H_2Equity:

Rebuilding a Fair System of Water Services for America

ENVIRONMENTAL POLICY INNOVATION CENTER

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ENVIRONMENTAL POLICY INNOVATION CENTER

The mission of the Environmental Policy Innovation Center is to build policies that deliver spectacular improvement in the speed and scale of conservation. We believe that innovation and speed are central to broadening efforts to conserve wildlife, restore special natural places, and to deliver people and nature with the clean water they need to thrive. To achieve those goals, conservation programs must evolve to accommodate our modern understanding of human behavior and incentives, and the challenges posed by humanity's expanding footprint.

Our work in water focuses on innovative financing, outcomes-based stream and wetland restoration, water quality partnerships, utility consolidation, and the role of data technology in improving consumer trust.

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Executive Summary

America's water systems used to deliver drinking water and remove wastewater from the homes and businesses of 327 million people are broken. Far too many Americans lack consistent access to affordable and safe water supplies to meet their needs. Far too many Americans distrust their tap water, even when it is safe. Far too many Americans experience sewage overflows, polluted riverfronts, and flooded streets. The failures of our water systems prevent all Americans, and especially low-income individuals and people of color, from having the healthy and prosperous lives they deserve.

Whereas improvements in water treatment and sewer infrastructure in the early 1900s disproportionately benefited African Americans in highly integrated cities, race is now the strongest predictor of lack of water and sanitation access, especially in the South. Native American, Black, and Latino households are less likely to have indoor plumbing compared to their white counterparts. Even when racially disadvantaged households have access to piped water and wastewater infrastructure, communities of color report greater levels of drinking water health violations and sewage backups during heavy storm events.

We conducted this strategic review of water issues to identify the overarching challenges in addressing health equity in water infrastructure – and how to make progress in reducing inequity. While there is a general public interest in water across the country at a profoundly higher level than in past decades, this moment won't last.

We must show people that government, advocates, utilities, and experts can be trusted to provide reliable and accessible information on what is and isn't safe to drink or swim in. And we must prove that we can solve problems of water quality, like the cities of Lansing, Madison, and Washington DC have done or are doing. That faith is critical to keeping all populations involved in efforts to keep making progress with America's water needs.

Maintaining the vast water and wastewater infrastructure network across the country is a complex operation. Construction and maintenance of these systems to ensure safe drinking water in our taps and clean water in our rivers and lakes takes enormous resources, which only some large cities can afford all on their own. Deliberate policies, or lack thereof, at the national, state, and local levels of government have exacerbated inequities in our water system. For example, most utility water rate structures exacerbate inequity because they ignore customer income. Why? To make up revenue from their customers, utilities too often charge high fixed rates and first block rates. Then, the price for each subsequent block is only marginally higher than the previous one. Because the first block is too small and priced too high relative to other blocks, this results in water being unaffordable and inequitable for low-income users.

Other forms of inequality arise from how the federal government supports water services. For example, the "environmental decade" of 1970s led to the creation of national environmental agencies, legislation, and federal funding focused on local government grants.[1] Over time, that framework was replaced by the "Washington Consensus" of 1990s leading to decentralization and a greater role for the private sector. That has resulted in a shift from grants to water and wastewater infrastructure loan programs that need to be repaid by communities. This shift alone resulted in significant equity implications for low-income residents and economically weaker and declining communities.

[1] The decade saw the creation of the EPA (1970) and the enactment of the Clean Water Act (1972), the Safe Drinking Water Act (1974), and a host of other environmental legislation.

Today, the American Water Works Association estimates that an investment of more than $1 trillion is needed over the next 25 years to maintain and improve drinking water infrastructure, with billions in additional costs for wastewater treatment upgrades. Lack of grant funding for capital improvement is only one of many challenges facing the water sector. Although bills for water utility customers remain lower than electric, mobile phone, and cable bills, the rate of increase during the last 20 years has outpaced inflation.

The strategic review is based on more than 100 interviews with water sector experts, which included three in-person roundtables held in Alabama, Ohio, and Texas. Roughly half of the experts interviewed were women, and over a quarter were persons of color. There are eight critical areas where investments – not just capital, but social and governance reforms – can improve health equity outcomes for all persons, but in particular among the economically and racially disadvantaged groups:

CONSOLIDATE UTILITIES AND PROMOTE SHARED SERVICES: There are 50,000 water systems, 15,000 wastewater systems, and a growing number of stormwater systems operating in the U.S. More than half the water systems each serve 500 persons or less. Small utilities struggle to meet today's health standards while staying solvent, resulting in inequity for those served by small systems. We need a massive reorganizational effort to consolidate small utilities or regionalize services to improve health outcomes for millions of households. While there is no consensus on the ideal utility size or how many utilities should exist in a state or county, we believe reducing the current number of water systems by 75% in the next 20 years is the minimum necessary amount of consolidation to facilitate sustainable and equitable delivery of water services.

LEAD IS A NEUROTOXIN - ELIMINATE LEAD WATER PIPES ACROSS AMERICA: Removal of all of America's 9 million lead pipes is a solvable problem in a generation or less. Most utilities, as evidenced by their response to the recently proposed EPA revisions to the Lead and Copper Rule, are reluctant to remove them – certainly not on a fast time scale. They prefer using chemical treatment of pipes with anti-corrosive compounds that keep lead out of the water most of the time. But customers are repeatedly experiencing crises that have made them lose faith in treatment technology, and it is impossible to imagine that faith coming back. Lead is a neurotoxin and is especially harmful to young children under the age of six. Public health advocates nearly unanimously agree that removal of these lead service lines is the most effective way of eliminating this source of contamination in our water supply. A few cities have succeeded in the elimination, and a handful of others are on their way to doing so. Lead pipes could be eliminated in America by 2040 through a combination of policy reform, regulation, and supportive government funding that backs utilities' ability to fund and carry out lead pipe removal on private property.

RESTRUCTURE WATER RATES AND ASSISTANCE PROGRAMS TO IMPROVE AFFORDABILITY: Water rates have nearly doubled since 2000, making water unaffordable for the poorest households and putting a significant strain on middle-income households. Deferred maintenance due to lack of funding in prior years has resulted in a sudden need for infrastructure upgrades, whose costs are now borne by consumers, thus accelerating the trend toward higher rates. We believe intentional reevaluation of water rates using household income and more equitable tier structures, and expansion of rate assistance programs, together with strong oversight from public utility commissions, are needed to make water services affordable to all.

