal activity" and "symbolize the absence of care and supervision in ways that encourage additional criminal activity").

[131] *Case Studies City of Hoboken,* WATERNOW ALL., https://tapin.waternow.org/resources/city-of-hoboken/ (last visited July 30, 2021).

[132] AM. PUB. HEALTH ASS'N, CLIMATE CHANGE: MASTERING THE PUBLIC HEALTH ROLE (2011), https://www.apha.org/~/media/files/pdf/factsheets/climate_change_guidebook.ashx; *see also Webinar: Tap into Climate Resilience,* WATERNOW ALL., https://tapin.waternow.org/resources/webinar-tap-into-climate-resilience/ (last visited July 30, 2021).

[133] *Webinar: Tap into Climate Resilience, supra* note 132.

infrastructure, and enjoy co-benefits including equity and affordability, environmental, economic, energy, and social benefits.

III. Creating Financing, Institutional, and Legal & Policy Pathways for Localized Water Infrastructure

As noted above, interest in LWI—whether water use efficiency, lead service line replacements, or GI—has been growing as policymakers and water managers seek additional pathways to address water challenges and build greater resilience and sustainability into our nation's water infrastructure. However, notwithstanding the feasibility, affordability, and multiple benefits of localized water infrastructure, its adoption has been slow and somewhat fitful. This is due partly to water managers' caution about plunging headlong into new technologies and strategies.

But it is due in large part as well to structural legal and policy barriers and constraints, and perceptions about constraints, that can unnecessarily limit flexibility and opportunity to move toward innovation and greater community benefits LWI offers. This section describes three categories of barriers: 1) Financing; 2) Institutional Challenges; and 3) Legal & Policy Challenges. Based on the September 2019 roundtable and follow up interviews, this section also provides recommendations and action items for removing these financing, institutional, and implementation barriers.

A. FINANCING

1. Barriers to Increased Investment in Localized Water Infrastructure

Local governments—whether cities, towns, counties, or special districts—bear 96% of the cost of water infrastructure investments and resource management.[134] With revenues largely limited to rates and fees, local water resource entities have found it necessary, or at least advisable, to spend more on annual operations than long-term investment in infrastructure at a roughly three-to-one ratio.[135] Further, current federal and state water infrastructure loan and grant programs, while helpful, are dwarfed by the size and scale of the need. In addition, the perception is that these programs focus on traditional 20th and 19th century solutions, that is, dams, pipes, and reservoirs.

As a result, there are significant financial barriers to greater implementation of LWI. These include:

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[134] *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), 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.

[135] CONG. BUDGET OFF., *supra* note 134.

- **Perceptions Regarding Accounting Limitations:** Financial accounting for all public entities in the U.S. is governed by the Governmental Accounting Standards Board (GASB), a non-profit organization.[136] GASB Concepts Statement No. 4 establishes the bedrock principle that in order to capitalize an investment in an asset, the public entity must control the asset to be financed.[137] This has been widely viewed, in a variety of settings, as precluding the use of bond dollars, and public debt generally, for projects, installations or devices on private property which are outside of municipal and/or utility ownership and control. Notwithstanding this perception, as described below, the GASB rules in fact provide two potential paths for using debt to finance localized water infrastructure.
- **State Gift Prohibitions:** Nearly every state has some form of a constitutional prohibition against "gifts" of public funds for private purposes.[138] These provisions are distinct from the rules regarding the use of public debt, but similarly can give rise to negative perceptions or concerns about the use of public funds for projects and technologies deployed on private property. As described below, constitutional gift prohibitions are generally not a barrier to greater investment in LWI.
- **State and Local Laws Limiting Use of Bond Proceeds:** Separate from accounting rules and state constitutions, most states and many localities have enacted laws regulating how public entities may and may not use bond dollars and/or other public debt in connection with private property. For the most part, these rules had their genesis in efforts to ensure against corruption, fraud, and misuse of public funds. However, they are also interpreted as limiting the ability of cities, towns, and utilities to access bond dollars for projects on private property even when those projects advance important public interests.[139] As described below, these state and local laws can be flexible enough to allow greater investment in LWI.
- **Limits on Tax-Exempt Governmental Bonds:** The federal tax code generally provides that interest on "governmental bonds" (i.e., bonds issued by state and local governments, including municipal utilities) is tax-exempt, which results in significant cost savings on the debt.[140] There are, however, limits on the amount of funds from tax-exempt governmental bonds that can be used to finance investments on private property.[141] Depending on where the LWI to be financed with a governmental bond will be installed, these limitations can create additional hurdles to full-scale investment in LWI.[142] These hurdles are, however, not barriers to LWI investments via tax-exempt bonds, which is explained below.
- **Lack of Dedicated or Sufficient Revenue Streams:** Many communities lack a dedicated or sufficient revenue source to cover the cost of water management— a circumstance that occurs

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136 Established in 1984, GASB an independent, private- sector organization that establishes accounting and financial reporting standards for U.S. state and local governments that follow Generally Accepted Accounting Principles. State and local governments, state Boards of Accountancy, and the American Institute of CPAs recognize the GASB standards as authoritative. *About the GASB*, GOV'TL ACCOUNTING STANDARDS BD., https://www.gasb.org/aboutgasb (last visited Aug. 4, 2021).

137 GOV'TL ACCT. STANDARDS BD., CONCEPTS STATEMENT NO. 4 OF THE GOV'TL ACCT. STANDARDS BD. ON CONCEPTS RELATED TO ELEMENTS OF FIN. STATEMENTS, 4-6, 17-18 (2007), https://www.gasb.org/jsp/GASB/Document_C/GASBDocumentPage?cid=1176160039610&acceptedDisclaimer=true

138 *Id.*

139 *The Tap Into Resilience Toolkit*, WATERNOW ALL., https://tapin.waternow.org/toolkit/ (scroll down to *What are my financing options?*, click on *Debt Financing Localized Infrastructure*, click on *Answering Legal Questions that Arise When Using Debt*) (last visited Aug. 8, 2021).

140 *Id.*

141 *Id.*

142 *Id.*

most often for stormwater services where cities are responsible for stormwater management but do not collect fees or charges to pay the associated costs. Absent these revenue sources, local governments' ability to invest in water infrastructure generally, as well as LWI in particular, can be severely constrained. Ways to address this barrier are detailed below.

- **Federal and State Loan Program Priorities:** LWI and strategies for implementing LWI—for example, rebates—are eligible for funding under state and federal grant and loan programs such as the State Revolving Fund and WIFIA loans. These programs often do not clearly recognize LWI as eligible projects and do not prioritize LWI.[143] This lack of clarity narrows the scope of projects for which water utilities seek state and federal grants and loans. The sections below provide strategies for addressing this barrier.
- **Federal Tax Disincentives/Lack of Incentives**. As described above, large-scale deployment of LWI will entail utility investment in projects and technologies on private property, which generally involves subsidies or financial incentives for private property owners. Federal tax law views such incentives as income for federal tax purposes, creating significant disincentives for both utilities and property owners. As detailed below, there are efforts underway in Congress to eliminate this barrier.

For the most part, cities and utilities are adept at taking on debt for conventional centralized water infrastructure. But many of the most promising LWI options, as outlined above, require deployment across communities on private as well as public properties. It is the issue of public investment involving private properties that represents the largest financing challenge—and opportunity—for scaling LWI investments.

2. Recommendations: Expand Public Financing Opportunities

There are opportunities for federal and state governments and public utilities to expand financing options for LWI and begin to close the water infrastructure funding gap. Four opportunities are discussed in detail below: 1) accessing municipal bonds; 2) establishing and leveraging dedicated revenues; 3) prioritizing localized water strategies in federal and state grant programs; and 4) leveraging federal and state tax codes.

i. Accessing Municipal Bonds

Municipal bonds have long been the debt-financing vehicle of choice for cities and public water agencies.[144] In order for local governments to invest in LWI at a scale needed to account for the impacts of climate change, such as more severe droughts and intense flooding, they will need to access to capital markets through municipal bonds, among other financing approaches addressed in latter sections of this report.[145] Municipal bonds can be issued either as revenue bonds or general obligation bonds, which can also be marketed as green bonds[146] or as innovative outcomes-based

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[143] *See, e.g.*, 33 U.S.C. §§ 1383(6), 1383(9) (authorizes loans for "water conservation, efficiency, or reuse but does not prioritize these projects); 42 U.S.C. § 300j–12 (does not expressly identify efficiency or conservation as qualifying uses of funds); 33 U.S.C. § 3905 (does not expressly identify efficiency or conservation as qualifying projects).

[144] Cynthia Koehler & Caroline Koch, *Innovation in Action: 21st Century Water Infrastructure Solutions,* WATERNOW ALL. 27 (2019), https://tapin.waternow.org/wp-content/uploads/sites/2/2019/11/WaterNowAlliance_Innovation-In-Action_FINAL-1.pdf.

[145] *Id.* (citing Sharlene Leurig Ceres & Jeremy Brown, *Bond Financing Distributed Water Systems* (2014)).

[146] Green Bonds are municipal bonds where the proceeds will be used exclusively for projects and activities that serve environmental sustainability purposes. Koehler & Koch, *supra* note 144, at 28.

environmental impact bonds.[147] To use municipal bonds to finance localized water infrastructure, however, local governments must first navigate accounting, legal, and tax constraints. How local governments can do so is detailed below.

a. *Accounting for Localized Water Infrastructure*

As described briefly above, it has been an article of faith in municipal and public utility accounting that debt can only be used to finance tangible assets controlled by the public entity. This would seem, on its face, to preclude agency spending on residential GI projects, water use reuse measures at commercial properties, or private lead lateral service line replacements, among other LWI. However, GASB's rules on debt are sufficiently flexible to enable utilities and municipalities to capitalize investments in localized infrastructure of all kinds.

First, a small but important set of water utilities are finding that they can invest municipal bond proceeds in LWI and comply with GASB Concepts Statement No. 4's requirement that the agency "control" the asset to be financed by entering into property liens or contracts with property owners. For example, over the last two decades, the Southern Nevada Water Authority (SNWA) has bond financed more than $250 million (as of 2020) in incentive programs such as private property turf replacements generating approximately 430,000 acre feet in water supply for the Las Vegas region.[148] Similarly, the MMSD capitalizes and bond and loan finances GI investments on property it does not own by requiring recipients of GI grants to enter into a conservation easement with MMSD. In 2019, MMSD invested $1.9 million in private property GI.[149] In February 2020, MMSD issued a certified Climate Bond to finance $20 million in "community based" GI.[150]

However, GASB has also promulgated an alternative to Statement 4. In December 2010, GASB issued Statement No. 62 (GASB 62) codifying accounting rules applicable to local governments for "Regulated Operations."[151] GASB 62 recognizes that public entities need to make long-term investments that do not necessarily produce conventional tangible assets (like stormwater tunnels or treatment facilities), but that also are not properly characterized as annual expenses. The Regulated Operations approach provides that local governments may capitalize spending on such "business-type activities" as long as they effectively commit to repaying their investors. To this end, any public entity can use the Regulated Operations accounting approach under GASB 62 if it meets three criteria:

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[147] Environmental impact bonds (EIBs) are an innovative financing tool that leverages private investment to support high-impact environmental programs. EIBs use a "Pay for Success" approach where private investors provide upfront capital for environmental projects and the beneficiary—either a public entity or a private institution that benefits from the project—repays the investors based on the achievement of the agreed-upon project outcomes. Koehler & Koch, *supra* note 144, at 29.

[148] S. NEV, WATER AUTH., COMPREHENSIVE ANNUAL FINANCIAL REPORT, 20 (2020), https://www.snwa.com/assets/pdf/reports-cafr.pdf; *Water Smart Landscape Rebate Program, Conservation Facts and Achievements*, S. NEV, WATER AUTH., https://www.snwa.com/importance-of-conservation/conservation-facts-and-achievements/index.html (last visited Aug. 10, 2021).

[149] *MMSD: Conservation Easement,* WATERNOW ALL., https://tapin.waternow.org/resources/mmsd-conservation-easement/ (last visited Aug. 5, 2021); *see also Milwaukee Metropolitan Sewerage District,* WATERNOW ALL., https://tapin.waternow.org/resources/milwaukee-metropolitan-sewerage-district-2/ (last visited Aug. 5, 2021).

[150] MILWAUKEE METRO. SEWERAGE DIST., *Green Bond Framework* (2020), https://tapin.waternow.org/wp-content/uploads/sites/2/2020/09/Climate_Bond_Framework_MMSD_2-26-2020__Final_v2_min.pdf.

[151] GOV'TL ACCT. STANDARDS BD., IMPLEMENTATION GUIDE NO. 2018-1 (2018), https://www.gasb.org/jsp/GASB/Document_C/DocumentPage?cid=1176170563952&acceptedDisclaimer=true.

1. The agency is governed by a board legally empowered to establish rates.
2. The rates must be designed to recover the specific business-type activity's costs of providing the financed services.
3. The rates must be set at levels that will recover the costs and can be charged to and collected from customers.[152]

Electricity utilities have been bond financing distributed energy conservation programs on private properties for many years using GASB 62 accounting.[153] However, this is not an approach that has been widely embraced by the public water resource sector and many water utility chief financial officers questioned whether it truly could apply to investments in consumer incentives for localized water strategies. Addressing this uncertainty, in May 2018, GASB issued new guidance under GASB 62 making it clear that public water resource agencies are authorized to capitalize investments in localized waters strategies employing consumer rebates and direct installations as "Regulated Operations."[154] The practical implication of this clarification is that utilities can now access municipal bond proceeds to invest in consumer rebate (and/or direct installation) programs. The GASB 62 accounting approach applies to investments made through both municipal revenue and general obligation bonds and can be used when issuing tax-exempt or taxable municipal bonds, as well as other forms of debt.[155]

Action Item: Utilities

Establish standards and/or targets for deploying LWI to support, extend, integrate with and, if appropriate, substitute for conventional built systems. This will help to institutionalize the concept that these strategies are water infrastructure that can be debt-financed in the same way as traditional water infrastructure.[156] Water use efficiency, onsite reuse, and distributed GI programs are often viewed as one-time programs to be implemented only in response to drought or other discrete water management needs. As explained above in Sections I and II.A, however, LWI can address the same drinking water, wastewater, and stormwater challenges as conventional solutions. Standardizing applicability of LWI to commonly occurring water management challenges will facilitate utilities' systematic selection of these solutions to meet those challenges, which, in turn, will help utilities shift towards financing these strategies as they would traditional infrastructure.

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[152] *See* GOV'TL ACCOUNTING STANDARDS BD., STATEMENT NO. 62 OF THE GOVERNMENTAL ACCOUNTING STANDARDS BOARD (2010), https://www.gasb.org/jsp/GASB/Document_C/DocumentPage?cid=1176159967625&acceptedDisclaimer=true; CYNTHIA KOEHLER & ROWAN SCHMIDT, *GO GREEN: MUNI BOND FINANCING FOR DISTRIBUTED WATER SOLUTIONS* 12 (2018), https://tapin.waternow.org/wp-content/uploads/sites/2/2019/02/GASB_Go-Green.pdf.

[153] Julie Desimone, *Debt*, WATERNOW ALL., (Apr. 7, 2021), https://waternowalliance2021.pathable.co/meetings/virtual/C2XxfKn5eRLLZ83FM.

[154] GOV'TL ACCOUNTING STANDARDS BD., *supra* note 151; *see also* KOEHLER & SCHMIDT, *supra* note 152, at 2–3.

[155] Whether a municipal bond issuance is tax exempt depends on several Internal Revenue Service (IRS) rules. However, municipalities and public utilities are also able to issue taxable bonds to finance localized water strategies if these IRS rules cannot be satisfied. Taxability of municipal bonds is a separate consideration from the accounting treatment. *The Tap into Resilience Toolkit,* WATERNOW ALL., https://tapin.waternow.org/toolkit/?item=tax-questions (last visited Aug. 5, 2021).

[156] Telephone Interview with Sanjay Gaur, Vice President, Raftelis (Jan. 24, 2020).