INCREASE PUBLIC TRUST IN TAP WATER AND UTILITIES: A third of the customers served by large water utilities rate their water as 'not safe', and a quarter admit to never drinking tap water. Such mistrust is particularly high among Black and Latino households, even when their water quality is essentially similar to their white neighbors. Mistrust of tap water is linked to decreased water consumption and use of expensive or unhealthy substitutes such as bottled water and sugary beverages. Improving trust in tap water is an immediate goal for water utilities and EPA, but they are seen as part of the problem. Trusted third parties and local community advocates need to do more to help drinking water utilities regain public trust in the large percent of the country where tap water is safe.

IMPROVE REPRESENTATION IN UTILITY LEADERSHIP: Utilities are actively taking on the challenge of diversifying their work force. It's safe to do so and they really have little choice given changes in the workforce and retirement patterns. But other than very large, urban utilities, we see little evidence that the 8,000 utilities that serve the majority of the population are moving toward strongly diversified boards of directors, elected bodies or general manager positions. Utility leadership, including board members and general managers, are more likely to be old, white, and male compared to their consumers. This lack of diversity hampers the utility's understanding its diverse customers' needs and changing priorities for service improvements. We outline strategies for utility leadership to expand the ranks of women and individuals of color and become more inclusive and effective institutions. Improving representation is also one of the ways to regain public trust.

REDUCE THE INEQUITY OF STORMWATER IMPACTS: Communities are experiencing 500-year flood events, coastal storm surges, sewer overflows, and basement backups with increasing frequency. These disasters, fueled by a rapidly changing climate, have a disproportionate impact on low-income residents and communities of color. Increased investment, especially in distributed systems like green infrastructure, is needed to improve community resilience. At the same time, we need to emphasize community engagement by seeking input, conducting workforce training, and handing ownership of local infrastructure to the community.

MAKE DECENTRALIZED SYSTEMS SUSTAINABLE: Large number of rural communities rely on decentralized water and wastewater systems such as wells and septic tanks. It would be economically infeasible and physically difficult to connect many of them to centralized water and sewer infrastructure. But poor design, maintenance, and a lack of monitoring means that such systems often fail to protect public health. Such private systems are ineligible for many federal funding programs. Public-private-philanthropic partnerships are needed to encourage robust and targeted public financial support for the construction, repair, and ongoing monitoring of decentralized water and wastewater systems or such partnerships could use their capital to leverage private investment.

RIGHT-SIZE INFRASTRUCTURE TO FIT COMMUNITY NEEDS: Most communities view water infrastructure and the ability to connect to the public water supply or sewers as a driver of economic growth, and hence are susceptible to "build it and they will come" investment decisions. All too often, however, the expensive water infrastructure is built with borrowed money, the growth doesn't materialize, and the community struggles to pay off the bill for the excess capacity. A cultural shift to thinking more flexibly about water infrastructure is needed to help communities avoid over-sizing their infrastructure. The rising popularity and use of green infrastructure to address stormwater pollution is a bright spot that showcases the multiple benefits of distributed infrastructure.

Some of the recommendations we make in this report may seem controversial to certain water advocates, because they require choices to focus on some problems at the expense of others:

- We believe removal of lead water pipes is a more important problem to solve now than addressing a number of other water issues in most parts of the country. Not only does lead heavily impact the youngest members of our society causing permanent damage, but failure to address this issue reveals a failure of governance and long-term vision to serve our most disadvantaged and vulnerable neighbors.
- We believe the direction that too many local and state governments and utilities are headed on water bills will displace and isolate lower income populations from quality water services – we must change direction. Water rate structures are not progressive with regard to consideration of customer incomes. Furthermore, the first block is priced too high relative to other blocks, and the price for each subsequent block is only marginally higher than the previous one, resulting in water being unaffordable and inequitable for low-income users. Whether through bigger reforms to block rate structures or the addition of easy-to-use income-based assistance programs, many more water utilities need a viable strategy to ensure that their most disadvantaged customers aren't shut off from water services.
- We believe some advocates and all bottled water companies benefit from people being afraid of their drinking water, even when that fear has no basis in any evidence of a health or safety risk. Fear changes behavior, but we have enough problems in communities that legitimately lack safe water. More accessible information and data on water quality – specifically designed to reach marginalized and excluded groups is desperately needed. Data tools and technologies are arising that can make that information available in nearly real time, whenever people are facing a choice about the water they use. We need to use these and other strategies and tactics to build accurate perceptions of water across the country.
- In 2012, the State of California took the nation's boldest step forward by creating a 'right to water' framework. We believe this state policy - and its replication in any other state - will drive dramatic progress by creating a right for every person to have safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes. It is difficult to find a more direct or more influential organizing strategy to place health and equity at the center of work of delivering water services.
- Policymakers and local leaders too often believe that rural communities can solve their water and wastewater problems by switching to technologically-sophisticated centralized systems: we need to understand the conditions which really fit onsite systems and then financially support it as much as we do those centralized systems.

Despite any controversy they might attract, we nonetheless make these and other recommendations because we believe they are at the heart of health equity problems tied to America's water services.

One of the overarching themes we observed over the course of this project is that despite the inherent connection between water and public health, water utilities typically fail to see themselves as agents for improved public health. The water sector needs a culture where prioritizing public health determines utility priorities. Decisions such as additional nitrate treatment, replacement of lead service lines, and wastewater disinfection should be taken based on their public health, economic, and equity impact rather than their financial cost alone. Here's a hypothesis we are comfortable making: a utility that hires a public health expert as its director or general manager, will quickly find itself succeeding with its customers and becoming a nationally-known bright spot for water services.

Rebuilding a Fair System of Water Services

America's first public drinking water systems – and private ones – were constructed before the Revolutionary War. Almost another century passed before large public sewer systems were built. These water utilities first arose to supply and meet local needs, expanding as the towns and cities they supported grew, but also arising to serve small, isolated communities that couldn't survive without clean, safe water.

Like electricity, broadband, roads, transit and other infrastructure sectors, it is easy for natural monopolies to arise in water services and so public utility commissions and others have exerted a strong degree of regulatory oversight over private and public water utilities for more than a century. However, very small utilities including those operated through homeowners' associations or cooperatives typically face little or no oversight from third-party regulators over their operations and interactions with customers. In the case of municipally-owned or -controlled systems, the checks and balances that come through local elections are typically strong enough to exert influence on the utility's decision-making, but there are often exceptions.

Predominantly, drinking water is delivered via decades- or even a century-old pipes through our streets and into our homes, and every flush of the toilet sends water to a wastewater treatment plant or septic tank in the yard. Thirteen percent of Americans still rely on private well water,[2] with Prince George's County, Maryland – a majority African American jurisdiction on the outskirts of Washington DC – having the highest proportion of people served by private wells in the country. Nearly 25 percent of Americans use private septic tank treatment for their wastewater management needs. Water and wastewater infrastructure across the U.S. is aging and in need of renewed investment and regular upkeep. Construction and maintenance of these systems to ensure safe drinking water in our taps and clean water in our rivers and lakes takes enormous resources, which only some large cities can afford all on their own.

Governance

Water systems (drinking water, wastewater, and stormwater) in the U.S. are regulated, supported, and overseen by an array of federal, state, and local government agencies. For example, EPA is the predominant federal agency regulating drinking water quality from large utilities, while USDA plays a major role on funding and regulations for rural communities. Bottled water is regulated by the Food and Drug Administration (FDA). The federal government has historically had the greatest role in setting public health thresholds for water quality such as contaminant standards, best practices, guidelines, and technology standards Through legislation such as the Clean Water Act (CWA) and the Safe Drinking Water Act (SDWA).

States play an important role in the water sector, as they have the ability under federal laws to set contaminant standards that are more stringent than the federal standards. Several states have done so, adopting more stringent effluent regulations a nd permit requirements in the case of wastewater, and have recently begun doing so in the case of drinking water standards.[3] State public utility commissions also have broad powers to influence water rate structures, siting of facilities, source water protection, and address affordability concerns in privately owned water systems.

"We have made great strides in making public water safe. SDWA and CWA have given us huge gains in public protection of drinking water."

– Trade group representative based in Washington, D.C.

[2] USGS. 2020. Contamination in U.S. private wells. Accessed at: https://www.usgs.gov/special-topic/water-science-school/science/contamination-us-private-wells on January 3, 2020.

[3] Several states have now set lower limits for emerging contaminants broadly known as per- and polyfluoroalkyl substances (PFAS). See https://pfasproject.com/2018/10/02/analysis-of-state-by-state-differences-in-pfas-regulation/

Finally, local governments play a critical role in various aspects of water infrastructure. This is largely attributed to the fact that local governments such as cities/towns, county, or other regional governments provide water and sewers to a vast majority of users served by centralized systems.[4] In the case of publicly owned utilities, the utilities or their local governments wield decision-making powers on a number of features such as siting of facilities, scope of the distribution system, quality and safety of the materials used and of the finished product (drinking water sent to homes and treated wastewater discharged in local rivers), its pricing and related features (additional fees as well policies regarding non-payment), etc. In most states, public utilities commission (PUC), a state-level agency, oversee private utilities and set rates. Leadership structures of public utilities vary, including systems where elected government officials also serve on the board of the water utility and where separate elections are held for water boards.

Investment

Ratepayers and taxpayers have provided for more than $4 trillion in water infrastructure investment costs since the 1950s. While the passage of major federal clean water legislation in the 1970s provided a large increase in federal grants to upgrade water services, federal water infrastructure grant funding has consistently fallen since then (see **Figure 1**).

In addition, federal funding transitioned from grants in the 1970s that did not need to be paid back to today's loan programs which require the communities and systems receiving loans to have the revenue to repay the federal funds. While Congress never provided more than a fraction of overall funding for water services in the last 60 years, in the 1970s extensive federal grants for major infrastructure improvements were available. Congress continues to fund critical programs such as EPA's water State Revolving Funds (SRF) and the Water Infrastructure Financing and Innovation Act (WIFIA) but these are loan- rather than grant-based programs making it difficult for disadvantaged communities to apply for funding.[5]

An investment of more than $1 trillion is needed over the next 25 years to maintain and improve drinking water infrastructure, with billions in additional costs for wastewater treatment upgrades.[6] At present, federal funding from the Clean Water State Revolving Fund and Drinking Water State Revolving Fund (SRF) and loans under the Water Infrastructure Finance and Innovation Act (WIFIA) can only provide about $6-10 billion annually. Meanwhile, bills for water utility customers remain substantially lower than electric and telephone/cable bills, even though they have been steadily increasing (including increasing by more than 7 percent between 2016 and 2018).[7]

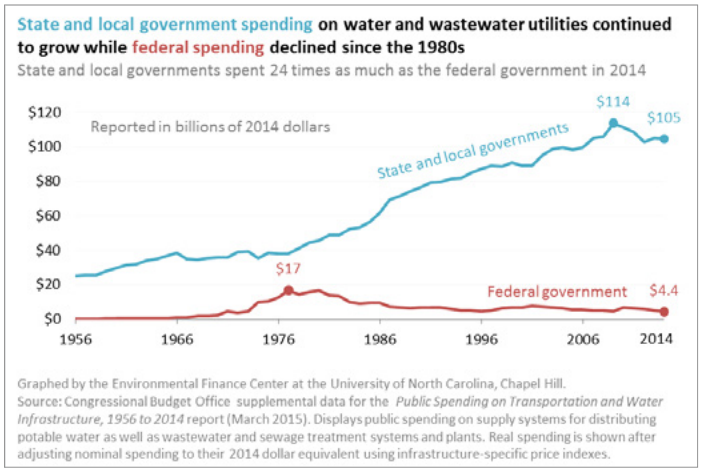

Figure 1. Share of federal and state + local spending on water infrastructure capital spending.

[4] About 13% of the U.S population relies on private wells for drinking water and 25% use individual septic systems for wastewater treatment. A small share (approximately 15%) of piped water users are served by private investor-owned utilities (IOUs) that either own the system fully or operate it under a long-term lease from the local government.

[5] States can leverage these resources to get additional private investors, and provide loans at differential rates to communities. Limited grant funding and zero percent interest for low-income communities are not uncommon.