CASE STUDY

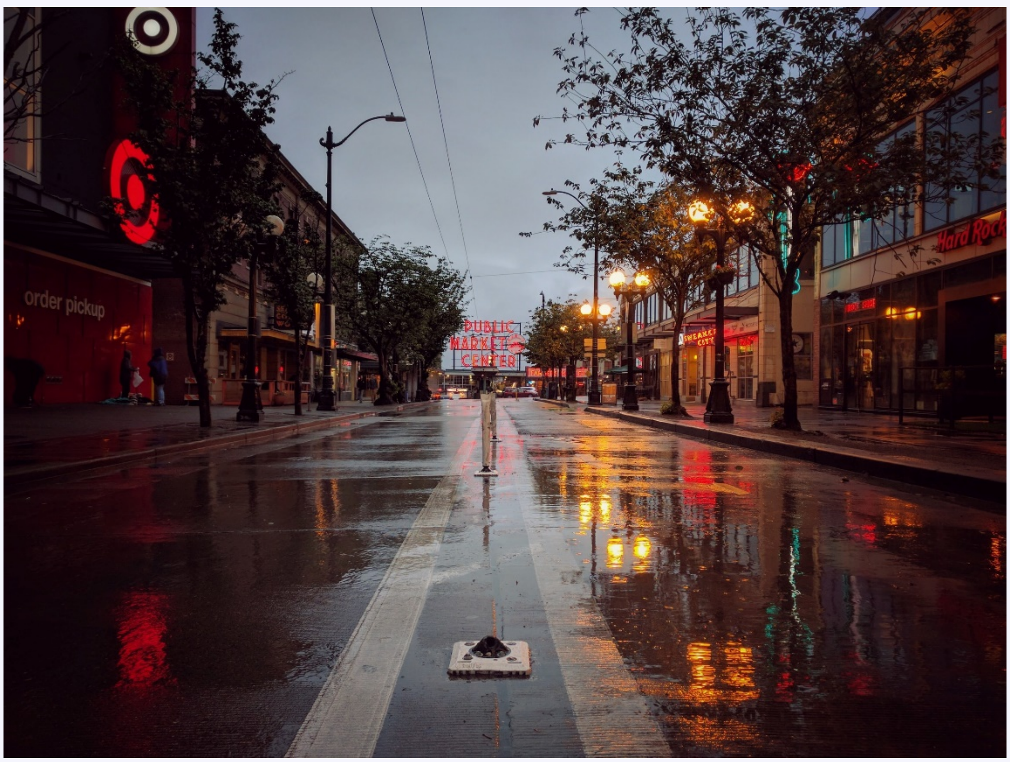
Accessing Municipal Bonds: Seattle Public Utilities & King County

Challenge: Urban stormwater runoff

Localized Water Strategy: RainWise program, which provides residential customers rebates that cover up to 100% of the costs to install rain barrels and rain gardens to address stormwater runoff and combined sewer overflows.[157]

Financing Mechanism: Seattle Public Utilities and King County finance the RainWise program with municipal bond proceeds using the GASB 62 regulated operations accounting approach.[158]

Results: By investing in these programs at scale, as of September 2020, Seattle has been able to finance GI projects that manage 410 million gallons of stormwater per year, bringing the city closer to meeting its goal of managing 700 million gallons of runoff per year with GI by 2025.[159]



[157] *Be Rainwise*, KING CNTY., https://www.kingcounty.gov/services/environment/wastewater/cso/rainwise.aspx (last visited Aug. 5, 2021); *see also* KOEHLER & SCHMIDT, *supra* note 152, at 20.

[158] *See* KING CNTY. & SEATTLE PUB. UTILS., 2017–2018 OVERVIEW AND ACCOMPLISHMENT REPORT: GREEN STORMWATER INFRASTRUCTURE 2,15 (2018), https://www.seattle.gov/documents/Departments/SPU/Documents/GSI-ProgressReport2018.pdf (explaining partnership with King County and stating that the RainWise program began in 2010); *see also* KING CNTY., COMPREHENSIVE ANNUAL FINANCIAL REPORT (2019), https://www.kingcounty.gov/depts/finance-business-operations/financial-management/~/media/depts/finance/financial-management-services/CAFR-2018/2018-comprehensive-annual-financial-report.ashx.

[159] KING CNTY. & SEATTLE PUB. UTILS., *supra* note 158, at 3, 9.

CASE STUDY

Accessing Municipal Tax-Exempt Bonds: Los Angeles Department of Water and Power (LADWP)

Challenge: Recurring drought

Localized Water Strategy: A variety of water efficiency and stormwater capture programs, including rebates for water-efficient installations, high-efficiency washing machines, permeable pavement, rain barrels, cisterns, and replacement of turf with low-water landscaping.[160]

Financing Mechanism: LADWP has been using municipal bond proceeds to finance these consumer rebate programs using the GASB 62 accounting approach. As of 2020, LADWP reported $160 million in distributed water conservation and stormwater regulatory assets.[161]

Results: By using the upfront capital provided by bond sales, LADWP can promote "water use efficiency as a permanent way of life" and work toward achieving the city's long-term conservation goals.[162] Since 2010, LADWP's conservation program has saved roughly 25,000 acre-feet of water per year.[163]

b. Meeting State and Local Laws Regulating Municipal Bonds

From an accounting perspective, the GASB 62 clarification clears one barrier for utilities to access their bond proceeds to finance LWI, but to use municipal bond proceeds to pay for LWI local governments must also have the requisite legal authority to issue debt and be able to meet local and state laws regulating public debt. As described above, state and local laws including constitutional "gift prohibitions" and statutes limiting the use of bond proceeds are often interpreted as restricting access to municipal bonds as a mechanism for increasing investments in LWI.[164] Yet, as with accounting

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160 OFFICE OF L.A. CITY CONTROLLER RON GALPERIN, COMPREHENSIVE ANN. FIN. REPORT 125 (2017), https://lacontroller.org/wp-content/uploads/2019/03/FY2017_CAFR.pdf; *see also* KOEHLER & SCHMIDT, *supra* note 152, at 21; L.A. DEP'T OF WATER & POWER, WATER CONSERVATION POTENTIAL STUDY 4 (2017), https://s3-us-west-2.amazonaws.com/ladwp-jtti/wp-content/uploads/sites/3/2018/05/23094537/LADWP-Water-Conservation-Study-Exec-Report-WebFinal-1.pdf

161 OFFICE OF L.A. CITY CONTROLLER RON GALPERIN, COMPREHENSIVE ANN. FIN. REPORT 105 (2021), https://lacontroller.org/wp-content/uploads/2021/01/CAFR-FY20_1.28.21.pdf.

162 *See State and Local Conservation Goals,* CITY OF L.A. DEP'T OF WATER & POWER, (Aug. 10, 2021, 12:08 PM), https://www.ladwp.com/ladwp/faces/ladwp/aboutus/a-water/a-w-conservation/a-w-c-conservationgoals?_afrLoop=307100106817961&_afrWindowMode=0&_afrWindowId=hrhosbazx_65#%40%3F_afrWindowId%3Dhrhosbazx_65%26_afrLoop%3D307100106817961%26_afrWindowMode%3D0%26_adf.ctrl-state%3Dhrhosbazx_81.

163 L.A. DEP'T OF WATER & POWER, *supra* note 160, at 7.

164 In addition, to access municipal bonds to pay for localized water infrastructure local governments will need to meet "additional debt tests" and "rate covenants." Because these requirements apply equally to localized and centralized infrastructure, this report does not detail these requirements. More information is available here at *The Tap into Resilience Toolkit,* WATERNOW ALL., https://tapin.waternow.org/toolkit/?item=debt-constraints (last visited Aug. 5, 2021).

standards, many of these legal requirements are sufficiently flexible to allow for, and are not complete bars to, bond financing LWI.

As to constitutional gift prohibitions, most states have developed extensive exceptions allowing public funds to be directed to private parties when these funds are deployed primarily for public benefits. These exceptions form the “public purpose” doctrine. Because of these exceptions, state gift prohibitions should not be viewed as barriers to implementing localized infrastructure on private property with public capital. Indeed, most states allow expenditures that incidentally benefit private interests, as long as they primarily serve and effectuate a public purpose. For example, California courts have interpreted the State’s “public purpose” exception broadly. In California, the primary question in determining whether the appropriation of public money is a “gift” within the constitutional prohibition is whether the funds are to be used for a public or private purpose.[165] If the money is for a public purpose, the appropriation is not a gift even though private persons are benefited by the expenditure.[166] Thus, if a California water provider were to use municipal bond proceeds to finance a large-scale turf replacement rebate program to create additional local water supplies, as LADWP does, the fact that homeowners and businesses receiving the rebate might also benefit from reduced water bills or other benefits does not make the expenditure a gift of public funds.

Some states choose narrowly interpret terms like “public purpose” and “private benefit” to limit the scope of the prohibition. For example, the Wisconsin Supreme Court has interpreted the State’s constitutional gift prohibition[167] to only prohibit the State from acting as surety or guarantor of the obligation of another party.[168] Under this narrow reading, if a city in Wisconsin were to use municipal bond proceeds to pay for consumer rebates for high-efficiency appliances or rain gardens, that city would not run afoul of the gift prohibition because the city would not be responsible for any debt of another party. In other words, the city would not be lending its credit to the individuals receiving a rebate.

Other states, however, have not extended the public purpose exemption as broadly. For example, Georgia courts have required that the state receive a “substantial benefit” in exchange for the use of public funds or property.[169] While potentially a more restrictive standard than that of California or Wisconsin, LWI investments are still likely to meet Georgia’s “substantial benefit” test. As detailed above, water use efficiency, onsite reuse, and distributed GI provide meaningful water management benefits, creating billions of gallons of water supply and capturing, treating, or slowing millions of gallons of stormwater, keeping surface waters free of contamination and expanding the capacity of combined sewer systems. These alone are substantial benefits for local water utilities, but they are also accompanied by the multiple co-benefits LWI offers.

As to state and local statutes and ordinances governing issuance of municipal bonds and the use of bond proceeds, each state and locality has its own requirements, but generally these rules can be read to allow for bond financing LWI. To meet their state or local public finance statutory requirements, generally local governments must demonstrate that LWI improves and/or benefits the utility system. For example, the First Class City Revenue Bond Act and the General Water and Wastewater Revenue Bond Ordinance of 1989 govern Philadelphia’s issuance of municipal bonds and provide that the City has authority to issue revenue bonds for the purpose of financing “projects” relating to the water “system.” These rules do not prohibit the City from issuing revenue bonds to pay

165 *Cnty. of L.A. v. La Fuente*, 20 Cal.2d 870, 382 (1942).
166 *Id.*
167 WIS. CONST. ART. VIII, § 3.
168 *State ex rel. Thomson v. Giessel*, 271 Wis. 15, 29 (1955).
169 *Garden Club of Ga. v. Shackelford* 274 Ga. 653, 654 (2002).

for LWI. The City would instead need to ensure that the financed LWI projects meet the statutory definitions of "projects" and "system." Similarly, in June 2018, San Francisco amended its City Charter to make clear that no matter where a project was located, so long as a project furthered the purposes of the utility, the San Francisco Public Utilities Commission (SFPUC) would be able to finance the project. As amended, in relevant part, the Charter now specifies:

> the Public Utilities Commission is hereby authorized to issue revenue bonds ... for the purpose of reconstructing, replacing, expanding, repairing, or improving water facilities, clean water facilities, power facilities, or combinations of water, clean water, and power facilities ... *for any [] lawful purpose* of the water, clean water, or power utilities of the City...[170]

The SFPUC has interpreted this Charter Amendment to allow the use of municipal bonds to pay for LWI.[171]

Action Item: NGOs and Universities

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. WaterNow is currently working to create this database including guidance for local water leaders, management, and staff on how to identify, evaluate, and address state-specific legal issues.[172] This database and accompanying guidance will be a follow-on from a 2014 Ceres report identifying public finance laws in seven states and whether those states prohibited debt-financing disturbed infrastructure[173] as well as from WaterNow's 50-state database of constitutional gift prohibitions.[174]

Action Item: State and Local Governments

Revise state and local laws governing municipal and utility bonds to expressly exempt LWI investments from restrictions on the use of bond proceeds on private property, and/or revise state and local laws governing municipal and utility bonds to expressly recognize investments in LWI as authorized investments.

c. Issuing Tax-Exempt Governmental Bonds for LWI

Debt-financing LWI can raise a number of tax issues. One of the most common, as summarized above, is whether a municipal bond issued to finance investments in LWI is a tax-exempt

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170 S.F., Cal., Charter § 8B.124 Water, Clean Water, And Power Revenue Bonds (June 5, 2018).

171 Memorandum from Eric Sandler, Assistant Gen. Manager, Bus. Servs. CFO, S.F. Water Power Sewer on Tax-Exempt Bond Financing of Distributed Infrastructure, to Comm'r Sophie Maxwell, President, S.F. Pub. Utils. Comm'n, (Dec. 22, 2020), https://sfpuc.sharefile.com/share/view/s5b528d2bb628418599a4aa17006299d7.

172 Telephone Interview with Jim Gebhardt, Senior Advisor, U.S. Envt. Prot. Agency, USEPA Water Infrastructure and Resilience Fin. Ctr. (Nov. 14, 2019).

173 Sharlene Leurig & Jeremy Brown, *Bond Financing Distributed Water Systems: How to Make Better Use of Our Most Liquid Market for Financing Water Infrastructure,* Ceres 14-41 (2014), https://www.ceres.org/sites/default/files/reports/2017-05/Ceres_WaterBondFinancing_082814.pdf.

174 *WaterNow: State Gift Prohibitions Database,* WATERNOW ALL., https://tapin.waternow.org/resources/waternow-state-gift-laws-database/ (last visited Aug. 5, 2021).

"governmental bond" given that LWI is deployed on private property. If debt issued by a utility to finance localized infrastructure can be issued as "tax-exempt bonds," the utility can achieve significant savings because the interest paid on "tax-exempt bonds" is excluded from gross income for federal income tax purposes.[175] Although the federal tax code provides a general rule that interest on bonds issued by state and local governments, including municipal utilities, is tax-exempt, there are a variety of requirements that must be satisfied.

Key requirements for a bond issuance to qualify as a governmental bond is that no more than 10% of the bond proceeds are "used in a private trade or business," and no more than 5% of the proceeds are loaned to a non-governmental person.[176] Thus, as a preliminary matter, incentives for residences would rarely (if ever) raise a concern with this requirement, as homeowners are not engaged in "private trade or business" and most consumer incentives take the form of rebates or grants (not loans). Further, this rule applies to the entire proceeds of a bond issue.[177] Thus, a bond including funding for LWI incentives for businesses could qualify as a governmental bond if it is part of a larger bond for financing these systems on public properties as well as more conventional infrastructure. For example, a $15 million program that offers non-loan incentives to businesses to install water use efficiency or stormwater management measures that is financed as part of a $200 million revenue bond that also finances other improvements to the utility's centralized water infrastructure would likely qualify as a tax-exempt governmental bond. Because of these flexibilities, local governments are likely able to access tax-exempt governmental bonds to finance LWI.

If a municipal bond issuance includes LWI and cannot meet the requirements of a governmental bond, the local government could still issue a taxable private activity bond.[178] While taxable bonds may be less attractive, taxability of the bond issuance is not a complete barrier to accessing municipal bonds to finance LWI.

Action Item: Federal Government

Utilities and municipalities can issue tax-exempt municipal bonds to finance investments in LWI. An update to the IRS code to exempt LWI from the cap on "private activities" for purposes of tax-free governmental bonds would, however, allow accelerated investments in LWI by removing the limitation on these investments and recognizing LWI investments serve a primarily public purpose even if located on private property.

While GASB 62 helps streamline the use of debt financing to scale investments in localized water strategies, one roundtable participant noted the importance of incorporating lessons learned and adaptive management into implementation of LWI over time.[179] These are practices that water managers routinely apply to conventional infrastructure systems, and can similarly apply to LWI. The participant also recommended that there should be standards or best practices for how much to spend on conservation programs on an annual basis, which would provide guidance to utilities considering scaling their investments in conservation as a localized water strategy.[180]

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[175] STEVEN MAGUIRE & JOSEPH S. HUGHES, CONG. RESEARCH SERV., PRIVATE ACTIVITY BONDS 6 (2018), https://fas.org/sgp/crs/misc/RL31457.pdf.
[176] 26 U.S.C. § 141.
[177] *The Tap into Resilience Toolkit,* WATERNOW ALL., https://tapin.waternow.org/toolkit/?item=tax-exempt (last visited Aug. 8, 2021).
[178] MAGUIRE & HUGHES, *supra* note 175.
[179] Telephone Interview with Sanjay Gaur, *supra* note 156.
[180] *Id.*

Accessing municipal bonds to pay for LWI is a key element to adopting these water management strategies at the scale needed to capture their full potential. Many of the accounting and legal requirements often viewed as barriers to using municipal bonds are only *perceived* barriers that can be overcome. Completing the action items outlined above would help utilities make needed shifts in how they use municipal bond proceeds.

ii. Establish and Leverage Dedicated Revenue Streams

The focus so far has been on municipal bond financing since this is often the vehicle of choice for municipalities and utilities to access capital for infrastructure investments. However, financing LWI on a wide scale will require additional vehicles and sources of capital—that is, dedicated taxes, fees, or charges. And accessing municipal bonds may depend on access to a dedicated revenue stream to secure the debt. Below are two options for these types of dedicated revenues.

a. Stormwater fees

Not all cities or utilities responsible for stormwater management have dedicated—or sufficient—taxes, fees, or charges to cover the cost of providing stormwater services. In its 2018 survey, Western Kentucky University researchers identified only 1,681 stormwater utilities that collect stormwater fees or charges in the United States.[181] For context, 22,322 communities participate in the National Flood Insurance Program, and according to EPA's database about 19,000 facilities nationwide provide wastewater and/or stormwater management services.[182]

Increased adoption of stormwater fees is thus an important tool available to local governments to expand public financing opportunities for GI. Stormwater fees can be structured in a number of ways, including:

- Tiers of stormwater rates based on diameter of a property's potable water pipe based on assumptions about usage;
- Based on a property's "usage," i.e., gallons of stormwater that a property generates per inch of rainfall either "parcel-based" or "impervious area-based;" or
- Based on assessed property value, i.e., property taxes.

As detailed in the below case study, Los Angeles has successfully adopted a parcel tax to help fund stormwater management, which specifically allows the tax revenues to pay for GI.[183] San Diego is considering a similar measure to help close its $459 million stormwater funding gap.[184]

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[181] C. WARREN CAMPBELL, W. KY. UNIV., WESTERN KENTUCKY UNIVERSITY STORMWATER UTILITY SURVEY 2018, 1 (2018), https://tapin.waternow.org/wp-content/uploads/sites/2/2019/05/Western-Kentucky-Stormwater-Fee-Survey.pdf.

[182] *Id.*; *see also Enforcement & Compliance History Online*, U.S. ENV'T PROT. AGENCY, https://echo.epa.gov/ (last visited Aug. 5, 2021).

[183] L.A. CNTY., CAL., PUB. UTIL. CODE, § 16.03 (West 2018).

[184] CITY OF SAN DIEGO, OFFICE OF THE CITY AUDITOR, PERFORMANCE AUDIT OF THE STORM WATER DIVISION 12 (2018), https://www.sandiego.gov/sites/default/files/18-023_storm_water_division_0.pdf; *see also* David Garrick, *San Diego Exploring 2022 Ballot Measure to Pay for Growing Flood-Prevention, Stormwater Needs*, THE SAN DIEGO UNION TRIB., Jun. 29, 2021, https://www.sandiegouniontribune.com/news/politics/story/2021-01-31/san-diego-exploring-2022-ballot-measure-to-pay-for-growing-flood-prevention-stormwater-needs.

CASE STUDY

Innovative Local Funding: Los Angeles County Parcel Tax

Challenge: Capturing contaminated urban stormwater runoff

Localized Water Strategy: Safe, Clean Water Program that funds projects throughout the Los Angeles region to capture, clean, and reuse stormwater.

Financing Mechanism: The County enacted a parcel tax via a ballot measure in 2018 that will generate approximately $300 million per year for stormwater capture projects.[185] Securing the two-thirds majority to pass was a major hurdle which the County overcame by partnering with an environmental NGO. This group was instrumental in garnering support for the measure and attributes its success to three key elements: 1) leadership at the County in the form of a champion on the Board of Supervisor and at the staff level; 2) local environmental and social justice groups aligned in their support of the measure; and 3) ongoing dialogue over the course of a year and a half among stakeholders through both formal and informal processes that resulted in all parties (NGOs, municipalities, organized labor, and businesses) reaching a compromise on the measure.[186]

Results: Through this program, as of October 2020, nine Stormwater Investment Plans (SIPs) have been approved.[187] Each SIP contains individual projects, which vary according to the type of capture infrastructure involved and the extent of additional community and nature benefits.[188] Some projects provide new parks and spreading grounds,[189] or expand or significantly rehabilitate existing ones, to either infiltrate water directly to groundwater or capture and reuse water from underground tanks.[190] Others feature low flow water diversion to wastewater facilities.[191] Many projects also include recreational opportunities and the placement of native plants and trees to provide habitat, cool communities, improve air quality, reduce flooding, and sequester carbon.[192] The Safe, Clean Water Program committees are also currently working on creating more specific criteria for community benefits, nature-based projects, and disadvantaged community investment.[193]

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185 The parcel tax is 2.5 cents per square foot of impermeable surface area. *Program Overview,* Cnty. of L.A., https://safecleanwaterla.org/program-overview/ (last visited Aug. 5, 2021).

186 Telephone Interview with Bruce Reznik, Exec. Dir., L.A. Waterkeeper (July 16, 2019).

187 *FY 20-21 Projects*, Cnty. of L.A., https://safecleanwaterla.org/projects2/ (last visited Aug. 5, 2021).

188 Email from Bruce Reznik, Executive Director, Los Angeles Waterkeeper, to Melissa Kelly, Staff Director and Attorney, UCI Law Center for Land, Environment, and Natural Resources (Oct. 26, 2020, 1:23 PM PST) (on file with author).

189 Spreading grounds are groundwater recharge facilities located where soils are permeable and water can percolate into a hydrologically connected aquifer. *Spreading Grounds,* Pub. Works L.A. Cnty., https://dpw.lacounty.gov/wrd/SpreadingGround/ (last visited July 29, 2021).

190 *Id.*

191 *Id.*

192 *Id.*

193 *Id.*

In some instances, if adopting a dedicated stormwater fee is not feasible, stormwater managers may also be able to access other taxes, fees, or charges to fund GI investments given the multiple benefits of these facilities. For example, beginning in 2016, Atlanta has allocated 10% of its annual Municipal Option Sales Tax revenue to stormwater improvements, the City's first dedicated source of stormwater funding.[194] Atlanta also uses water and sewer rates to pay for GI projects designed to reduce the inflow of stormwater into the City's combined sewer system thereby helping to prevent sewer overflows.[195] Even with these revenue sources, however, Atlanta's Watershed Improvement Plan projects, which include GI and total $596 million as of 2019, do not have a dedicated source of funding. This underscores the need for more communities to set stormwater fees that can fund LWI investments.

b. *Special fees*

In addition to utility rates, some utilities levy special fees to help pay for key programs that can help the utility fund important strategies to help achieve water quality or quantity goals. Examples include "conservation fees" which collect funds to pay for water conservation programs, or "watershed protection" fees which help fund land acquisition efforts to protect water quality.[196] Below are two examples from communities using special fees to fund LWI investments.

The City of Tucson implements a "conservation fee" that collects $0.10 per every 100 cubic feet (748 gallons) of water used by commercial and residential property owners. The revenue collected from the conservation fee, in turn, is used to fund Tucson Water's rebates and grant programs, which reimburse residential and commercial property owners for replacing inefficient water fixtures and installing water re-use systems. Projects that Tucson Water reimburses include replacing high-usage toilets and clothes washers with water-efficient models, and installing rainwater harvesting and greywater systems. Tucson Water also collects a Green Stormwater Infrastructure fee assessed based on customers' water use at a rate of about $1 per month for the average residential customer, which is expected to raise about $3 million each year.[197] The revenues will be used to build and maintain GI projects distributed throughout the City designed to reduce stormwater pollution, mitigate localized flooding, and put stormwater to beneficial use for irrigation.[198]

Central Arkansas Water (CAW), a regional metropolitan water system, implements a "watershed protection fee" that generates approximately $1 million in annual revenues. The fee has been in effect since 2009, and is added to the monthly bills of all customers based on the diameter of a property's water meter. The watershed protection fee revenues are then used to repay the agency's bonds. In particular, in November 2020, CAW issued a $31.8 million certified green bond "to acquire and protect forests specifically to support clean drinking water."[199] The bond proceeds are partly used to buy land

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[194] In addition, Atlanta's Department of Watershed Management leverages numerous federal grants from agencies such as EPA, FEMA, and the Army Corps, as well as the City's recently issued Environmental Impact Bond, to fund green stormwater infrastructure projects. *Municipal Option Sales Tax (MOST),* CITY OF ATLANTA DEP'T OF WATERSHED MGMT., https://www.atlantawatershed.org/most/ (last visited Aug. 5, 2021); *see also Atlanta Department of Watershed Management,* WATERNOW ALL., https://tapin.waternow.org/resources/atlanta-department-of-watershed-management/ (last visited Aug. 5, 2021).

[195] *Atlanta Department of Watershed Management, supra* note 194.

[196] *The Tap into Resilience Toolkit*, *supra* note 139 (scroll down to *What are my financing options?*, click on *Utility Costs & Revenue Sources*, click on *Special Fees*).

[197] *Green Stormwater Infrastructure,* CITY OF TUCSON, https://www.tucsonaz.gov/gsi (last visited July 29, 2021).

[198] *Id.*

[199] *Central Arkansas Water is First in World With Certified Green Bond to Protect Drinking Watershed for Water Quality,* CENT. ARK. WATER, https://carkw.com/news/announcements/central-arkansas-water-is-first-in-world-with-certified-green-bond-to-protect-drinking-watershed-for-water-

in CAW's watershed that is then protected by a conservation easement. This decentralized strategy helps the agency protect the community's drinking water from increased pollution that may result from development and other land disturbances.[200]

By establishing dedicated revenue streams, local governments can not only create long-term ways to fund LWI, but they can also potentially leverage these revenues to secure municipal debt, as appropriate, further increasing water managers to bring LWI to scale.

iii. Prioritizing LWI for Federal & State Grants and Loans

There are myriad federal programs providing support for water infrastructure of various types. By far the most significant of these programs are the Clean Water Act and Safe Drinking Water Act State Revolving Funds (SRFs), and the more recently enacted Water Infrastructure Finance and Innovation Act, known as WIFIA.[201] The SRFs assist communities with upfront cash to build water infrastructure and are administered by the states.[202] Thus, implementation is state specific. In contrast, while the WIFIA program eligibilities are coextensive with the SRFs, WIFIA loans are issued by EPA for projects of $20 million or more for large communities and $5 million or more for small communities.[203]

The SRFs have provided low-cost loans to utilities building water infrastructure for more than 30 years, amounting to more than $189 billion in project investments.[204] Since 2014 when it was created, the WIFIA program has closed 49 loans totaling $9.3 billion in credit assistance to help finance nearly $20 billion for water infrastructure projects.[205] Historically, these federal loans have been used to pay for conventional, grey infrastructure. Notably, by establishing the Green Project Reserve, the American Recovery Act of 2009 requires all Clean Water SRF programs to use at least 10% of their federal capitalization grant for projects that address GI, water and energy efficiency, or other environmentally innovative activities.[206]

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quality/#:~:text=Free%3A%20855.742.0309-,Central%20Arkansas%20Water%20is%20First%20in%20World%20With%20Certified%20Green,Drinking%20Watershed%20For%20Water%20Quality&text=When%20CAW%20issued%20the%20bond,the%20bond%20to%20Morgan%20Stanley (last visited July 29, 2021).

[200] Central Arkansas has a watershed protection fee. CENT. ARK. WATER, *Safe High Quality Low Cost Abundant Dependable Water, 2018 Financial Plan* 26, 53, 58, 89 (2018), https://tapin.waternow.org/wp-content/uploads/sites/2/2019/05/CAW-2018-Financial-Plan.pdf.

[201] Water Resources Reform and Development Act of 2014, Pub. L. No. 113-121, 128 Stat. 1193 (codified as amended in scattered sections of 33 U.S.C.).

[202] *See* 33 U.S.C. § 1383; 42. U.S.C. § 300j-12; *see also* EPA, *Learn About The Clean Water State Revolving Fund*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/cwsrf/learn-about-clean-water-state-revolving-fund-cwsrf (last visited Aug. 8, 2021); *How the Drinking Water State Revolving Fund Works,* U.S. ENV'T PROT. AGENCY, https://www.epa.gov/dwsrf/how-drinking-water-state-revolving-fund-works#tab-1 (last visited Aug. 8, 2021).

[203] 128 Stat. 1193.

[204] *EPA Recognizes Excellence and Innovation in Clean Water and Drinking Water Infrastructure Projects,* U.S. ENV'T PROT. AGENCY (Dec. 20, 2020), https://www.epa.gov/newsreleases/epa-recognizes-excellence-and-innovation-clean-water-and-drinking-water-1.

[205] *WIFIA Closed Loans,* U.S. ENV'T PROT. AGENCY, https://www.epa.gov/wifia/wifia-closed-loans (last visited Aug. 5, 2021).

[206] *Green Project Reserve Guidance for the Clean Water State Revolving Fund (CWSRF),* U.S. ENV'T PROT. AGENCY (Jun. 29, 2021, 3:27 PM), https://www.epa.gov/cwsrf/green-project-reserve-guidance-clean-water-state-revolving-fund-cwsrf.

Green Project Reserve

As part of the American Recovery Act of 2009, Congress established a requirement that all Clean Water SRF programs dedicate a portion of their federal capitalization grant for projects that address "green infrastructure, water and energy efficiency, or other environmentally innovative activities."[207] This requirement is commonly referred to as the "Green Project Reserve." Since 2012, the Green Project Reserve has been set at 10% of a state's federal SRF capitalization grant.[208] Notable to accelerating LWI investments, the EPA has determined that programs for:

- water efficient devices, such as plumbing fixtures and appliances;
- permeable pavement bioretention, trees, green roofs, and other practices such as constructed wetlands that can be designed to mimic natural hydrology and reduce effective imperviousness at one or more scales;
- greywater and other onsite reuse systems;
- efficient outdoor irrigation systems, including moisture and rain sensing systems;
- and integrated water resources management planning likely to result in a capital project

All qualify as Green Project Reserve projects. EPA has also determined that efficiency programs implemented via consumer incentives qualify for the Green Project Reserve and can be funded by SRF loans.[209]

Despite these expressly authorized types of LWI, only a limited amount of Green Project Reserve funding has been allocated to these distributed solutions. For example, a 2012 50-state survey of Green Project Reserve projects counted only one efficient water fixture program at the Suffolk County Community College in New York State that received SRF funds.[210] A 2015 EPA report found that between 2009 and 2015, 54% of Green Project Reserve funds went towards energy efficiency projects to increase energy efficiency at wastewater treatment plants; green infrastructure projects accounted for only 18% of Green Project Reserve funding.[211] Another 14% went toward water efficiency improvement projects such as conveyance system upgrades and installation of water meters.[212] While these projects are beneficial, significant opportunity remains to leverage Green Project Reserve funding for LWI.

In addition to these main federal and state loan programs, there are smaller grant and loan programs that make funding available for water infrastructure improvements, which include:

- WaterSMART Water and Energy and Efficiency Grants program[213]
- Land and Water Conservation Fund[214]

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[207] American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, 123 Stat. 115, 169.
[208] Water Quality Protection and Job Creation Act of 2021, 117 H.R. 1915 117th Cong. § 14 (2021).
[209] 2012 CLEAN WATER STATE REVOLVING FUND 10% GREEN PROJECT RESERVE: GUIDANCE FOR DETERMINING PROJECT ELIGIBILITY, U.S. ENV'T PROT. AGENCY, 1 (2012), https://www.epa.gov/sites/default/files/2015-04/documents/green_project_reserve_eligibility_guidance.pdf.
[210] PG ENV'T, LLC, COMPILATION OF TECHNICAL PROJECT INFORMATION AND PROJECT PERFORMANCE INFORMATION, WATERNOW ALL. 105 (2012), https://tapin.waternow.org/wp-content/uploads/sites/2/2021/05/PG-Environmental-LLC_ARRA-GPR-Compilation-Report-July-2012.pdf.
[211] CLEAN WATER STATE REVOLVING FUND GREEN PROJECT RESERVE REPORT, U.S. ENV'T PROT. AGENCY 17 (2012), https://www.epa.gov/sites/production/files/2015-04/documents/arra_green_project_reserve_report.pdf.
[212] *Id.*
[213] *WaterSMART Water and Energy Efficiency Grants*, U.S. BUREAU OF RECLAMATION (Aug. 5, 2021), https://www.usbr.gov/watersmart/weeg/.
[214] Conservation, Management, and Recreation Act, Pub. L. No. 116-9 (2019).

- Water and Waste Disposal Loan and Grant Program[215]
- Reducing Lead in Drinking Water Grant[216]
- Sewer Overflow and Stormwater Reuse Municipal Grants Program[217]
- Innovative Water Technology Grant Program[218]
- Economic development assistance programs[219]
- Individual state SRF grant programs[220]
- State infrastructure banks[221]

While these programs can be used to fund LWI, the eligibility criteria and application processes do not specifically prioritize LWI, and it is not clear whether utilities widely view these programs as potential sources of LWI financing. Water use efficiency and distributed GI projects implemented via consumer incentive programs are already eligible for SRF loans.[222] However, these funds are not accessed to finance LWI as often as they can and should be. Further, most states do not yet clearly explain that localized options are eligible for SRF loans.

The time for federal and state governments to reinvest in water infrastructure is now. Renewed federal investments should reflect 21st century needs and solutions. To this end, as outlined above, federal and state grant and loan programs should prioritize LWI as key strategies for building increased resilience at the local level.

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215 *Water and Waste Disposal Loan and Grant Program*, U.S. DEP'T OF AGRIC., https://www.rd.usda.gov/programs-services/water-waste-disposal-loan-grant-program (last visited Aug. 8, 2021); *see also* OFF. OF RURAL DEV., U.S. DEP'T OF AGRIC., WATER AND WASTE DISPOSAL LOAN AND GRANT PROGRAM (2017), https://www.rd.usda.gov/files/fact-sheet/RD-FactSheet-RUS-WEPDirect.pdf.

216 *Funding for Lead Service Line Replacement,* U.S ENV'T PROT. AGENCY, https://www.epa.gov/ground-water-and-drinking-water/funding-lead-service-line-replacement (last visited Aug. 8, 2021).

217 *Sewer Overflow and Stormwater Reuse Municipal Grants Program,* U.S ENV'T PROT. AGENCY, https://www.epa.gov/cwsrf/sewer-overflow-and-stormwater-reuse-municipal-grants-program (last visited Aug. 8, 2021).

218 42 U.S.C. § 300j-1a (2018).

219 *Funding Opportunities*, U.S ECON. DEV. ADMIN., https://www.eda.gov/funding-opportunities/ (last visited Aug. 21, 2019); *Notice of Funding Opportunity EDAP2018, Public Works and Economic Adjustment Assistance Programs,* U.S ECON. DEV. ADMIN., https://www.grants.gov/web/grants/view-opportunity.html?oppId=306735 (last visited Sept. 2, 2019); *Investment for Public Works and Economic Development Facilities*, FED. GRANTS WIRE, https://www.federalgrantswire.com/grants-for-public-works-and-economic-development-facilities.html#.XIcISBNKhTY (last visited Aug. 21, 2019).

220 *See* U.S ENV'T PROT. AGENCY, FUNDING WATER EFFICIENCY THROUGH THE STATE REVOLVING FUND PROGRAMS 2–8 (2003), https://bit.ly/2XDvmPU.

221 NICOLE DUPUIS & CHRISTINA K. MCFARLAND, NAT'L LEAGUE OF CITIES, PAYING FOR LOCAL INFRASTRUCTURE IN A NEW ERA OF FEDERALISM: A STATE-BY-STATE ANALYSIS 14–16 (20 16), https://www.nlc.org/sites/default/files/2016-12/NLC_2016_Infrastructure_Report.pdf.

222 *2012 Clean Water State Revolving Fund 10% Green Project Reserve: Guidance for Determining Project Eligibility, supra* note 209, at 3-4.