[6] American Water Works Association. 2012. Buried no longer: Confronting America's water infrastructure challenge. Denver, CO: Author.

[7] The reasons for low water bills are varied. The presence of largely public utilities in the water sector, as opposed to electric and telephone/cable/broadband, certainly plays a big role. Much of the country also enjoys plentiful water, resulting in its low cost.

Water infrastructure requirements and costs are higher today not only because of decades of underinvestment in that infrastructure, but also because of increasing requirements for treatment of drinking and wastewater. For example, communities, regulators, public health advocates and political leaders have pressured utilities to address legacy and emerging contaminants like lead water pipes (service lines), naturally occurring contaminants such as arsenic, and persistent manmade chemicals like per- and polyfluoroalkyl substances (PFAS). Utilities must also incorporate costly new treatment technologies at a faster pace than ever before, often under government mandate. These factors, coupled with changing demographics, socioeconomic patterns, and climate change have created a "perfect storm" for the 50,000 drinking water and 15,000 wastewater utilities that are struggling to provide safe, trusted and affordable water services to much of America. Further, estimates of infrastructure needs don't include costs for the millions of Americans relying on domestic wells for their water needs, and septic systems and rudimentary waste collection and disposal mechanisms make up the rest of the complex water and sanitation landscape of the country.

MYTH BUSTING

MYTH: Federal spending has been greater than state and local funding for water infrastructure in the last 60 years.

Fact: State and local government cover $105 billion in capital and operations expenses today compared to $4.4 billion in federal spending. At the peak of federal spending in the 1970s, only $17 billion was being spent compared to $40 billion by state and local governments. While federal spending on capital expenditures (i.e., new infrastructure) did eclipse state and local funding in the 1970s, it largely appears that state and local governments reduced their spending during the times when federal spending increased. In other words, there was no overall increase in spending as a result, just a shift in who paid. The shift from grants to loans has been more important and detrimental to health equity than past declines in federal funding. However, that does not mean that a future increase of well-targeted federal funding is not critical to future efforts to address health equity.

Inequity

On top of new challenges that affect all residents are the inequity and unfairness that has always affected a subset of Americans and will continue to do so in the future unless we act to get at the root causes of inequity in how water infrastructure is planned, delivered, and billed. In some instances, major infrastructure programs missed entire communities and many of those areas either remained without public water and wastewater systems or had to develop their own small systems. Additionally, exclusionary housing policies kept certain populations, like farm workers, out of well-funded water service areas, and they were forced to settle outside of service areas with inadequate infrastructure. Such communities that did not benefit from earlier decades of government investment in water infrastructure in the 20th century, will struggle to secure investments today, even when some of the institutional, racist, or cultural barriers and biases have been eliminated. Put simply, "race is the strongest predictor of water and sanitation access" in the U.S.[8]

[8] Dig Deep and US Water Alliance. 2019. Closing the water access gap in the United States: A national action plan. Accessed at: http://uswateralliance.org/resources/publications

CONSIDER:

More than
2 MILLION AMERICANS live without running water and basic indoor plumbing. This is a lower percent of Americans than at any point in our history but without new action, these numbers won't decline fast enough.

Contamination from agricultural and industrial production in the form of nitrates, arsenic, and PFAS affect the **NEARLY 44 MILLION** rural and suburban residents who rely on well water for drinking needs.

Fewer than
ONE IN FOUR water utilities offer assistance programs to help lower income customers pay their water bills. This data comes from a survey that over-sampled large utilities and is thus almost certainly an overestimate of the availability of bill assistance.

LOW-INCOME COMMUNITIES of color often have the worst quality water infrastructure, with high rates of health-based violations.

BLACK AND LATINO ADULTS are twice as likely to drink bottled water as non-Hispanic Caucasian adults.

MORE THAN 9 MILLION WATER PIPES made from toxic lead remain connected to residential homes, schools, and other drinking supplies across the country.[9] Those pipes are treated with anti-corrosive agents that keep them from leaking lead into drinking water, but that treatment system fails too often.

[9] Environmental Defense Fund and American University. 2020. Lead Pipes and Environmental Justice: A study of lead pipe replacement in Washington, DC. Available at: https://www.edf.org/sites/default/files/u4296/LeadPipe_EnvironJustice_AU%20and%20EDF%20Report.pdf

Although water and wastewater services are inherently tied to public health, utilities typically fail to see their role as agents of public health (see **Figure 2**). An analysis of 50 utility websites found little evidence of public health framing in content, messaging, and programs.[10] There is simply no information provided by most of these utilities focused on health. Utilities often provide copies (usually in pdf form) of mandatory water test results on water contaminants, but those reports are difficult to find, rarely exist in languages other than English, and are highly technical. Utilities rarely test water any more frequently that the regulatory minimum requires. In fact, there are several instances where water utilities and their trade associations have opposed improved health standards due to the increased cost of compliance.[11]

"I've been surprised at how little connection I've seen between public health departments and drinking water systems. It's the missing link."

– Non-profit leader based in the South

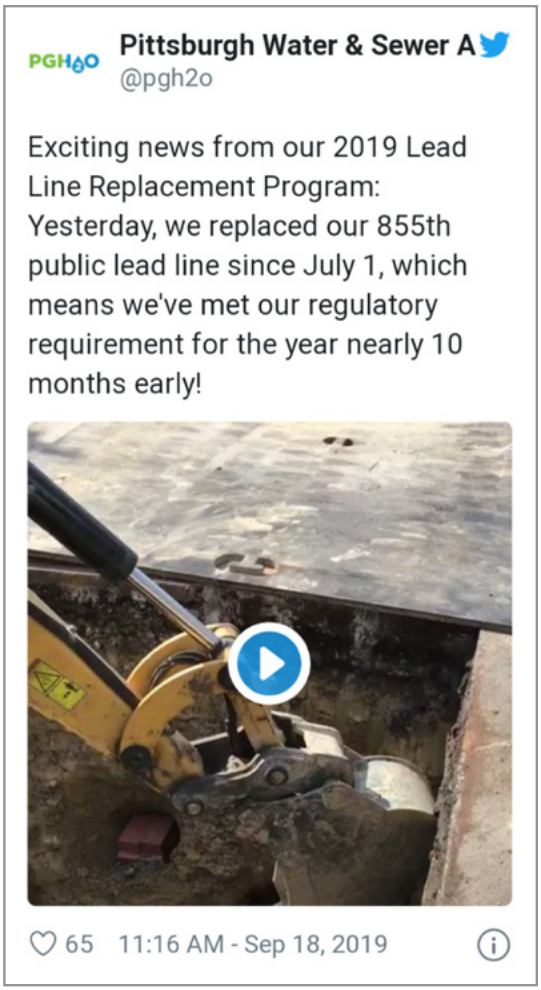

Figure 2. A tweet by the Pittsburgh Water & Sewer Authority (twitter handle: @pgh2o) posted on September 18, 2019 touts an early achievement of regulatory requirement rather than highlighting improved public health for nearly a thousand households. Utilities often chase metrics like this one that miss the point of the very public health interventions they are carrying out.