Accessing Billions in Untapped SRF Capacity

As described in a 2014 report by EPA's Environmental Finance Advisory Board (EFAB), "Utilizing SRF Funding for Green Infrastructure Projects," there are significant opportunities to expand the benefits provided by the SRFs by leveraging the very large amount of liquidity these funds generate year to year.[223] To date, state SRF administrators have mostly provided funding assistance to local utilities for eligible projects in the form of loans,[224] which are funded either from SRF equity or the proceeds of revenue bonds secured by SRF equity.[225] Under this model, the funding capacity for projects begins with **the sum of:**

(1) the state's allocation of annual SRF funds +
(2) the state's matching dollars +
(3) earned interest on SRF accounts +
(4) loan repayments and releases from bond reserves, if any +
(5) bond proceeds deposited into the state SRF account

Bond principal and interest payments and administrative costs[226] are subtracted from this amount to arrive at funding capacity in any one year. This funding model, and the methods used to determine SRF program's financial assistance capacity,[227] have been successful in financing nearly $189 billion in water infrastructure projects over almost three decades.[228]

However, this model does not fully take advantage of SRF cashflows or the liquidity that is consistently building on SRF balance sheets as loans are repaid and net earnings accumulate (net SRF cashflows). This is a missed opportunity to provide substantially greater financial support to cash-strapped local water utilities.

Nationally, annual net SRF cashflows exceeded $2 billion as of 2014—this presents a huge reservoir of opportunity.[229] State SRF administrators have the authority under current law to leverage annual net SRF cashflows to support additional project financing in the form of **loan guarantees.** This authority extends to localized water infrastructure strategies as well as conventional systems.

Net SRF cashflows, as well as equity held in liquid assets, can be used to develop guarantee capacity alongside SRF loan programs.[230] In other words, SRF administrators can take advantage of net program cashflows and available equity to build a new product option. That new product could take the form of a top-rated credit enhancement vehicle to support local water agencies' access to capital markets. This new vehicle would support 'sub-SRFs,' local revolving funds run by municipalities or regional agencies, to finance SRF-eligible projects by backing local

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223 *Utilizing SRF Funding for Green Infrastructure Projects,* ENV'T FIN. ADVISORY BD. 3 (2014), https://www.epa.gov/sites/production/files/2014-04/documents/efab_report_srf_funding_for_greeninfra_projects.pdf.
224 *Id.*
225 *Id.*
226 *Id.*
227 That is, the amount of SRF dollars deemed available in state's annual Intended Use Plan to fund eligible projects.
228 *2019 Annual Report: Building the Project Pipeline Clean Water State Revolving Fund,* U.S. ENV'T PROT. AGENCY 4 (2020), https://www.epa.gov/sites/production/files/2020-10/documents/2019_cwsrf_annual_report_9-10.pdf (stating CWSRFs have provided over $138 billion in funding); *see also Drinking Water State Revolving Fund Helping Protect America's Public Health Since 1997,* U.S. ENV'T PROT. AGENCY 2 (2019) (stating DWSRFs have provided over $41 billion in for infrastructure), https://www.epa.gov/sites/production/files/2020-10/documents/2019_annual_report_final_508compliant.pdf.
229 *Utilizing SRF Funding for Green Infrastructure Projects, supra* note 223, at 11.
230 *Id.*

bonds or providing loan guarantees. These leveraged SRF dollars can be used to finance projects whether publicly or privately owned, including LWI such as green roofs, infiltration basins, curb cuts, bioswales, wetland protection and restoration. It could also be used to support low-impact development practices that reduce stormwater discharge that may not otherwise have access to the market due to perceived risks with these innovative solutions.[231]

The 2014 EFAB report estimated that accessing this additional capacity could mean between $6 billion and $28 billion in potential GI funding capacity nationwide.[232] The report's key conclusion was that SRF administrators have a major opportunity to add new financial assistance capacity to assist underserved areas of the water infrastructure market without reducing existing future loan capacity.[233] This finding remains as valid today.

Action Item: Federal Government

- Create or update federal guidance for states to update their SRF eligibility criteria to prioritize funding for LWI.[234] Such federal guidance on how to revise SRF eligibilities to foster greater investment in localized water strategies would also provide consistency and clarity for water utilities applying for SRF loans.
- Update or create federal guidance for SRF administrators to develop expanded SRF financial assistance mechanisms that can lower costs and accelerate the pace of GI funding on a national scale as outlined in the 2014 Environmental Financial Advisory Board report.[235] Fulfilling this action item could position SRF administrators to access the full capacity of their funds and significantly increase the impact of SRF funding, particularly for green infrastructure.

Action Item: NGOs and Universities

Conduct a literature review of existing 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. Widely disseminating this summary report to SRF administrators and local utilities would help expand stakeholders' understanding of current SRF eligibilities and encourage use of SRF dollars for sustainable, localized water management projects.

iv. Leveraging State and Federal Tax Codes

As described above, the ability of water utilities to employ financial incentives to motivate their customers to participate in LWI programs is key to their success, particularly at a large scale. State and federal tax codes are central to these efforts. Tax incentives can be powerful catalysts for action; removing tax barriers is essential to avoid disincentivizing participation in otherwise strong programs.

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231 *Financing Green Infrastructure: A Best Practices Guide for the Clean Water State Revolving Fund,* U.S. ENV'T PROT. AGENCY 4 (2015), https://www.epa.gov/sites/production/files/2016-01/documents/final_gi_best_practices_guide_12-9-15.pdf.

232 *Utilizing SRF Funding for Green Infrastructure Projects, supra* note 223, at 4.

233 Financial assistance capacity for loans or guarantees is only impacted when the program incurs losses resulting from missed payments that are never recovered—a risk that all SRF programs currently accept.

234 Telephone Interview with Jim Gebhardt, *supra* note 172.

235 *Utilizing SRF Funding for Green Infrastructure Projects, supra* note 223, at 28.

On the federal side, the Internal Revenue Service's (IRS) definition of "gross income" is proving to be a major challenge for water resource agencies nationwide attempting to provide consumer rebates to deploy a wide variety of cost effective, climate resilient, and environmentally sustainable LWI. The IRS and U.S. Department of Treasury maintain that consumer rebates issued by public water utilities qualify as "income" for federal tax purposes notwithstanding that such rebates advance clear public interests. This has led utilities to conclude that they are required to issue 1099 tax forms to customers participating in rebate programs covering water use efficiency measures, GI installations, septic system upgrades, and more. It is widely believed among rebate program managers that taxing local water rebates as "income" operates as a major disincentive for private property owner participation in LWI programs. Indeed, in some areas, concern about federal taxation on rebates may be aggravating public health and safety challenges as homeowners refuse to participate in programs to swap out septic systems for upgraded, onsite treatment technology.[236]

Efforts to address this issue administratively since 2014 have not been successful as the IRS takes the position that only Congress can make the requisite IRS Code changes.[237] Federal legislation to address this issue and exempt a full range of financial incentives for decentralized and distributed water infrastructure strategies from federal income taxation has been introduced, but has not yet been enacted as of June 2021.[238]

On the state side, an exemption from state taxes for water rebates can also be important. California's tax code, for example, exempts rebates for water efficient toilets and clothes washers and certain plumbing for recycled water from both personal and corporate taxes.[239] However, California's current exemption does not cover all types of efficiency rebates, such as those for turf replacement or stormwater management.[240] The taxability of these rebates is a barrier to full scale implementation of these crucial programs. Efforts to remove this barrier at the California legislature have not yet been successful.[241]

On the other hand, state legislatures are beginning to show some willingness to use their tax codes to affirmatively support deployment of water infrastructure. These initiatives are particularly significant because they can provide vital support without draining local utility resources. Several examples of innovative state tax incentives include the following:

- **Georgia**, where residents can receive an income tax credit of 25% of the cost of the qualified equipment or $2,500, whichever is less, for purchasing energy/water-efficient equipment for residential or business use.[242] This credit extends to rainwater capture and greywater reuse systems as well.

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236 Telephone interview with Kevin McDonald, Conservation Project Director for Public Lands, The Nature Conservancy on Long Island (February 5, 2021)

237 Letter from the Internal Revenue Service to the Honorable Jared Huffman (Jan. 5, 2016) (citing Section 61(a) and Section 136 of the Internal Revenue Code).

238 *See* 117 H.R. 848 § 305 (2021).

239 CAL. REV. & TAX CODE §§ 17138, 17138.1, 24308.1; *see also Taxability of Financial Incentives: State Tax Issues*, WATERNOW ALL., https://tapin.waternow.org/resources/taxability-of-financial-incentives-state-tax-issues/ (last visited Aug. 8, 2021).

240 California adopted a state income tax exemption for turf change out rebates from 2014 to 2019 (Cal. Rev. & Tax Code §17138.2), but this was allowed to lapse in 2019 over the objections of a large statewide coalition of water utilities.

241 *See* AB 533 (2019).

242 GA. REVENUE & TAX CODE § 48-7-40.29

- **Maryland**, where counties or the City of Baltimore are authorized to establish a property tax credit against local property taxes when a sediment control pond or stormwater management structure is required by law to be built on that property.[243]
- **Texas**, where the legislature established a sales tax exemption for equipment, services and supplies for rainwater harvesting, water recycling, desalination, brush control, or precipitation enhancement.[244] In addition, residents are exempt from property tax reassessments for the implementation of "approved water conservation initiatives, desalination projects, or brush control initiatives."[245]

Action Item: Federal and State Governments

- Update the IRS code to exempt consumer incentives designed to implement LWI from federal income tax.
- Create tax incentives for residents and businesses to invest in LWI.

Federal and state tax laws provide two leverage points for accelerating investments in LWI. First, updating income tax codes to exempt consumer incentives for installing LWI on residential property would remove a significant barrier to full-scale LWI implementation. Second, embedding incentives for private-property-owner LWI investments in federal and state tax codes would supplement local incentives and further encourage large-scale LWI deployment.

3. Conclusion

Local ratepayers bear major financial responsibility for water infrastructure nationwide, but there are pathways available to utilities to ease this burden. Municipal bonds, including EIBs and green bonds, are now fully available to finance less expensive WI using Regulated Operations accounting. Stormwater and other dedicated fees are becoming more politically palatable, and state SRFs have more options than are currently being utilized to support LWI investments. Modest changes in federal and state tax codes can both provide new incentives and remove unnecessary barriers to local action.

Roundtable participants identified additional action items, highlighted in Section III.A.2 above, to further clear the path to financing localized strategies in a way that realizes their full capability in providing drinking water, wastewater, and stormwater services. These action items are catalogued in the below matrix in Section IV along with the corresponding recommended actors and localized water strategies. If utilities, the federal government, NGOs, and universities complete these tangible tasks, it could meaningfully accelerate investments in LWI.

B. INSTITUTIONAL CHALLENGES

1. Barriers to LWI Acceptance and Adoption

Despite the multiple benefits of LWI described in Section II.B above, water resource agencies—drinking water, wastewater, stormwater, or some combination thereof—face significant challenges as institutions in pivoting to adopt LWI at larger scales. There is often a lack of institutional will to view these strategies as infrastructure, due in part to the way in which water resources have traditionally

[243] MD. TAX-PROP. CODE § 9-224
[244] TEX. TAX CODE: PROP. § 151.355
[245] *See* TEX. TAX CODE §§ 11.32, 151.355; *see also Taxability of Financial Incentives, supra* note 239. The exemption applies as long as the local taxing entity has adopted an ordinance identifying eligible projects.

been managed and regulated;[246] that is, through a compartmentalized approach that separates surface water, stormwater, wastewater, drinking water, and groundwater—the antithesis of a One Water approach. This siloing favors centralized water infrastructure because it is designed to serve a limited purpose, which similarly aligns with water utilities traditionally serving a specific purpose.[247] Further, due to the large fixed costs of centralized water infrastructure, agencies favor maintenance and upgrades to existing, centralized systems over introducing new LWI.[248] Put differently, a great deal of water utility institutional muscle memory has developed over many years. This can be laudable for an industry with a primary mandate grounded in public health and safety. At the same time, expanding the water sector's vision of infrastructure to include LWI, and associated benefits, suggest that it can be useful to identify the major institutional barriers to greater adoption of LWI, particularly now as the One Water concept is gaining momentum. The challenge will be how best to operationalize this expansion.

While not intended to be comprehensive, this initiative has identified six primary institutional issues that can operate as barriers to larger-scale adoption of localized water strategies:

1. **Lack of appropriate decision support tools and guidance**. Roundtable participants identified a lack of guidance or decision support tools designed to help decision-makers and managers identify when and/or which LWI is a technically appropriate approach to meeting a particular water management need. They noted that existing guidance and support tools are mainly focused on conventional infrastructure. Meaningful adoption of LWI will thus require "institutional decision-making criteria" that accurately capture the full range of LWI options, or suite of options, and well as costs and benefits of LWI, including the technological advancements, environmental impacts, and flexibility of these strategies.[249] For example, conventional cost-benefit analyses often underestimate the social and environmental benefits of decentralized strategies.[250]
2. **Compartmentalized water management**. As mentioned above, historically local governments have taken a compartmentalized approach to managing surface water, stormwater, wastewater, drinking water, and groundwater. When surface water, stormwater, wastewater, drinking water, and groundwater within a single community or region are all separately managed by separate utilities or entities with independent mandates, the natural segmentation of operations, priorities, and approaches is inevitable and can make it difficult to implement an integrated approach to water resource management. Agency silos are a structural impediment to LWI adoption, and an integrated approach to water resource management can facilitate greater implementation of localized strategies because LWI operates across surface water, stormwater, wastewater, drinking water, and groundwater systems.[251]
3. **Lack of collaboration with other city departments and community groups.** As with siloing across water utilities, LWI investment and adoption depends on water utilities' collaboration

[246] Leigh & Lee, *supra* note 7, at 10.
[247] *See* CLEAN WATER AM. ALLIANCE, *supra* note 7, at 6; Leigh & Lee, *supra* note 7, at 2; THE JOHNSON FOUNDATION AT WINGSPREAD, *supra* note 15, at 18.
[248] Leigh & Lee, *supra* note 7, at 10.
[249] Leigh & Lee, *supra* note 7, at 10–11 (2019) (explaining "conventional cost-benefit analyses underestimate the social and ecological benefits" of LWI and that a short-term time horizon can undermine perceived cost-efficiencies); *see also* STRATEGY TO OPTIMIZE RES. MGMT. OF STORMWATER, ENHANCING URBAN RUNOFF CAPTURE AND USE 40 (2017) [hereinafter STORMS REPORT] (explaining capture and use systems are often undervalued due to the lack of a standard methodology for analyzing environmental benefits and costs).
[250] *Id.*
[251] DAVID LEWIS FELDMAN, THE WATER-SUSTAINABLE CITY 56–57 (2017); *see* Leigh & Lee, *supra* note 7, at 10.

not only across water utilities (overcoming water agency siloing), but also on collaboration between other city departments, such as planning and transportation. In addition, LWI is most effectively implemented when done in partnership with local community groups.[252] This type of collaboration builds community support for LWI and can better facilitate its implementation, but also presents challenges in the time and resources needed for such broad collaboration efforts. As explained below, it also necessitates water utilities taking on new, and perhaps unfamiliar, roles and responsibilities.

4. **Difficulty accessing water management potential of private property.** LWI is innately about partnerships with a broad array of private property owners, from businesses, to institutions, to residences. While the benefits of distributed infrastructure are significant, ensuring installations on many different properties presents new and different challenges, even for utilities accustomed to maintaining distributed systems. The need to monitor and, potentially, maintain privately-owned systems requires utilities to establish agreements with property owners and have personnel trained in servicing the different technology that may be used in operating distributed systems.[253]
5. **Outdated business models**. Traditional utility business models rely on selling a certain amount of water in order to generate needed revenue streams for operation and maintenance, and capital investments. This can be at odds with reduced water usage that results from water-saving strategies.[254] Thus, utilities may be reticent to adopt LWI without updated business models that decouple water rates from revenue.
6. **Limited scope of water utility role and capacity**. Adoption of LWI, particularly at a larger scale, involves considerably different jobs and functionality than conventional water infrastructure. In addition to engineers and water quality technicians, LWI may require experts in landscaping, urban planning, different types of new technology, and in most cases, considerably expanded capacity in public outreach, partnerships, and communications. Moving into these more unconventional areas can not only be challenging from a resource perspective, but can also be uncomfortable and feel outside of what the agency was established to do. Challenges presented by the need to reorganize roles and responsibilities and provide training with respect to planning, operation, funding, and maintenance of LWI systems pose barriers to adoption of LWI.[255]

In identifying these six primary institutional issues that can operate as barriers to LWI, roundtable participants also highlighted corresponding approaches and action items water utilities, and the interdisciplinary ecosystem that support these utilities, can take to accelerate the institutional shift towards implementing LWI as infrastructure. These are detailed in the next section.

2. Recommendations: Build Institutional Capacities to Foster Adoption of Localized Water Infrastructure

Addressing the institutional challenges outlined above entails long-term transformation of deep-rooted municipal and utility *modus operandi.* For purposes of this analysis, we focus on three strategy sets that roundtable participants identified 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 in the water space: 1) development of

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[252] *E.g.*, CLEAN WATER AM. ALLIANCE, *supra* note 7, at 3.
[253] *See* THE JOHNSON FOUNDATION AT WINGSPREAD, *supra* note 15, at 10.
[254] *See id.* at 18.
[255] *See, e.g.*, Leigh & Lee, *supra* note 7, at 10; *id.* at 10.

new decision-support tools; 2) creation of alternative water service business models; and 3) establishment of a new model of interagency and interdisciplinary coordination and collaboration.

i. New Decision-Support Tools

Expanding water infrastructure options requires that municipal and utility leaders have credible and reliable tools, protocols, and guidance on which to base their decisions about implementation and investment. As briefly described above, this can include cost benefit protocols that include, for example, life cycle costs as well as the value of building climate resilience. In the absence of such tools, managers and political decisionmakers fall back on analytical approaches designed for a substantially more limited set of strategic and financial options.

One recommendation for addressing this is for NGOs, universities, and the federal government (specific agencies such as EPA and the Bureau of Reclamation) to develop tools to assist decisionmakers in their evaluation of various LWI. Roundtable participants agreed that these tools should:

- Account for the full range of the advantages and disadvantages of each localized water strategy (i.e., consider benefits such as those described in Section II.B above and do not interpret water savings as reduced revenues).[256]
- Use a time horizon that accounts for localized water strategy's cost efficiency over its lifetime.[257]
- Account for climate variability projections.[258]
- Evaluate impacts of land use decisions on water resources.[259]
- Forecast demand to accurately reflect downward trend in water use and integrate factors such as efficiency, change in economic activity, and denser development.[260]

With respect to demand forecasting, roundtable participants emphasized the importance of looking back to see how prior demand forecasts compare to actual demand.[261] This would provide an opportunity to learn from errors in demand forecasting and for subsequent adjustment.[262] This is particularly critical at the local agency level, as one participant expressed concern that demand forecasting would become increasingly difficult as outliers become more prevalent, due, e.g., to climate change.[263]

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[256] Leigh & Lee, *supra* note 7, at 10; DIRINGER ET AL., *supra* note 102.
[257] *Id.* at 11.
[258] THE JOHNSON FOUNDATION AT WINGSPREAD, *supra* note 15, at 17.
[259] Comment by Susan Lien-Longville, Dir., San Bernardino Valley Mun. Water Dist., at Workshop Roundtable (Sept. 13, 2019).
[260] Comment by Heather Cooley, Dir. of Research, Pac. Inst., at Workshop Roundtable (Sept. 13, 2019).
[261] Telephone Interview with Heather Cooley, Dir. of Research, Pacific Institute (Nov. 7, 2019); Telephone Interview with Sanjay Gaur, *supra* note 156.
[262] Telephone Interview with Heather Cooley, *supra* note 261.
[263] Comment by Sanjay Gaur, Vice President, Raftelis, at Workshop Roundtable (Sept. 13, 2019) (explaining that most CA water agencies expected water demand to rebound after the 2015 drought, but demand is still below 2013 levels).

Action Items: NGOs, Universities, and the Federal Government

- Develop tools to evaluate a broader range of the advantages and disadvantages of localized water strategies.[264] For example, the Pacific Institute has proposed a framework for embedding multiple benefits and costs into decision making and is applying the framework through test cases.[265]
- Develop a tool to determine the appropriate type of decentralized water reuse for community conditions and needs.[266] This type of resource could be built as part of the implementation of the federal Water Reuse Action Plan.
- Develop a matrix that matches localized water strategies with the different applications (residential, commercial, etc.), the various challenges the strategies can address, data needs, and financing tools.[267] This can help local decisionmakers view these options as "infrastructure" appropriate for long-term investment.
- Refine existing decisionmaking frameworks for implementing LWI that best fit a community's particular needs. In 2019, WaterNow developed a high-level, ten-part decisionmaking framework for deploying LWI at a larger scale.[268] This framework can be refined to reflect real-world application and to include additional guidance and resources.

Action Item: State Governments

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.[269] For example, California,[270] Colorado,[271] Texas,[272] and Arizona[273] have state-level water supply planning laws that could be updated to incorporate refined demand forecasting methods.

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[264] Comment by Bill McDonnell, Manager of Water Efficiency, Metro. Water Dist. of S. Cal., at Workshop Roundtable (Sept. 13, 2019).
[265] *A Multi-Benefit Approach to Water Management,* Pacific Institute (Jun. 30, 2021 2:34 PM), https://pacinst.org/multiplebenefits/.
[266] Comment by Heather Cooley, *supra* note 260 (explaining that San Francisco looked at where there was inadequate reuse and specifically incentivized reuse in those areas).
[267] *Id.*
[268] *The Tap into Resilience Toolkit,* WATERNOW ALL., https://tapin.waternow.org/toolkit/#decision_framework (last visited Aug. 8, 2021).
[269] Comment by Cynthia Koehler, Exec. Dir., WATERNOW ALL., at Workshop Roundtable (Sept. 13, 2019).
[270] CAL. WATER CODE, §§ 10610-10656, 10608.
[271] COLO. WATER CONSERVATION ACT OF 2004, H.B. 04-1365 (2004).
[272] TEX. WATER CODE, § 13.146; TEX. ADMIN. CODE, Title 31, Ch. 363, § 363.15.
[273] See, e.g., ARIZ. REVISED STATUTES §§ 9-461.05, 45-342.

Development of these decision-support tools requires data generation, collection, and/or analysis where data gaps exist.[274] Roundtable participants emphasized the need for data standardization in order to be able to integrate, disseminate, and share data.[275]

Action Item: NGOs, Universities, and the Federal Government

- Generate, collect, and analyze data on:
  - How LWI meet water supply, stormwater, and wastewater management needs[276]
  - Environmental, economic, and social benefits of LWI[277]
  - How LWI meet public health and safety standards[278]
  - How capital costs, performance, and sustainability/resiliency characteristics of LWI compare to centralized systems[279]
  - The job creation potential of various LWI.[280]
- Create a "data dictionary" for public water data that includes definitions, standards, and data collection protocols to "promote interoperability, efficiency, and user-flexibility"[281]

There was consensus that it would be highly beneficial to develop tools that systematically measure the performance of LWI by using consistent metrics and evaluation of multiple benefits and other factors described above. This would help to ensure that LWI are accurately evaluated against conventional alternatives in water resource management decisions. Further, evaluating the full range of multiple benefits can bring disparate groups together and create opportunities for co-financing solutions while helping communicate and build opportunities for local partnerships.[282] The importance of collaborations is discussed in Section III.B.iii below.

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274 *See, e.g. Overcoming Barriers to Green Infrastructure,* U.S. ENV'T PROT. AGENCY. https://www.epa.gov/green-infrastructure/overcoming-barriers-green-infrastructure (last visited Aug. 8, 2021); *see also* Strifling, *supra* note 7, at 430; Mukta Sapkota et al., *An Overview of Hybrid Water Supply Systems in the Context of Urban Water Management: Challenges and Opportunities*, 7 WATER 163–64 (2015) (identifying cross contamination and oversight issues as potential public health barriers to onsite reuse); Mare Lohmus & John Balbus, *Making Green Infrastructure Healthier Infrastructure,* 5 INFECTION ECOLOGY & EPIDEMIOLOGY 2–7 (2015) (identifying the potential of increased populations of ticks and mosquitos from increased green space, algae in urban ponds, and urban trees potentially increasing exposure to allergens as potential health impacts of green infrastructure); PAC. INST., *supra* note 53, at 28.

275 Comment by Joone Lopez, Gen. Manager, Moulton Niguel Water Dist., at Workshop Roundtable (Sept. 13, 2019); comment by Heather Cooley, *supra* note 260; comment by David Feldman, Urban Planning and Pub. Policy & Dir. of Water UCI, UCI Sch. of Social Ecology at Workshop Roundtable (Sept. 13, 2019); and Doug Bennett, Conservation Manager, S. Nev. Water Auth., at Workshop Roundtable (Sept. 13, 2019).

276 *See Overcoming Barriers to Green Infrastructure, supra* note 274; *see also* Strifling, *supra* note 7 at 430.

277 *See id.*

278 Mukta Sapkota et al., *supra* note 274; Lohmus & Balbus, *supra* note 274; PAC. INST., *supra* note 53, at 28.

279 THE JOHNSON FOUNDATION AT WINGSPREAD, *supra* note 15, at 15.

280 Comment by Bruce Reznik, Exec. Dir., L.A. Waterkeeper, at Workshop Roundtable (Sept. 13, 2019).

281 *Internet of Water Revisited,* THE ASPEN INST. at 18, 22 (2019); *see* Telephone Interview with Heather Cooley, *supra* note 261.

282 Comment by Heather Cooley, *supra* note 260; *see also* SARAH DIRINGER & MORGAN SHIMABUKU, PACIFIC INST. STACKED INCENTIVES: CO-FUNDING WATER CUSTOMER INCENTIVE PROGRAMS (2021).

Action Item: Utilities Working with Technology and University Partners

Invest in tools and technologies that harness real-time data to inform improved rate modeling and decisionmaking.[283] To fulfill this action item, utilities should work with technology and university partners to address utility data access and usage challenges. The California Data Collaborative and the Internet of Water provide examples of this type of effort.[284] California's work to implement its Open and Transparent Data Act (AB 1755) and create the Water Data Consortium serves as another example.[285]

CASE STUDY

Developing Decision-Support Tools: Austin Water

Challenge: Recurring drought and climate change

Localized Water Strategy: Onsite water reuse

Decision-Support Tool: The City of Austin's "Water Forward Plan" employed disaggregated demand forecasting models as well as projections of the effects of climate change to match local water supplies with predicted need.[286] Using the disaggregated demand forecasting model helped the planners understand how much current and future demand could be met by onsite non-potable sources. Without this model only rough estimates of water demand for non-potable uses were available.

Results: Austin's disaggregated analysis enabled the City to evaluate centralized and decentralized options and develop recommendations for a 100-year integrated water plan that prioritizes conservation and efficiency strategies.[287] For example, by 2040, Austin will produce, capture, and treat 20 times more water from buildings than any other city in the U.S.[288] This will amount to 10 million gallons per day of decentralized non-potable reuse.

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283 Comment by Lindsey Stuvick, Water Efficiency Manager, Moulton Niguel Water Dist., at Workshop Roundtable (Sept. 13, 2019).

284 *The Future of Water Management,* CAL. DATA COLLABORATIVE, http://californiadatacollaborative.org/ (last visited Aug. 8, 2021); *see also Internet of Water*, NICHOLAS INST. FOR ENV'T POLICY SOLUTIONS, https://nicholasinstitute.duke.edu/internet-of-water (last visited Aug. 8, 2021).

285 *AB 1755: Open and Transparent Water Data Platform for California,* CAL. DEP'T OF WATER RES., https://water.ca.gov/ab1755 (last visited Aug. 8, 2021).

286 *Water Forward*, AUSTIN WATER, http://austintexas.gov/waterforward (last visited Aug. 8, 2021).

287 *See* AUSTIN WATER, WATER FORWARD INTEGRATED WATER RESOURCE PLAN 1-4, 3-9, 3-11 (2018), http://austintexas.gov/sites/default/files/files/Water/WaterForward/Water_Forward_Plan_Report_-_A_Water_Plan_for_the_Next_100_Years.pdf.

288 *Id.* at 6-22; *see also* Alyssa Goard, *Austin Wades Out of Historic Floods, Looks to Expand Water Sources,* KXAN (Nov. 14, 2018), https://www.kxan.com/news/local/austin/austin-wades-out-of-historic-floods-looks-to-expand-water-sources/1593925261/.

CASE STUDY

Developing Decision-Support Tools Case: Philadelphia Water Department (PWD)

Challenge: Combined sewer overflows

Localized Water Strategy: Distributed GI

Decision-Support Tool: In developing its GI program, PWD employed a triple-bottom line analysis that measured the economic, social, and environmental benefits to capture the full spectrum of benefits and increase community support for localized projects.[289]

Results: In May 2019, the Sustainable Business Network of Greater Philadelphia (SBN) released an evaluation of triple-bottom line impacts of Philadelphia Water's Green City, Clean Waters program.[290] The analysis found significant economic, social, and environmental benefits to the City, including, $40 billion in total economic (direct, indirect, and induced) impact in terms of 2018 dollars, 1,160 jobs on average per year, and increased open space with 65% of GI projects located in low- and moderate income neighborhoods, among others.[291]

ii. Alternative Water Utility Business Models

A particular institutional challenge arises for public water providers in connection with increased efforts to deploy reuse and other water saving technologies. While it is becoming widely acknowledged that "conservation is the cheapest source of water,"[292] for many, if not most, municipal water suppliers, declining water sales equates to declining revenues. This is a major issue since upwards of 80% of water utility costs are fixed.[293] Moreover, like other forms of water infrastructure, localized reuse and efficiency measures require investment. For these reasons, utilities are often deterred from investing in these strategies notwithstanding that long-term, reduced water demand can generate substantial financial savings for ratepayers, as well as other co-benefits described above.[294]

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289 *See* GCCW TRIPLE BOTTOM LINE IMPACT, *supra* note 88; *see also* STORMS REPORT, *supra* note 249, at 37.
290 GCCW TRIPLE BOTTOM LINE IMPACT, *supra* note 88, at 13.
291 *Id.*
292 *See, e.g.*, SAN ANTONIO WATER SYSTEM, WATERNOW ALL., https://tapin.waternow.org/wp-content/uploads/sites/2/2019/02/WaterNow_SanAntonio_CaseStudy_013019.pdf; Koehler & Koch, *supra* note 144, at 55-56.
293 *See* SOQUEL CREEK WATER DIST., CUSTOMERSELECT RATE MODEL EVALUATION 12–15 (2018); Telephone Interview with Sanjay Gaur, *supra* note 156.
294 WATER RESEARCH FOUND., RATES REVENUES 7 (2011).

Water utilities are not locked into a one-size-fits-all business model, however, and increasingly, they are developing alternative business models designed to maintain fiscal health without relying on volumetrically-driven water sales. There are a number of ways to accomplish this, including budget-based rate structures and "shifting away from the single-purpose service provider model and becoming multi-purpose utilities that provide a variety of services at different scales."[295] The energy sector shifted in a similar way—as small-scale systems became more prevalent, power utilities began providing more distribution and grid management services.[296] Some recommendations for alternative business models include:

- Providing services to operate and/or maintain LWI systems by:[297]
  - Building public-private partnerships to monitor and maintain LWI systems[298]
  - Providing LWI installation services[299]
  - Providing consulting services on ordinance coordination[300]
- With respect to drinking water utilities, decoupling rates from revenues by implementing one or a combination of conservation-oriented rate structures:[301]
  - Repeal of volume discounts
  - Increasing block or tiered rates
  - Seasonal rates
  - Drought pricing
  - Flat fee combined with a variable, tiered rate
  - Water budgets
  - Fixed variable rates[302]
- With respect to internal agency structures, updating institutional hierarchies and traditional roles to reflect 21st century needs by:[303]
  - Evaluating where staff capacities are most impactful on meeting utility and community goals
  - Realigning departments and roles to match utilities' priorities
  - Refreshing the utility's stated mission to correspond with community values

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295 THE JOHNSON FOUNDATION AT WINGSPREAD, *supra* note 15, at 18.
296 *Id.*
297 *Id.*
298 *See, e.g.*, CLEAN WATER AM. ALLIANCE, *supra* note 7, at 34.
299 THE JOHNSON FOUNDATION AT WINGSPREAD, *supra* note 15, at 18.
300 *Id.*
301 WATER RESEARCH FOUND., *supra* note 294; OFF. OF WASTEWATER MGMT., U.S. ENV'T PROT. AGENCY, EPA 832-F-03-027 WATER AND WASTEWATER PRICING 5 (2003), https://www.azwifa.gov/download.aspx?path=publications/&file=PricingGuide.pdf; AM. RIVERS INC., *supra* note 27, at 15–16; WATER RESEARCH FOUND., UTILITY FINANCE REVENUE FACT SHEET, TRADITIONAL AND NEW SOURCES OF WATER REVENUE 3 (2017); *see also* SOQUEL CREEK WATER DIST., *supra* note 293; Telephone Interview with Sanjay Gaur, *supra* note 156.
302 Water utilities have not yet successfully adopted a fixed, variable rate structure. An attempt to do so by the City of Davis was challenged by Yolo Ratepayers for Affordable Public Utility Services in a 2013 lawsuit, which was resolved in a settlement agreement requiring, among other things, that the City adjust its rate structure. *See Water Rate Table (2016-2019)*, DAVIS, CAL., https://www.cityofdavis.org/city-hall/public-works-utilities-and-operations/water/water-rates (last visited Aug. 8, 2021).
303 Telephone Interview with Joone Lopez, Gen. Manager & Lindsey Stuvick, Water Efficiency Manager, Moulton Niguel Water Dist. (Nov. 26, 2019); comment by Joone Lopez, *supra* note 275.

- Providing LWI job training programs that can:[304]
    - Create new local jobs, including for vulnerable youth[305]
    - Garner greater confidence in LWI[306]
    - Reduce the costs associated with acquiring skilled personnel to implement, operate, and monitor LWI systems

Water utilities across the nation, including the examples from Colorado and California provided below, demonstrate how development and implementation of alternative business models has allowed drinking water utilities to encourage water conservation and efficiency and better weather drought, while still maintaining revenue stability. As more water utilities demonstrate the long-term benefits of alternative business models that do not rely on selling water as a commodity, there will be greater opportunities to increase adoption of LWI.

Fixed Variable Rates

In considering alternative business models, water utilities look to balance three overlapping needs: revenue stability, affordability, and water conservation.[307] One roundtable participant identified fixed variable rate structures as a rate structure that is able to strike an appealing balance between each of these needs.[308] A fixed variable rate structure involves two elements. A charge based on customers' historical highest use (the "variable" component).[309] The customer then pays this charge for the duration of the billing period (the "fixed" component).[310] This rate structure incentivizes conservation because the variable charge is higher for customers with higher historical water usage, and it provides revenue stability because customers pay that charge throughout the fixed billing period.[311] Furthermore, this rate structure addresses affordability concerns by allowing the customer to control their water bill.[312] Fixed variable rate structures may increase administrative costs as the charge varies by customer.[313] California's Proposition 218[314] may pose an additional obstacle. Soquel Creek Water District explored the possibility of implementing this rate structure; however, the water district ultimately decided not to move forward with it, citing concerns regarding compliance with Proposition 218.[315] However, a fixed variable rate structure would not face Proposition 218 challenges in other states, and may, nonetheless, survive a challenge in California.