Decisions such as whether to adopt additional nitrate treatment, replace of lead service lines, or enhance wastewater disinfection are often prioritized similarly to routine maintenance decisions, even though there is an additional public health outcome associated with these investments. California's an important recent exception to this statement. In 2012, the State of California took the nation's boldest step forward in systematically bringing a 'right to water' into the mainstream of how utilities serve all the people of the state.[12] We believe this state policy is unique in putting public health and health equity into the center of utility and state regulator decision-making. This policy has shifted the legislative and policy landscape in the state by facilitating intense discussion and investment on issues of water access and affordability, including passage of a safe and affordable drinking water fund (SB 200) in 2019, and the state is in the process of establishing reporting standards that will track progress.

[10] Vedachalam, S. and Kirchoff, M. 2020. Analysis of water utility websites reveals missed opportunities. Journal AWWA, 112(3), 62-69.
[11] A few notable instances center around the issue of lead. In 1991, AWWA opposed the original EPA proposal to ban mandatory lead service lines in the Lead and Copper Rule (LCR). Eventually, EPA settled for voluntary lead line replacement so as not to delay the rule's implementation. More recently, a group of Michigan utilities challenged the revised LC standards developed by the state in 2018. The state Supreme Court has dismissed most of the challenges, but the matter is not fully settled yet.
[12] California Water Boards. 2020. Human Right to Water Portal. Accessed on March 25 at: https://www.waterboards.ca.gov/water_issues/programs/hr2w/

"Health equity means that everyone has a fair and just opportunity to be as healthy as possible. This requires removing obstacles to health such as poverty, discrimination, and their consequences, including powerlessness and lack of access to good jobs with fair pay, quality education and housing, safe environments, and health care."[13]

A push to prioritize public health would be incomplete without consideration of equity. Take the case of pollution compliance. Wastewater treatment, stormwater management and other point and nonpoint source regulations result in EPA issuing upgrade requirements, consent decrees, and permits with conditions that require expensive infrastructure upgrades. For example, the City of Houston faces a $2 billion consent decree to reduce sewage discharge into local waters.[14] This consent decree addresses the environmental harm caused by that city's untreated wastewater, but does not take into account the impact of these fines and remedial measures on the city's poorest residents. In fact, it is highly likely, as observed in other cities facing similar consent decrees (see **Case Study 4**), that compliance will result in higher wastewater bills, disproportionately impacting low-income residents.

> **"Utilities don't want to talk about [equity] issues, unless they have to"**
>
> *– Academic expert based in the West*

Many of the best ideas in building equity and a health focus into water services are happening locally. For example, the Water Equity Task Force is a compelling effort led by a set of cities and the US Water Alliance to develop best practices for individual cities to take on and an aggressive agenda to focus on equity throughout the water sector. Their work, for example, led to development of the first water equity 'roadmap' for the city of Louisville. This was, unfortunately, a weak document in that it only focused on staffing of the utility. However, a second roadmap for Camden, New Jersey followed in late 2019 which is comprehensive in its prioritization and strategies for equity.[15] Many of these plans are either under development or only being tested at a pilot-scale; the real test comes when utilities and communities try to implement them – but their development is essential in more places. Another local example is the work of Greenprint Partners, a startup, women-owned business that is helping develop action plans for cities to disproportionately site green infrastructure aesthetic improvements in lower income neighborhoods and to ensure that construction and maintenance jobs associated with those projects go to historically disadvantaged populations. Local 'bright spots' like these need dramatic replication and amplification. If they receive that support, they will be successful in changing cultural attitudes across water utilities regarding how they can address health and inequity with their services.

[13] Braveman, P., Arkin, E., Orleans, T., Proctor, D., Acker, J., & Plough, A. 2017. What is health equity? Robert Wood Johnson Foundation.
[14] U.S. Department of Justice. 2019. Press release dated August 27. Accessed at: https://www.justice.gov/opa/pr/houston-texas-agrees-implement-comprehensive-measures-aimed-eliminating-sanitary-sewer-0
[15] Water Online. 2019. Camden leaders release water equity road map. September 16. Accessed at: https://www.wateronline.com/doc/camden-leaders-release-water-equity-roadmap-0001

Summary

This report details challenges confronting the U.S. water sector, along with possible interventions, some that have been implemented and others worth pursuing. This report is set up as a scan that looks at key trends and practices in a diversity of fields within water infrastructure. While we examine the causes of health inequity in this report and offer recommendations on solutions, the problems affecting various water services are also symptoms of broader problems with inequity across the country that cannot be solved through work on water infrastructure alone. We believe that sustained intervention by government agencies, utilities and trade groups, philanthropic foundations and community groups could make a dramatic difference in the health inequity that is prevalent throughout our water infrastructure system.

We focus our analysis and recommendations in 8 areas:

1. **THE NEED TO ACCELERATE CONSOLIDATION OR BETTER NETWORKED SERVICES FOR THOUSANDS OF SMALL WATER UTILITIES**
2. **ELIMINATING LEAD PIPES FROM WATER SYSTEMS**
3. **BETTER AFFORDABILITY POLICIES AND SYSTEMS**
4. **INCREASING THE ACCURACY OF PERCEPTIONS OF UTILITIES AND TAP WATER QUALITY**
5. **INCREASING REPRESENTATION IN UTILITY LEADERSHIP**
6. **REDUCING THE INEQUITY OF STORMWATER IMPACTS**
7. **ENHANCING STRATEGIC MANAGEMENT OF SEPTIC SYSTEMS IN RURAL AREAS**
8. **RIGHT-SIZING INFRASTRUCTURE FOR FUTURE NEEDS**

For each area of analysis, we provide a) goals, b) an overview and background, and c) recommendations and justification for them. Lastly, while national policy still drives the discussion on water quality, many of the best ideas in building equity and a health focus into water services are happening locally. That is why, in addition to the above, we highlight case studies where possible, that provide context to the trials and tribulations of residents, community advocates, and utilities themselves as they seek to make the water services more equitable and just for all residents.