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[304] *See, e.g.*, DIRINGER ET AL., *supra* note 102, at 17, 28, 35; *see also* ELI MOORE ET AL., PAC. INST., SUSTAINABLE WATER JOBS: A NATIONAL ASSESSMENT OF WATER-RELATED GREEN JOB OPPORTUNITIES 32, 34, 37, 38, 40 (2013), https://pacinst.org/wp-content/uploads/2014/05/sust_jobs_full_report.pdf.

[305] Telephone Interview with City of Hoboken Staff (May 9, 2019); Telephone Interview with Andy Kricun, Exec. Dir./ Chief Eng'r, Camden Cnty. Municipal Util. Auth. Staff (Apr. 16, 2019).

[306] One roundtable participant noted that, as demonstrated in the context of centralized systems, the more broadly recognized a training program is, the greater confidence it can build in LWI. Telephone Interview with David Smith, Assistant Water Dir., Env't Prot. Agency Region 9 (Dec. 6, 2019).

[307] Telephone Interview with Sanjay Gaur, *supra* note 156.

[308] *Id.*

[309] *See* SOQUEL CREEK WATER DIST., *supra* note 293

[310] *Id.*

[311] *See* SOQUEL CREEK WATER DIST., *supra* note 293; Telephone Interview with Sanjay Gaur, *supra* note 156.

[312] *Id.*

[313] Telephone Interview with Sanjay Gaur, *supra* note 156.

[314] CAL. CONST. ART. XIIIC §§ 1-2.

[315] Telephone Interview with Sanjay Gaur, *supra* note 156; *see* SOQUEL CREEK WATER DIST., *supra* note 293. The city of Davis attempted to implement a similar rate structure in 2013 and was sued for violating Proposition 218. That case settled in 2014 leaving the rates intact, with an agreement that the plaintiffs would not seek a referendum to repeal the rates. *See* CITY OF DAVIS, MINUTES OF THE DAVIS CITY COUNCIL (August 26, 2014),

CASE STUDY

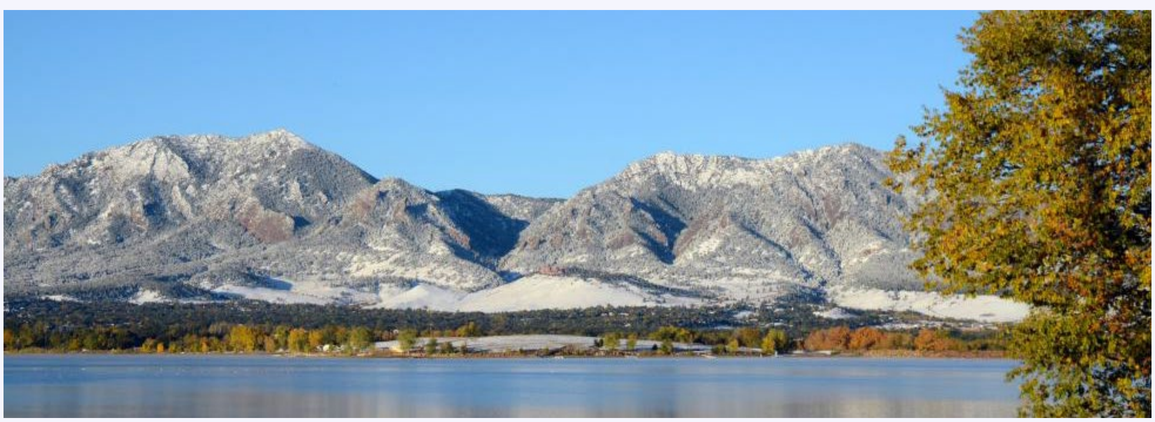
Creating Alternative Business Models for Utilities: Boulder Water Utility

Challenge: Drought

Localized Water Strategy: Conservation and water use efficiency

Alternative Business Model: Since 2018, the City of Boulder, Colorado has used a budget-based rate structure. A customer's "water budget" reflects the amount of water that customer is expected to use during a specific month. Each customer's water budget is different based on their unique water needs, as well as their past usage levels. The water budget is then applied to the City's block-rate structure, which ranges from $3.65 / 1,000 gallons to $24.35 / 1,000 gallons. A customer's monthly usage as compared with their water budget determines whether they move into the next block. For example, a customer that uses 61% of their water budget in a month will be in Block 2; if they reduce their water use to less than 60% of their budget, they'll move down into Block 1—the lowest rate block.[316]

Results: With its budget-based rate structure, Boulder has decoupled water rates from revenues.[317] The City's water budget rate structure also provides the City and water users the flexibility to quickly respond to even moderate drought and encourages water conservation.[318] To help customers move to lower rate blocks, Boulder offers a number of efficiency and conservation rebates and programs. For example, outdoor irrigation consultations save an average of 5,000 gallons per household in the first year following the consult.[319] Installation of 900 high-efficiency toilets saves an average of 5,000 gallons per household.[320] The City plans to build on its ability to use data from its billing system to measure gallons of water saved as well as evaluating the effectiveness of its conservation programs and its water budget block rate structure.



http://documents.cityofdavis.org/Media/Default/Documents/PDF/CityCouncil/CouncilMeetings/Minutes/2014/Minutes-2014-08-26-City-Council-Meeting.pdf.

316 WATER BUDGETS – FREQUENTLY ASKED QUESTIONS, CITY OF BOULDER, COLO., https://www-static.bouldercolorado.gov/docs/water-budgets-faqs-1-201307111223.pdf?_ga=2.57606954.1608282507.1594320964-205470500.1594320964.

317 *Monthly Water User Charges*, CITY OF BOULDER, COLO. (AUG. 10, 1:15 PM), https://bouldercolorado.gov/services/water-utilities#section-244; *see also* BOULDER WATER UTILITY, WATERNOW ALL. (2019), https://tapin.waternow.org/wp-content/uploads/sites/2/2019/02/WaterNow_Boulder_CaseStudy_021219.pdf.

318 *Id.*

319 BOULDER WATER UTILITY, *supra* note 317.

320 *Id.*

CASE STUDY

Creating Alternative Business Models for Utilities: Moulton Niguel Water District (MNWD)

Challenge: Recurring drought and limited local supply

Local Water Strategy: Conservation

Alternative Business Model: In 2011, MNWD began transitioning to a water budget-based rate structure, where customers receive a customized, monthly water budget designed to meet their indoor and outdoor needs. [321] Customers who consume water efficiently and stay within their budget enjoy the benefit of low water rates, while over-budget water use is billed at increasingly higher unit costs.[322] In addition to this updated rate structure, MNWD updated its organizational structure to integrate traditionally siloed departments and foster integrated management of key internal functions. For example, MNWD developed a department manager role to oversee utility finance, conservation programs, and rates.[323] This involved evaluating utility needs, staff capacities, and community values and learning from those outside of the water sector.[324] MNWD also employed a proactive approach to outreach and engagement with its customer base.[325] Further, because the revenue generated from the higher rates customers pay for using water inefficiently is invested in conservation and efficiency programs in the community, customers have been able to see how that revenue is used.[326]

Results: With a budget-based rate structure, MNWD has decoupled rates from revenue.[327] MNWD collects two distinct charges from customers: a service charge to cover the majority of the District's fixed costs and a volumetric charge to cover the cost of water. Separating these revenue streams has allowed the District to achieve greater water use efficiency and revenue stability.[328] During the 2012 to 2016 drought, MNWD did not see a loss in revenue like many other water agencies did.[329] Further, the conservation and efficiency achieved with this rate structure has reduced overwatering and resulted in a decrease in dry weather runoff, which in turn reduces the amount of polluted urban runoff reaching surface waters.[330] Linking its finance considerations with conservation efforts as well as rate issues has been an important opportunity for meaningful integrated water management at MNWD.[331]

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321 Telephone Interview with Joone Lopez, Gen. Manager and Drew Atwater, Dir. of Fin. & Water Res., Moulton Niguel Water Dist. (Mar. 16, 2020).
322 *Id.*
323 Comment by Joone Lopez, *supra* note 275.
324 Telephone Interview with Joone Lopez & Lindsey Stuvick, *supra* note 303.
325 Telephone Interview with Joone Lopez & Drew Atwater, *supra* note 321.
326 *Id.*
327 Comment by Joone Lopez, *supra* note 275.
328 Telephone Interview with Joone Lopez & Drew Atwater, *supra* note 321.
329 Dan Keppen & Laura Ziemer, *Why a National Infrastructure Bill Needs Money for Western Irrigation,* The New Humanitarian (May 25, 2017), https://deeply.thenewhumanitarian.org/water/community/2017/05/25/why-a-national-infrastructure-bill-needs-money-for-western-irrigation.
330 Telephone Interview with Joone Lopez & Drew Atwater, *supra* note 321.
331 Comment by Joone Lopez, *supra* note 275.

iii. New Pathways for Collaboration

A number of the above detailed institutional barriers to acceptance and adoption of LWI as legitimate infrastructure strategies speak to the evolving nature of how utilities function in municipal and community ecosystems. With notable exceptions, water utilities are typically accustomed to performing their critical functions largely in isolation, whether a special district or public works department embedded within a city or county. This siloing means that pathways for collaboration with other agencies or departments rarely develop organically. Similarly, it does not always come naturally for utilities to be deeply engaged with the community organizations, institutions, and other partners generally vital to broad deployment of decentralized solutions.

Roundtable participants agreed that greater collaboration and communication between public entities, different disciplines, and the community would enable the sharing of resources and technical expertise needed to facilitate both the assessment and implementation of LWI.[332] This includes identifying and coordinating with key intra-city agencies, agencies entirely separate from the city or utility implementing the LWI, as well as NGOs and universities.[333]

LWI—because they are implemented on non-utility property—can benefit significantly from coordination among traditionally siloed agencies.[334] For example, to ensure that installation of distributed GI on non-utility property is well-coordinated, the City of Lancaster, Pennsylvania's Stormwater Division funds other city agencies to build these projects when publicly-owned land is involved, such as city parks and streets.[335] Through this interjurisdictional collaboration, over 60 GI projects have been smoothly completed on different types of properties city-wide.[336] A recent report from the Pacific Institute, highlights how San Mateo, California, and Fort Collins, Colorado, have taken a coordinated approach to co-fund water customer incentive programs to install multiple benefit LWI.[337] These coordinated efforts not only opened the door to additional funding, but made the programs more accessible to customers and effectively leveraged each utility's unique capacities and expertise.[338]

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332 *See* THE JOHNSON FOUNDATION AT WINGSPREAD, *supra* note 15, at 20.

333 *See The Tap into Resilience Toolkit*, *supra* note 139 (scroll down to *Explore localized water infrastructure implementation strategies,* click on *Public Non-Utility Property Localized Infrastructure,* click on *Intra-City Issues,* click on *Coordinating with Key Intra-City Partners*; under *Public Non-Utility Property Localized Infrastructure*, also click on *Coordinating with Entirely Separate Public Entities*); comment by Mark Gold, Exec. Dir., Ocean Prot. Council & Deputy Sec'y for Ocean and Coastal Policy, Cal. Natural Res. Agency; comment by Joone Lopez, *supra* note 275.

334 *See* THE JOHNSON FOUNDATION AT WINGSPREAD, *supra* note 15, at 20; Leigh & Lee, *supra* note 7, at 10.

335 *Intra-agency Coordination: An Example from City of Lancaster*, WATERNOW ALL., https://tapin.waternow.org/resources/inter-agency-coordination-an-example-from-city-of-lancaster/ (last visited Aug. 8, 2021).

336 *Id.*

337 DIRINGER & SHIMABUKU, *supra* note 282, at 13.

338 *Id.*

CASE STUDY

Interjurisdictional Collaboration: Milwaukee Metropolitan Sewerage District (MMSD)

Challenge: Combined sewer overflows

Localized Water Strategy: Distributed GI

Collaboration Pathway: As a regional utility that needs to coordinate with multiple separate public entities, MMSD fosters consistent inter-city communication by conducting monthly meetings with city engineers, coordinating on GI project work plans, and hosting a technical advisory team that includes members from all 28 member cities.[339] This interagency collaboration to facilitate wide-spread implementation of GI is critical for Milwaukee to meet its 2035 goal of capturing the first half inch of rainfall, equivalent to 740 million gallons of stormwater storage.[340]

Greater engagement and collaboration with non-traditional community partners can also be a key to addressing local equity issues related to water resource management. Increasingly, municipalities and utilities are taking steps to incorporate equity considerations into their decisions, recognizing the need for a deliberate approach to addressing equity-related challenges such as flooding, water quality, inadequate infrastructure, and climate impacts. Part of this task requires empowering disadvantaged and vulnerable communities disproportionately affected by these challenges by giving voice to their concerns and needs. The River Network, for example, recently released its Equitable Water Infrastructure Toolkit, intended to help "stakeholders, advocates, and leaders" familiarize themselves with "water infrastructure funding and financing mechanisms" and "[u]nderstand the role and impact of local, state, and federal entities, and community organizations in addressing affordability and sustainability."[341]

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339 *See* 2020 FACILITIES PLAN, MILWAUKEE METRO. SEWERAGE DIST. 1-11, 1-13 (2020), https://www.mmsd.com/application/files/6014/8226/1806/2020_Chapter_1_Introduction.pdf; *See The Tap into Resilience Toolkit*, *supra* note 139 (scroll down to *Explore localized water infrastructure implementation strategies,* click on *Public Non-Utility Property Localized Infrastructure,* click on *Coordinating with Entirely Separate Public Entities*).

340 REGIONAL GREEN INFRASTRUCTURE PLAN, MILWAUKEE METRO. SEWERAGE DIST. 5 (2013), https://www.mmsd.com/what-we-do/green-infrastructure/resources/regional-green-infrastructure-plan.

341 *Equitable Water Infrastructure Toolkit,* RIVER NETWORK, https://www.rivernetwork.org/equitable-infrastructure-toolkit/#decision (last visited Aug. 8, 2021).

Municipalities and utilities can collaborate with NGOs focused on promoting racial equity to incorporate a meaningful equity lens into their localized water strategies in a number of ways:

- Measuring and describing community disparities.[342]
- Providing local planners, public officials, community organizations, and foundations with the tools they need to engage marginalized populations and advocate for equity objectives.[343] For example, Climate Interactive created the Framework for Long-Term, Whole System, Equity-Based Reflection as a way to examine the distribution of water management benefits as well as positive impacts on marginalized communities within a project or initiative.[344]
- Transforming equity goals into targeted discussions on particular disparities that will be tackled.[345]
- Conducting a visible and inclusive public planning process designed to foster equitable participation in the decision-making process as well as the resulting localized programs.[346]
- Developing specific measurable equity-based objectives and achievable action items.[347]
- Eliminating barriers to participation by, for example, bridging language and cultural barriers, expanding distributed GI, water use efficiency, conservation, or onsite reuse incentive programs to multi-family homes, and removing exclusions from participating in rebate or other incentive programs for customers with late or overdue payments.[348]

As described above in Section II.B.4.i, utilities have incorporated equity considerations into a variety of LWI such as water use efficiency strategies including indoor, high-efficiency appliances and fixtures,[349] and green infrastructure. The Atlanta Department of Watershed Management case study illustrates how collaboration with an NGO can enhance equity co-benefits of localized strategies.

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[342] Greg Schrock, et al., *Pursuing Equity and Justice in a Changing Climate* 35(3) J. OF PLANNING EDUC. & RESEARCH 282, 292 (2015); *see also* AN EQUITABLE WATER FUTURE, US WATER ALL. 26 (2017), http://uswateralliance.org/sites/uswateralliance.org/files/publications/uswa_waterequity_FINAL.pdf.
[343] *Id.*
[344] FLOWER *A Tool for Creating Climate Co-benefits in Your Community,* CLIMATE INTERACTIVE, https://www.climateinteractive.org/ci-topics/multisolving/flower/ (last visited Aug. 8, 2021).
[345] *Id.*; *see also* GREEN INFRASTRUCTURE STRATEGIC ACTION PLAN*,* CITY OF ATLANTA DEP'T OF WATERSHED MGMT. (2018), https://tapin.waternow.org/wp-content/uploads/sites/2/2020/05/GI-Strategic-Action-Plan-2018-FINAL.pdf.
[346] INCORPORATING MULTIPLE BENEFITS INTO WATER PROJECTS*,* PAC. INST. 11-12, 32 (2020), https://pacinst.org/wp-content/uploads/2020/06/Incorporating-Multiple-Benefits-into-Water-Projects_Pacific-Institute-_June-2020.pdf.
[347] Schrock, et al., *supra* note 342, at 286-287.
[348] *See, e.g.*, DROUGHT AND EQUITY IN CALIFORNIA*,* PAC. INST. (2017), https://pacinst.org/wp-content/uploads/2017/01/PI_DroughtAndEquityInCA_Jan_2017.pdf.
[349] For example, Tucson Water provides limited-income individuals and families with free high-efficiency toilets and offers grants (up to $400) and loans (up to $2,000) for rainwater harvesting systems. *See Tucson Water,* WATERNOW ALL., https://tapin.waternow.org/resources/tucson-water/ (last visited Aug. 8, 2021).