Over time, we believe that concerted action by governments, advocates, local communities, academics and nonprofits can a) build water policies and practices that provide everyone with access to affordable, safe, drinking water; b) ensure that water decision-makers are representative of the communities they serve; c) shift water utilities so they see equity and health as core to their mission of delivering community outcomes, not just water; d) increase quality and reliability of safe drinking water in communities of color and lower-income communities, and e) move public opinion so that communities of color and the broader public have trust in water services where such trust is warranted.

CONSOLIDATION AND REGIONALIZATION OF WATER SERVICES

Goals

- Improve water quality in rural and underserved areas by eliminating very small utilities through mergers, acquisitions, and shared service agreements
- Create state or federal policy structures that allow states to enhance the pace and quality of mergers
- Create a national policy framework that prioritizes health outcomes and disincentivizes the creation and continued persistence of utilities without a sustainable funding base

Background

The number of utilities that provide water services is dramatically different from other infrastructure sectors. Roughly 87% of the U.S. residents receive piped water from a water utility and the rest rely on private water wells. There are more than 50,000 community water systems that supply water to the same people year-round. These systems are the primary focus of this review, except where noted. There are also an additional 103,000 small water systems that serve non-regular users or serve the same users seasonally (see **Figure 3**). In addition, there are about 13,000 wastewater utilities. Nearly 90% of the water utility systems in the United States serve less than 10,000 people and more than half serve less than 500 people.[16] Compare this to around 3,300 electric utilities, 2,600 internet service providers, or 54 state and territorial state highway agencies.[17]

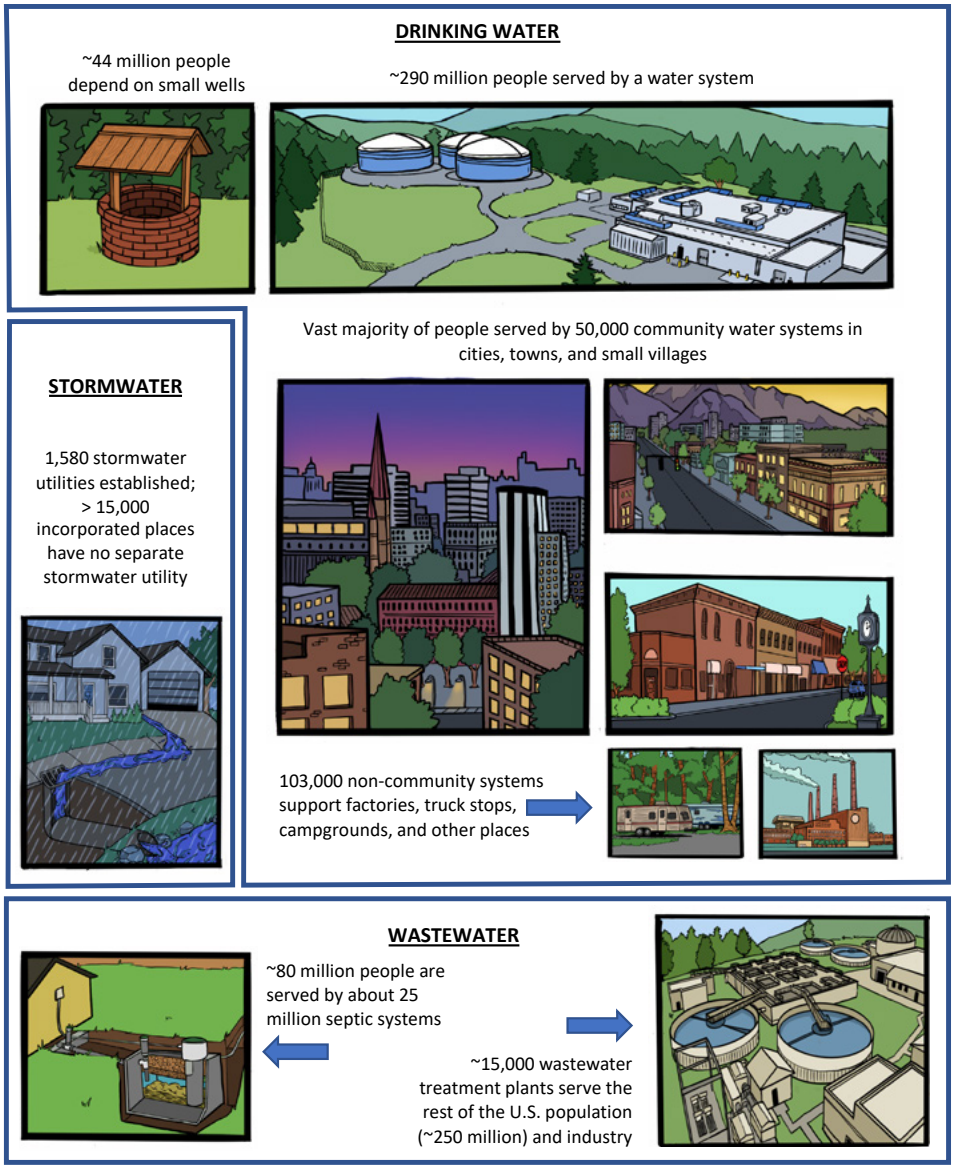

Figure 3. Water system ownership and overall structure

[16] National Governors Association, "State Level Policies to Promote Water Utility Consolidation," (Oct. 2018).
[17] Wang, T. 2019. Largest energy utility companies in the U.S. based on market value 2019. Statista. Accessed at https://www.statista.com/statistics/237773/the-largest-electric-utilities-in-the-us-based-on-market-value/; list of internet service providers: https://broadbandnow.com/All-Providers

WATER SYSTEM DEFINITIONS

A **public water system** provides water for human consumption through pipes or other constructed conveyances to at least 15 service connections or serves an average of at least 25 people for at least 60 days a year.[18] A public water system may be publicly or privately owned. There are over 151,000 public water systems in the United States. EPA classifies these water systems according to the number of people they serve, the source of their water, and whether they serve the same customers year-round or on an occasional basis.[19]

Community Water System (CWS): A public water system that supplies water to the same population year-round.

Non-Transient Non-Community Water System (NTNCWS): A public water system that regularly supplies water to at least 25 of the same people at least six months per year. Some examples are schools, factories, office buildings, and hospitals which have their own water systems.

Transient Non-Community Water System (TNCWS): A public water system that provides water in a place such as a gas station or campground where people do not remain for long periods of time.

This report will focus extensively on community water systems, which number about 52,000 throughout the U.S. These systems may also be synonymously referred to as water utilities.

The immense number of small water systems exacerbates the water sector's challenges such as aging infrastructure, affordability, technical know-how to deal with contaminant pollution, and sustainability issues.[20] Water utilities exhibit strong economies of scale. The per-volume cost of producing water goes down with increasing volumes, thus benefiting large utilities that produce several millions of gallons per day. Small utilities that produce only thousand gallons per day are disadvantaged by their size. Average water costs are 30% more expensive for customers of smaller utilities across states like Indiana. The same pattern is true for wastewater utilities. Small utilities also have a smaller user base to charge and are thus vulnerable to shocks such as population loss, changes in the local economy, or weather patterns. Small utilities have trouble hiring and retaining qualified operators, have few resources to improve their overall infrastructure, and are more likely to experience water quality violations.[21,22] They often lack resources to keep track of and apply for government grants that are specifically targeted for small utilities.

Utility consolidation is a health equity issue because **the smallest utilities disproportionately serve isolated, rural and lower-income communities and we see no circumstances in which a large fraction of these utilities can provide safe and sustainable water in the future.** However, we have little data about the utilities that a) serve significant disadvantaged populations, b) have significant water quality issues tied to health and community outcomes, and c) are unsustainable by themselves but might become solvent by joining with nearby utilities. This kind of analysis is crucial to developing a national consolidation strategy that focuses on health equity.

Water systems across the country have been taking advantage of the process of consolidation to achieve several objectives, which include increasing access to high quality water and wastewater services, improving resilience, reducing costs to consumers, increasing efficiency, and modernizing the water infrastructure. The US Water Alliance defines consolidation as "...two or more distinct legal entities [becoming] a single legal entity operating under the same governance, management, and financial functions."[23] The ultimate goal of consolidation is to combine powers to improve efficiency and quality overall, while improving access across the water sector.

[18] This report does not address issues associated with water systems that fall below this cutoff (serving 14 connections or 24 persons and under). California regulates a subset of these systems, serving between 5 and 14 connections as "state small water systems". Some information available here: http://sonomacounty.ca.gov/Health/Environmental-Health/Water-Quality/State-Small-Water-Systems/

[19] EPA. 2020. Information about Public Water Systems. Accessed at https://www.epa.gov/dwreginfo/information-about-public-water-systems on January 6.

[20] *Ibid.*

[21] NRDC. 2019. Watered Down Justice. Accessed at https://www.nrdc.org/sites/default/files/watered-down-justice-report.pdf

[22] Teodoro, M. P., & Switzer, D. 2016. Drinking from the talent pool: A resource endowment theory of human capital and agency performance. Public Administration Review, 76(4), 564-575.

[23] US Water Alliance, "Utility Strengthening through Consolidation: Guiding Principles for the Water Sector," (2019).

The process of consolidation and regionalization, however, must happen in such a way that it builds community engagement. In cases where the smaller utility is absorbed into a larger system, provisions must be built to ensure the smaller utility's customers have a role in the decision-making and that community is fully represented in the newly created entity.

There are three broad types of consolidation:

Direct Acquisition

Direct acquisitions occur when a larger utility takes over operations of another system, acquiring the assets and consumer base, and absorbing the system to make it part of the larger utility.[24]

Erie County Water Authority (2019): After a residential vote in June of 2019, the Town of Aurora, New York decided to merge its water system with the Erie County Water Authority. Upon acquisition, ECWA is now responsible for the town's entire water system, as well as the operations, maintenance and future infrastructure investments.[25] Expected savings are projected to be about $288 for east or southeast customers, and $97 for northern district customers as a result of consolidation.[26] ECWA Aurora currently serves a population of 13,857.

Joint Merger

Aside from direct acquisitions, joint mergers occur when equal standing utilities adjust their operations and governance, join forces with one another, and form a larger utility governed by the two former separate utilities under a single entity.

Truckee Meadows Water Authority (2014): The Washoe County Department of Water Resources and South Truckee Meadows General Improvement District in California consolidated into the Truckee Meadows Water Authority after five years of discussion and planning. Both utilities merged to form the Truckee Meadows Water Authority, with goals consisting of improved management and use of water resources, more efficient infrastructure utilization and development, and better service to customers.[27] After consolidation, Truckee Meadows Water Authority now serves nearly 117,000 homes and businesses.

Balanced Merger

Balanced mergers consist of two or more utilities consolidating, typically between a utility that is more well-equipped than the other(s) and establishing a governing structure that allows for the less-equipped utility have some role in future decision-making.

City of Georgetown (2014): After three years of negotiation, the City of Georgetown, Texas and the Chisholm Trail Special Utility District merged by absorbing Chisholm Trail customers into the City of Georgetown water system.[28] The City of Georgetown paid $10.4 million for pipelines, buildings and other infrastructure that was formerly owned by the Chisholm Trail Special Utility District.[29] While the two utilities consolidated under the City of Georgetown's name, the Chisholm Trail district board continues to serve on the policy board and has the ability to hold regular meetings and elections until the decision is made for the district to formally be dissolved.[30] Furthermore, two positions, reserved specifically for out-of-city members, were added to the Georgetown Utility Systems Advisory Board. Today, the City of Georgetown serves nearly 62,500 water customers.