CASE STUDY

Equity and Affordability: City of Atlanta Department of Watershed Management (DWM)

Challenges: Localized flooding, polluted stormwater runoff, climate change, rapid growth

Localized Water Strategy: Distributed GI on public and private property[350]

Equity Strategy: In 2017, the City of Atlanta's Green Infrastructure (GI) Task Force developed a GI Strategic Action Plan (Plan) to "help address institutional and funding barriers, steer policy, increase effectiveness, and engage multiple city departments, citizens, the development community, and environmental groups in implementing [green infrastructure] at scale across the City."[351] The Plan set a goal for the City to reduce 225 million gallons of stormwater runoff annually with GI, and outlines strategic actions to achieving this goal.[352] As part of Atlanta's development of this Plan, DWM collaborated with a nonprofit, the Partnership for Southern Equity, to convene a series of workshops with several of the City's GI Task Force members and community stakeholders to consider potential unintended consequences of GI on disadvantaged communities.[353] Workshop participants developed a set of shared values, including: (1) installation of GI may likely increase property values and managing that increase for vulnerable populations must be considered; (2) GI must be developed in ways that benefit local and surrounding communities that have felt the cost of poor infrastructure in the past; (3) there must be transparency and meaningful community participation, leadership, and ownership in change efforts; and (4) community empowerment, improved quality of life, and community wellness should be the ultimate outcomes of GI projects.[354] Thus, the City of Atlanta's Plan expressly instructs that GI be developed equitably and that the shared values identified during the Partnership for Southern Equity workshops inform implementation of each of the strategic actions as GI is installed across Atlanta.[355]

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[350] GI on private property in Atlanta is installed pursuant to a local ordinance that requires certain new and re-development projects to build GI to manage stormwater onsite. The City does not install GI on private property or provide funding or incentives for private GI.

[351] GREEN INFRASTRUCTURE STRATEGIC ACTION PLAN, *supra* note 345, at 1.

[352] *Id.* at 6–7.

[353] *Id.* at 7.

[354] *Id.*

[355] *Id.* at 7-10; *see also Equity, Health, Resilience, and Jobs: Lessons from the Just Growth Circle*, Nonprofit Quarterly (Aug. 22, 2019), https://nonprofitquarterly.org/equity-health-resilience-and-jobs-lessons-from-the-just-growth-circle/ (detailing the work of Partnership for Southern Equity and the Just Growth Circle to advance equitable green infrastructure development in Atlanta).

Results: Atlanta has begun to implement the strategic actions identified in the Plan that likely advance the identified shared equity values. For example, DWM is working to establish a prioritized capital program for equitable GI implementation.[356] Further, DWM provides support for Atlanta CREW—a "free green infrastructure and stormwater management workforce development program that trains participants how to install and maintain GI that has been designed with a cultural and artistic vision" established by the Southface Institute in partnership with West Atlanta Watershed Alliance[357]—and partners with other local workforce development organizations to provide trainings and employment opportunities.[358] Another outcome of DWM's work is its participation in the US Water Alliance's Water Equity Taskforce;[359] Atlanta convened a Learning Team comprised of DWM as the member utility and leaders from community-based organizations to advance the adoption of policies and practices that will promote equitable water management. In addition, supported by funding from the City's recently issued Environmental Impact Bond, Atlanta is working to complete construction of six GI projects in the Proctor Creek Watershed—projects identified through community-led planning to reduce flooding, improve water quality, and provide public green space, among other benefits, for some of the City's most economically disadvantaged neighborhoods.[360]

3. Conclusion

Roundtable participants agreed that new decision-making tools, alternative water utility business models, and new pathways for collaboration will help remove institutional barriers to greater adoption of LWI. There are some valuable decision-support tools already available, and some utilities have begun to update their business models. To build on these efforts, roundtable participants identified the action items highlighted above in Section III.B.2 to be taken by utilities, state governments, NGOs, and universities to help shift water resource management toward practices that treat LWI as options on par with conventional approaches. These action items are catalogued in the below matrix in Section IV along with the corresponding recommended actors and localized water strategies.

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[356] GREEN INFRASTRUCTURE STRATEGIC ACTION PLAN, *supra* note 345, at 10.

[357] *Training,* SOUTHFACE, https://www.southface.org/training/?wpv-topic=green-infrastructure&wpv_aux_current_post_id=26960&wpv_view_count=26959 (last visited Aug. 8, 2021).

[358] DWM also partners with other local organizations that provide similar GI training, e.g., Greening Youth, Habesha. Email from Amanda Hallauer, Watershed Manager, Env't Plan. Div., Office of Watershed Prot., Dep't of Watershed Mgmt., City of Atlanta (Dec. 17, 2020, 10:52 AM (on file with author).

[359] *Meet the Learning Teams,* US WATER ALL.*,* http://uswateralliance.org/initiatives/water-equity/taskforce/team-atlanta (last visited Aug. 8, 2021).

[360] GREEN INFRASTRUCTURE STRATEGIC ACTION PLAN, *supra* note 345, at 4; *see also Atlanta Department of Watershed Management,* WATERNOW ALL., https://tapin.waternow.org/resources/atlanta-department-of-watershed-management/ (last visited Aug. 8, 2021); *Atlanta: First Publicly Offered Environmental Impact Bond,* QUANTIFIED VENTURES, https://www.quantifiedventures.com/atlanta-eib (last visited Aug. 8, 2021); *Helping to Engage Proctor Creek Community Members as Stewards of Their Watershed,* U.S. ENV'T PROT. AGENCY (Oct. 26, 2020), https://www.epa.gov/sciencematters/helping-engage-proctor-creek-community-members-stewards-their-watershed; *Proctor Creek Watershed Story Map: The Intersection of Green Infrastructure and Health,* U.S. ENV'T PROT. AGENCY, https://epa.maps.arcgis.com/apps/MapSeries/index.html?appid=a9360889f36743269d8b0db3fd96ec6b (last visited Aug. 8, 2021).

C. LEGAL AND POLICY CHALLENGES

1. Legal and Policy Barriers to LWI

In addition to financing and institutional barriers, certain types of legal and regulatory requirements can hinder, or effectively preclude, implementation and deployment of LWI. These barriers and disincentives occur at federal, state, and local levels. For the most part these rules were established to serve important public purposes (e.g., to support local development or to ensure public safety), but need to be updated to reflect an expanded definition of infrastructure. In addition, in many cases, the absence of specific regulations, provisions, or policies needed to facilitate adoption of LWI can operate as barriers to implementation.

This Section focuses on state and local legal and policy barriers. While federal laws and policies can present barriers to LWI adoption,[361] as detailed above, federal programs that intersect with LWI mostly, but not only, concern funding and financing options. In contrast, state and local rules, regulations, and policies represent the majority of the laws and policies that govern whether and how LWI can be implemented.

State and local water supply, land use, as well as water quality rules and regulations can present challenges to implementation of LWI in two ways: (1) current regulations may directly prohibit or serve as disincentives to implementation; and (2) the absence of specific regulations, provisions, or policies pertaining to LWI implementation can indirectly limit implementation of such strategies because they leave LWI out of the discussion as ways to meet legal and regulatory requirements. Detailed below are examples of rules and regulations that fall within these two categories.

i. State and Local Laws and Policies Expressly or Implicitly Prohibiting LWI

Municipal codes and ordinances can limit LWI because they were not drafted with localized solutions in mind and expressly prohibit deploying LWI to meet water supply, wastewater, and stormwater management needs.[362] 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.[363] Landscape guidelines at local, regional, or even homeowner's

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[361] For example, federal laws and policies that can indirectly or directly constrain LWI implementation include Clean Water Act rules and policies governing National Pollutant Discharge Elimination Permits, the Combined Sewer Overflow Policy, and the Lead and Copper Rule. Updates to these federal policies also present opportunities to create pathways for broader adoption of LWI as best management practices to deliver clean water at the local level. In addition, federal action plans such as the Water Reuse Action Plan are examples of ways the federal government can support local adoption of LWI.

[362] *See, e.g.*, Strifling, *supra* note 7, at 427; CLEAN WATER AM. ALLIANCE, *supra* note 7 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/.

[363] WIS. SEA GRANT, *supra* note 290, 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.

association levels may preclude or limit appropriate outdoor water use efficiency measures[364] or restrict GI installations using bioswales, bioretention areas, or drought tolerant plants.[365]

Among LWI types, GI in particular can often run afoul of state and local land use and development-related rules that have not been updated to allow for GI. For example, the City of New Orleans has made a major commitment to installing GI on a large scale, but its municipal code was written when its governing policy was to move water into sewer systems quickly. In particular, a comprehensive analysis of New Orleans' city code revealed that the "Streets, Sidewalks, and Other Public Places" code included several provisions that could restrict GI on public right of ways, including requirements that "[w]hen new curbing, guttering, or counter curbing is required, it must be made of such material as is generally used in such a block."[366] Also, certain provisions of the Stormwater Code could prohibit GI on private property such as New Orleans' prohibition of plants on private property in excess of 18 inches.[367] This can prohibit GI on private property because New Orleans' code does not include an allowance for GI installed to manage stormwater onsite, and many native plants used for managing stormwater exceed 18 inches.

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,[368] restrictions on soils used for infiltration,[369] and requirements for vector control such as mosquito abatement rules.[370]

ii. Absence of LWI from State and Local Laws and Policies

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

Because LWI can represent emerging or relatively newer technologies, such as smart irrigation controllers or advanced onsite reuse systems, there is still a lack of generally accepted guidelines and

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364 *Id.*

365 *See, e.g.*, Strifling, *supra* note 7, at 427; CLEAN WATER AM. ALLIANCE, *supra* note 7, at 16; *see also TACKLING BARRIERS TO GREEN INFRASTRUCTURE*, *supra* note 362.

366 NEW ORLEANS MUN. CODE § 146-187. New Orleans' code may also impede GI by providing that: "No person shall impede or obstruct the flow of water in any gutter, canal, pipe, or other conduit used for draining;" and that "All new sidewalks or banquettes or repaved sidewalks or banquettes immediately adjacent to property located in the Vieux Carre must be paved, repaved, or constructed either with brick in the tan-medium brown color range or with flagstone in the blue-grey color range." NEW ORLEANS MUN. CODE §§ 78-1, 146-194. NEW ORLEANS MUN. CODE §§ 26-160, 66-312 (*see also* § 82-352 prohibiting the creation of artificially induced mosquito breeding area with no exemption for GI or stormwater management systems).

368 CLEAN WATER AM. ALLIANCE, *supra* note 7, 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; Yu, *supra* note 45, at 651–52.

369 CLEAN WATER AM. ALLIANCE, *supra* note 7, at 20.

370 Yu, *supra* note 45, at 652–53, 659–60; NAT'L BLUE RIBBON COMMISSION FOR ONSITE NON-POTABLE WATER SYSTEMS, *supra* note 44, at 6; *see, e.g.*, NEW ORLEANS MUN. CODE,§ 82-352 (prohibiting the creation of "artificially induced mosquito breeding areas" without exception for stormwater management systems).

371 *See* WIS. SEA GRANT, *supra* note 290.

performance standards for LWI. This makes the decision to deploy LWI prohibitively resource intensive for all but the most well-resourced utilities and cities. As the National Blue Ribbon Commission for Onsite Non-potable Water Systems stated, "[d]espite growing interest in incorporating onsite non-potable water systems to meet broader One Water goals, a lack of public health-based state or national standards, streamlined permitting processes, and regulatory guidance for ONWS has created barriers to implementation."[372]

2. Recommendations: Update State and Local Laws and Policy to Support Widespread Adoption of LWI

As detailed above, because state and local laws and policies govern on-the-ground adoption of LWI, they present the main legal and policy implementation barriers when it comes to large-scale LWI adoption. Accordingly, state and local laws and policies also present key leverage points for decisionmakers and advocates working to eliminate these implementation barriers, including establishing new state and local guidelines, regulations, and policies; promoting LWI in existing laws and policies; and mechanisms that improve information dissemination of or communication on potential application of LWI to meet state and local regulatory requirements.

i. Create New Laws and Policies to Support LWI

Because many state and local water related laws and policies were developed before water managers understood the potential of LWI, adoption of new state and local laws and policies that either require and/or incentivize LWI would facilitate greater LWI implementation. These new laws and policies would provide local decisionmakers with guidance as to when LWI can appropriately meet water management needs, including whether LWI options meet state and local regulatory requirements.[373]

For example, at the state level, California's state plumbing code provides guidelines for installation of residential greywater systems.[374] As a result, many utilities and local governments invested in public education, and incentive programs and public interest in greywater systems increased, in turn increasing installation of such systems.[375] In 2019, Utah's Division of Water Resources adopted water conservation goals for municipal and industrial water use, for example, residential, commercial, institutional, and industrial water use excluding agriculture, mining, and power generation, for nine regions around the state.[376] With these goals in place, it is now incumbent on local water agencies to meet them. A key way will be investing in LWI.[377] In Colorado, to foster greywater reuse, in 2015, the State adopted "Regulation 86" outlining requirements, prohibitions, and standards for greywater use for non-drinking purposes that local jurisdictions can adopt to create their own locally administered greywater programs.[378] Western Resource Advocates (WRA) has built a database of several notable state water policies and programs from around the country related to urban water conservation, water reuse, and land use and water integration.[379] Many of the policies and programs identified in WRA's

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372 NAT'L BLUE RIBBON COMMISSION FOR ONSITE NON-POTABLE WATER SYSTEMS, *Fact Sheet,* 1 http://uswateralliance.org/sites/uswateralliance.org/files/brc_factsheet_120417_a.pdf (2016).
373 *See, e.g.*, CLEAN WATER AM. ALLIANCE, *supra* note 7, at 20–21.
374 CAL. PLUMBING CODE, Ch. 15 (2016).
375 GREYWATER ACTION, RESIDENTIAL GREYWATER IRRIGATION SYSTEMS IN CALIFORNIA 1 (2013).
376 *Utah's Regional M&I Water Conservation Goals,* HANSEN, ALLEN & LUCE, INC. & BOWENS, COLLINS & ASSOCS., INC. 4, 61, 71 (2019), https://conservewater.utah.gov/wp-content/uploads/2021/05/Regional-Water-Conservation-Goals-Report-Final.pdf.
377 *Id.*
378 COLO. CODE REG. TIT. 5, §1002-86.
379 *Advancing Sustainable Urban Water Management Through State Policy,* W. RES. ADVOCATES, https://westernresourceadvocates.org/state-water-policy-program-database/ (last visited Aug. 8, 2021).

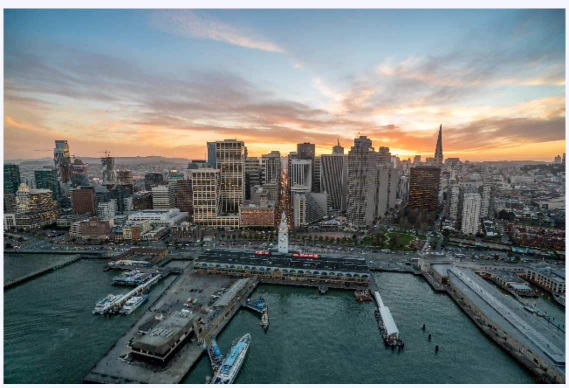
database serve as robust examples for how states can establish policies to accelerate adoption of LWI.

At the local level, there are a number of ways local governments can adopt new regulations to prescribe or incentive LWI implementation. They can establish rules related to new development or redevelopment as a cost-effective approach.[380] This can range from prioritizing GI for onsite, stormwater management in post-construction stormwater ordinances, such as in Seattle, Washington (see case study below), and Eugene, Oregon, to establishing conservation-oriented tap fees designed to promote water-wise growth in the arid West, as in Westminster (see case study below) and Castle Rock, Colorado, to adopting an ordinance requiring new development to reuse available greywater, rainwater, and foundation drainage for toilet and urinal flushing and irrigation, as in San Francisco, California (see case study below). Local "net zero" water policies, which allow for new development so long as there is no net increase in water consumption, are another tool cities have used to advance LWI.[381]

CASE STUDY

Establishing Guidelines, Regulations, and Policies to Drive Localized Water Strategies: San Francisco Public Utilities Commission

Challenge: Combined sewer overflows



Localized Water Strategy: Distributed GI

Policy: SFPUC's Non-potable Water Program requires larger, new development projects to include "an onsite non-potable water system to treat and reuse available greywater, rainwater, and foundation drainage for toilet and urinal flushing and irrigation."[382] The City achieved this by adopting an ordinance that allows for the use of alternate water sources for non-potable uses at the building and district-scale.[383]

Results: Buildings covered by the program can reduce water use by 25% to 75%.[384] City-wide, onsite water reuse projects will save an estimated 2 million gallons of potable water supply per day.[385]

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380 Leigh & Lee, *supra* note 7, at 12.
381 Comment by Mark Gold, *supra* note 333 (discussing Santa Monica, California's water neutrality ordinance).
382 *Non-potable Water Program*, S.F. PUB. UTILS. COMM'N, (JUL. 2, 2021, 1:53 PM), https://sfwater.org/index.aspx?page=686 (referencing S.F. HEALTH CODE, Art. 12C.4 (2015)).
383 *Id.*
384 *San Francisco Public Utilities Commission,* WATERNOW ALL. (Jul. 2, 2021, 1:54 PM), https://tapin.waternow.org/resources/san-francisco-public-utilities-commission/.
385 *Id.*

CASE STUDY

Promoting Localized Water Strategies in Existing Regulatory Schemes: City of Westminster, Colorado

Challenge: Drought, climate change, population growth, limited access to new supply

Localized Water Strategy: Conservation and efficiency

Policy: To incentivize water conservation and efficiency strategies that "ensure water availability at city-wide buildout,"[386] the City of Westminster, Colorado, has set conservation-oriented "tap fees."[387] In other words, to connect to the City's water system, new developments are charged based on the development's planned landscaped area and projected annual landscape water demand; connection charges are lower for developments that use water-wise landscapes and reclaimed water.[388] The City also charges a two-factor connection fee for commercial, industrial, and institutional new and re-development. One element of the fee is based on meter size; the other is based on the type of business or activity and projected annual water use.[389] This allows the City to recommend water efficiency measures that could result in reduced connection fees when the City reviews new developments' design plans.[390]

Results: Westminster's conservation and efficiency programs, including its long-standing conservation-oriented tap fees, has saved the City in both water resource and infrastructure costs. As of a 2013 study, the City had experienced a 21% reduction in average per capita water demand.[391] This kept residents and business' water rates 99% lower than they would have been without conservation.[392] New customers in Westminster also avoided an 80% increase in water and sewer tap fees.[393]

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386 *Comprehensive Plan*, City of Westminster, CO 1-28 (2015), https://www.cityofwestminster.us/Portals/1/Documents/Government%20-%20Documents/Departments/Community%20Development/Planning/COMPLETE%20Comp%20Plan_2015%20Update_WEB.pdf.; *see also City of Westminster Water Conservation Plan,* City of Westminster, CO (2013), https://www.waterdm.com/sites/default/files/City%20of%20Westminster%20(2013)%20Water%20Conservation%20Plan.pdf.

387 Tap fees are "one time charges assessed to new developments to help pay for the direct costs of connecting to a utility's water system and for the infrastructure and water resources capacity needed to support these new developments." *A Guide to Designing Conservation-Oriented Water System Development Charges,* W. Res. Advocates 4-77 (2018), https://westernresourceadvocates.org/wp-content/uploads/2018/07/WRA_Guide-to-Conservation-Oriented-SDCs_web.pdf.

388 *Id.* at 75–76.

389 *Id.* at 74–75.

390 *Id.* at 74.

391 *Conservation Limits Rate Increases for a Colorado Utility,* Alliance for Water Efficiency 1–8 (2013), https://www.allianceforwaterefficiency.org/sites/www.allianceforwaterefficiency.org/files/highlight_documents/AWE-Colorado-Article-FINAL-%28Ver7%29.pdf.

392 *Id.*

393 *Id. at* 7–8.

Action Item: States and Local Governments

Establish criteria and monitoring guidelines in health and safety codes for onsite reuse of stormwater, greywater, and blackwater. Stormwater captured with GI can occur on the property where it will be used or offsite and routed to a reuse system; thus, standards need to account for this variability in the location where the use will occur.[394] Local utilities also need guidance and criteria to authorize or mandate onsite greywater and blackwater reuse. The current lack of these criteria has hindered adoption of onsite reuse systems.

Cities and towns can also adopt conservation and efficiency goals that go above and beyond state-level requirements. For example, in November 2018, the Austin City Council approved the city's Water Forward Plan that establishes a suite of water conservation and onsite reuse goals, including that onsite reuse will represent one-third of all additional water supplies that Austin will bring online by 2040.[395] Similar policies and conservation and water efficiency goals or mandates can promote adoption of LWI by utilities and others in an effort to meet such goals and mandates.

Action Item: NGOs and Universities

Create a repository of local ordinances, policies, and programs that facilitate localized strategies.[396] This database could be similar to that created by Western Resource Advocates, which provides examples of state policies and programs related to water conservation and efficiency, water reuse, and land use and water integration[397] and DSIRE's database of state policies and incentives for renewables and efficiency more broadly.[398]

ii. Update Existing Laws and Policies to Clear Barriers to LWI

There are also many opportunities to accelerate adoption of LWI by updating existing state and local regulations and policies. These include updating local building, land use, and zoning laws to require rather than simply authorize LWI,[399] and incorporating specific LWI as available management practices to meet state and local regulatory requirements for efficiency and conservation, as well as to meet wastewater and stormwater management objectives. Local governments can also accelerate

394 Comment by Mark Gold, *supra* note 333; comment by David Smith, Assistant Water Dir., Env't Prot. Agency 9, at Workshop Roundtable (Sept. 13, 2019); comment by Kirsten Evans, N. Am. Urban Water Dir., The Nature Conservancy, at Workshop Roundtable (Sept. 13, 2019) (emphasizing that stormwater standards need to be different than those designed for wastewater).

395 Caroline Koch, WATERNOW ALL., *Tapping Into Resilience: Austin Water's Innovative 100-Year Water Plan Receives Unanimous City Council Approval,* https://waternow.org/2018/11/30/tapping-into-resilience-austin-waters-innovative-100-year-water-plan-receives-unanimous-city-council-approval/ (last visited Aug. 8, 2021).

396 Comment by Heather Cooley, *supra* note 260; Telephone Interview with Heather Cooley, *supra* note 261.

397 *Advancing Sustainable Urban Water Management Through State Policy, supra* note 379.

398 *Database of State Incentives for Renewables & Efficiency,* DSIRE, https://www.dsireusa.org/ (last visited Aug. 8, 2021).

399 Comment by Bill McDonnell, *supra* note 264; Caroline Koch, Water Policy Dir., WATERNOW ALL.; and Nicholas Marantz, Assistant Professor, UCI Sch. of Social Ecology, at Workshop Roundtable (Sept. 13, 2019); W. RES. ADVOCATES & LAND USE LAW CTR., INTEGRATING WATER EFFICIENCY INTO LAND USE PLANNING IN THE INTERIOR WEST 45–161 (2018).

adoption of LWI by revising water supply planning regulations and policies to integrate water savings from water use efficiency, conservation, and water reuse, and refining water efficiency regulations and policies to include water reuse as a way to achieve increased efficiency.

This also includes updating land use planning policies to integrate water planning and LWI. For example, Severance, Colorado's most recent Comprehensive Plan includes a stand-alone water element and incorporates water conservation considerations throughout the Plan.[400] This approach is designed to "bring about continued discussion surrounding water conservation for every planning document or decision that is proposed in the Town." To operationalize the policies in its Comprehensive Plan, Severance will rely, at least in part, on LWI such as rebate programs for high efficiency toilets,[401]and adoption of water efficient landscape regulations and irrigation design criteria that will likely drive development of LWI.[402] Other local governments could take a similar approach to integrated land use and water supply planning. This integrated approach also applies to local resiliency or sustainability planning that is already underway in many communities.

Action Item: Utilities & Other Local Governmental Entities

- 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.
- 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. For example, mandate pervious surfaces for new parking lots, onsite water reuse, [403] and stormwater capture.
- Establish criteria and monitoring guidelines in health and safety codes for onsite reuse of stormwater, greywater, and blackwater.
- 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.
- Incorporate LWI objectives into comprehensive master plans and sustainability plans.

Action Item: State & Local Government

- 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.

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[400] Lindsay Rogers, , WATERNOW ALL., *Water Conservation Prioritized in Town of Severance's Newly Adopted Comprehensive Plan*, https://waternow.org/2021/01/13/water-conservation-prioritized-severance/ (last visited Aug. 8, 2021).
[401] 2017 MUNICIPAL WATER EFFICIENCY PLAN*,* TOWN OF SEVERANCE 26 (2017), https://www.townofseverance.org/sites/g/files/vyhlif4986/f/uploads/2-severance-mwep-2017-05-25-draft.pdf.
[402] 2020 COMPREHENSIVE PLAN*,* TOWN OF SEVERANCE 19-20 (2020), https://www.townofseverance.org/sites/g/files/vyhlif4986/f/uploads/comp_plan_12.9.20.pdf.
[403] Comment by Doug Bennett, *supra* note 275.

Action Item: State Governments

- Eliminate state level prohibitions to LWI technologies and strategies such as rain cisterns, onsite reuse, and greywater systems; and/or establish state-level guidance for deploying such systems safely while protecting public health.
- Update water supply planning regulations and policies to ensure planning integrates water savings from water use efficiency, conservation, and water reuse.

In addition, state-administered CWA permit programs present opportunities for state regulations to be updated to present LWI to permittees as an option for meeting permit requirements. For example, the California State Water Resources Control Board has adopted amendments to the statewide industrial stormwater general permit to incentivize[404] storm water capture and use.[405] To this end, the permit authorizes onsite and/or offsite stormwater capture as compliance options provided the discharger meets the specific stormwater capture requirements outlined in the permit.[406] Under these permit terms, urban industrial development, in particular, presents opportunities for stormwater capture and grey water strategies due to the demand for non-potable water at industrial sites,[407] and some industrial stormwater permittees have already demonstrated how implementation of such strategies can support CWA compliance. For example, several cement manufacturing facilities in southern California are retaining and reusing stormwater on site in their industrial operations[408] and a grain elevator and export facility in Washington is infiltrating all stormwater from its surface onsite.[409] Similar amendments to other state's industrial stormwater permits would incentivize more permittees to invest in stormwater capture strategies to meet their permit requirements.

Several roundtable participants also emphasized the need to use liability as a driver for taking on the responsibility of addressing water resilience.[410] Participants discussed opportunities to redesign CWA permits to assign liability in ways that distribute the risk and burden among polluters including different deadlines for permittees that choose to deploy LWI to meet permit requirements and establishing

[404] CAL. STATE WATER RES. CONTROL BD., NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM, ORDER WQ20XX-XXX-DWQ AMENDING GENERAL PERMIT FOR STORMWATER DISCHARGES ASSOCIATED WITH INDUSTRIAL ACTIVITIES, Factsheet at 23, Attachment I (2018).

[405] *Id.* at Factsheet at 23. Political will played a key role in the adoption of these amendments. Determination of the permit terms required costly infiltration technological feasibility studies, which were ultimately funded by the Los Angeles Department of Water and Power (LADWP) due, in part, in an effort to achieve the goals in the City of Los Angeles' Mayor's Executive Directive of reducing per capita water use and the purchase of imported water. Telephone Interview with Richard Horner, Research Professor, Univ. of Wash. Dep't of Civil and Env't Eng'g (August 12, 2019).

[406] *Id.* at Attachment I.

[407] Leigh & Lee, *supra* note 7, at 13.

[408] *$300,000 Settlement with Concrete Mixing Facilities to Benefit Wildlife Restoration,* L.A. WATERKEEPER (Jul. 2, 2021, 2:31 PM), https://www.coastkeeper.org/press/archive/3000000-settlement-concrete-mixing-facilities-benefit-wildlife-restoration/.

[409] Consent Decree at 8, Puget Soundkeeper Alliance v. Louis Drefyus Commodities LLC et al., No. 14-cv-00803-RAJ (W.D. Wash. filed July 14, 2016).

[410] Comment by Nicholas Marantz, *supra* note 399; comment by Mark Gold, *supra* note 333; comment by Bruce Reznik, *supra* note 280; comment by David Smith, *supra* note 394.

credit-trading systems.[411] For example, Washington D.C.'s MS4 permit[412] incorporates its Stormwater Retention Credit (SRC) Trading program, which incentivizes installation of GI by providing credits for projects with retention capacity that exceeds requirements.[413]

Action Item: State Governments

- Leverage regulatory requirements, for example, 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, for example, setting different deadlines for permittees that deploy LWI to meet permit terms and allowing for stormwater credit-trading systems.

3. Conclusion

As detailed above, some regulations and policies have begun to incentivize and clear the path for greater adoption of localized water strategies. Roundtable participants identified the specific action items, highlighted throughout Section III.C.2 above, to be taken by state and local governments, NGOs, and universities to shift state and local water laws and policies towards LWI, and accelerate LWI deployment. These action items are catalogued in the below matrix in Section IV along with the corresponding recommended actors and localized water strategies.

IV. Conclusion

LWI implementation at scale is possible. Public utilities have access to mechanisms to finance large-scale LWI investments just as they do for conventional infrastructure. The tools to counteract the 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.

The recommendations and action items CLEANR and WaterNow have identified through the roundtable are catalogued in the below table with the suggested corresponding strategy and actor or actors. If utilities; municipalities; federal, state, and local governments; NGOs, universities, and other stakeholders carry out these recommendations and actions items, communities' water resources will be more sustainable, resilient, and better able to adapt to climate change.

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[411] Comment by Mark Gold, *supra* note 333; comment by Bruce Reznik, *supra* note 280; comment by David Smith, *supra* note 394.

[412] *Authorization to Discharge Under The National Pollutant Discharge Elimination System Municipal Separate Storm Sewer System Permit,* U.S. Env't Prot. Agency 6 (2018), https://doee.dc.gov/sites/default/files/dc/sites/ddoe/publication/attachments/dcsewer_dcms4_permit.pdf.

[413] *Stormwater Retention Credit Trading Program,* Dep't of Energy & Env't, https://doee.dc.gov/src (last visited Aug. 8, 2021).

VI. Action Item Matrix

Category	Recommendation	Action Items	Applicable Localized Water Infrastructure Category	Recommended Actor
Financing Pathways	*Access municipal bonds*	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.	All, particularly when LWI is implemented via customer incentives or direct installations	Utilities and municipalities
		Create a database of state-level statutory and regulatory barriers to debt-financing localized water strategies along with guidance for local water leaders on how to identify, evaluate, and address their state-specific legal challenges	All	NGOs and universities
		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.	All	State and local governments
		Update the IRS code to exempt LWI from the cap on "private activities" for purposes of tax-free governmental bonds	All	Federal government
	Establish and leverage dedicated revenue streams		All, particularly GI aimed at ecosystem management and protection strategies whose co-benefits can be highlighted to garner support	Utilities and municipalities
	Prioritize LWI for federal and state grants and loans	Create federal guidance for states to update State Revolving Fund eligibility criteria to prioritize funding for localized water strategies	All	Federal government
		Update or create federal guidance for SRF administrators to develop expanded SRF financial assistance mechanisms that can lower the costs and accelerate the pace of LWI funding on a national scale	All	Federal government
		Conduct a literature review of existing 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.	All	NGOs and universities

Category	Recommendation	Action Items	Applicable Localized Water Infrastructure Category	Recommended Actor
	Leverage state and federal tax codes	Update the IRS code to exempt consumer incentives designed to implement LWI from federal income tax	All	Federal and state governments
		Create tax incentives for residents and businesses to invest in LWI	All	Federal and state governments
Institutional Pathways	*Develop decision-support tools*	Develop consulting resources and/or other tools to evaluate a broader range of the advantages and disadvantages of localized water strategies	All	NGOs, universities, and the federal government
		Develop a tool to determine the appropriate type of decentralized water reuse for community conditions and needs	Reuse	NGOs, universities, and the federal government
		Develop a matrix that matches localized water strategies with the different applications (residential, commercial, etc.), the various challenges the strategies can address, data needs, and financing tools	All	NGOs, universities, and the federal government
		Refine existing decisionmaking frameworks for implementing LWI that best fit a community's particular needs	All	NGOs, universities, and the federal government
		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	Water use efficiency	State governments
		Invest in tools and technologies that harness real-time data to inform improved rate modeling and decisionmaking.	Water use efficiency	Utilities working with technology and university partners
		Generate, collect, and analyze data on: ● How localized water strategies meet water supply, stormwater management, and wastewater management needs ● Environmental, economic, and social benefits of localized water strategies ● How localized water strategies meet public health and safety standards ● How capital costs, performance, and sustainability/resiliency characteristics of localized water strategies compare to centralized systems ● The job creation potential of various localized water strategies	All	NGOs, universities, and the federal government
		Create a "data dictionary" for public water data that includes definitions, standards, and data collection protocols to "promote interoperability, efficiency, and user-flexibility"	Water use efficiency	NGOs, universities, and the federal government
	Create alternative business models	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	All, particularly water use efficiency and	Utilities and local government

Category	Recommendation	Action Items	Applicable Localized Water Infrastructure Category	Recommended Actor
		discounts, flat fee combined with a variable, tiered rate, fixed variable rates	conservation strategies	
		Update institutional hierarchies and traditional roles to reflect 21st century needs by refreshing the utility's stated mission to shift away from the single-purpose service provider model and becoming multi-purpose utility 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, realigning departments and roles to match utilities' priorities	All, particularly water use efficiency and conservation strategies	Utilities and local government
	Establish new pathways for collaboration	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	All, particularly water use efficiency and conservation strategies	Utilities and local government
		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	All	Utilities working with technology, university & NGO partners
Legal & Policy Pathways	*Create new laws and policies to support LWI*	Establish criteria and monitoring guidelines in health and safety codes for onsite reuse of stormwater, greywater, and blackwater	Reuse	State and local governments
		Create a repository of local ordinances, policies, and programs that facilitate localized strategies	All	NGOs and universities
	Update existing laws and policies to clear barriers to LWI	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	All	Utilities and other local governmental entities
		Revise building codes and other relevant, state and local laws to mandate, rather than merely authorize, LWI	All, particularly reuse and alternative water source strategies, and GI	Local governments
		Update water supply planning regulations and policies to ensure planning integrates water savings from water use efficiency, conservation, and water reuse	Water use efficiency, reuse, and GI	State and local governments
		Revise ordinances or incentive programs to ensure private property owners maintain onsite facilities	All, particularly GI	Local governments
		Establish dedicated utility staff to ensure proper operation and maintenance of privately-owned facilities through oversight and inspection	All, particularly GI	Local governments
		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	All, particularly GI and reuse	State governments

Category	Recommendation	Action Items	Applicable Localized Water Infrastructure Category	Recommended Actor
		LWI to meet permit terms and allowing for stormwater credit-trading systems		
		Incorporate LWI objectives into comprehensive master plans and sustainability plans	All, particularly water use efficiency and GI	Local governments