[24] US Water Alliance, "Utility Strengthening through Consolidation: A Briefing Paper," (2019).
[25] Erie County Water Authority, "Town of Aurora Merges Water System with ECWA," (June 2019).
[26] WIVB, "Town of Aurora-ECWA water system merger approved," (June 2019).
[27] Truckee Meadows Water Authority, "Frequently Asked Questions," (Nov. 2014).
[28] City of Georgetown, "Chisholm Trail and City of Georgetown Water Utilities Consolidate Assets," (Sep. 2014).
[29] Statesman, "Georgetown, Chisholm Trail consolidating water utilities," (Sep. 2014).
[30] City of Georgetown, "Chisholm Trail Special Utility District Dissolution FAQ," (Sep. 2019).

Consolidation and regionalization reap many of the same effects and are very similar in that both improve efficiency and resilience across the water sector. However, their implementation processes are a bit different. While consolidation occurs typically between a few utilities, regionalization is larger scale and consists of several local water systems combining forces and working together through partnerships.[31] The Rural Community Assistance Partnership (RCAP) argues that regionalization can occur in four different ways: **informal cooperation** (systems simply working together and pooling resources without being contractually obligated to one another), **contractual assistance** (systems signing contractual agreements with each other), **joint power agency** (formation of a separate legal entity by utilities that is responsible for performing variety of functions), or **ownership transfer and consolidation**.[32]

RECOMMENDATIONS

A predominant view among water experts is that water provision through such a large number of small utilities is unsustainable in the long-run, and thus utilities should seek out opportunities to share services and even consolidate with other similar-sized or larger utilities. While there is no consensus among experts on the ideal utility size or how many utilities should exist in a state or county, Dr. Manuel Teodoro of Texas A&M University, a water governance expert who frequently consults for water utilities, believes that **consolidating the existing water systems from more than 50,000 to fewer than 5,000 by 2030 is one of the most effective ways to improve the country's water systems**.[33]

1. **EPA rulemaking and state policy needs to be a higher priority – those policies need to create stronger incentives for voluntary consolidation and more authorities to mandate consolidation when a utility cannot meet its customers' needs. Health equity should be a driver of consolidation.**
2. **Set a national goal to bring down the number of utilities by 75% in the next 20 years and improve health outcomes for millions of rural residents.**

The EPA is currently exploring a rule, expected to be finalized in October 2020, to encourage states to have greater authority to enable consolidation. The Water Restructuring Rule would govern mandatory restructuring assessments and will authorize primary agencies to mandate restructuring assessments for public water systems that don't comply with or violate health standards frequently. Restructuring assessments will be designed specifically for the water system based on its size, type, etc. in order to prevent assessments from being "overly burdensome." The rule will also include consolidation incentive provisions, which are currently available only in some states like California. The EPA estimates that 740 public water systems that are "persistently in violation," and are considered very likely candidates for restructuring assessments, as well as 3,508 public water systems with health violations in the past year that are considered potential candidates if the underlying issues at hand are not addressed.[34]

A longer discussion of the proposed **Water Systems Restructuring Rule** is available on the EPIC website.

[31] Rural Community Assistance Partnership, "How to Leverage Regional Collaboration for your Community," (Sep. 2019)
[32] RCAP is a U.S. non-profit established as part of the New Deal to support water and sanitation needs in rural and small communities. It has six regional affiliates which carry out the on-the-ground work, providing capacity development and technical assistance to the communities in their region.
[33] Teodoro, M. 2019. The Plan: A five-point proposal to transform U.S. water system governance. October 15. Accessed at: http://mannyteodoro.com/?cat=13
[34] Environmental Protection Agency, "The Water System Restructuring Rule," (July 2019).

This future action is an opportunity for a much stronger national campaign focused on consolidation priorities and authorities. Although utilities and utility associations themselves are playing a strong role in encouraging consolidation, there is much more work and advocacy that is needed from funders and activists to support consolidation policies that prioritize health equity considerations. Louisiana, for instance, recently created a Rural Water infrastructure Committee, whose priority is consolidating small, struggling water systems with more stable larger neighbors.[35] The state is offering grant funding to cover the full capital cost of consolidation. This field of work on water policy is largely vacant and would be an attractive area for public health advocates to make a significant contribution through investments in analysis, business planning, and policy advocacy.

Organizations such as RCAP – a key rural community partner backed by USDA and other supporters - promote regional collaboration among water utilities. Collaboration among water utilities can range from informal cooperation to outright ownership transfer. While sharing services can expect to result in cost savings for each of the utilities involved in the agreement, an assessment of shared service agreements in New York suggests that the need for improved service quality and cross-jurisdictional cooperation, rather than cost savings, lead to longer-term agreements across municipal entities.[36] These efforts are important as well.

[35] Walton, B. 2019. In Louisiana, Officials Pursue Fixes for Indebted, Failing Water Systems. Circle of Blue. December 12. Accessed at: https://www.circleofblue.org/2019/world/in-louisiana-officials-pursue-fixes-for-indebted-failing-water-systems/

[36] Aldag, A.M. and Warner, M. 2017. Cooperation not cost savings: explaining duration of shared service agreements. Local Government Studies, 44(3): 350-370.

3. New utility models need more help and support

The sustained growth of EJ Water Cooperative, a member-owned nonprofit water utility operating in central Illinois, is another example of the opportunity to address healthy equity by working to reform utility structure and size (see **Case Study 1**). The Cooperative is bringing stronger water services to rural areas in the state while keeping costs down, using a network of expert staff to deliver technical services across previously disconnected water systems. They have built a networked set of facilities that continue to grow as more communities seek to join the cooperative. The newly-formed not-for-profit version of EJ Water (as opposed to its current coop model) would be an alternative to the private, for-profit utility consolidation that is taking place across Pennsylvania, Connecticut, and New Jersey. Support for efforts like this create a learning opportunity to identify utility structures that would best support strong investments in health equity.

Case Study 1: Consolidation of Rural Utilities: The Case of EJ Water Cooperative

DEJ Water Cooperative, Inc. ("EJ Water"), based in central Illinois, is a successful model of utility consolidation that holds lessons for communities large and small across the country. The utility follows a coop model where ratepayers are also owners, unlike traditional utilities where ratepayers are simply customers. Initially based around Effingham and Jasper counties of Illinois (giving the utility its initials "EJ"), EJ Water is now the largest regional water utility in Illinois as a result of merging 18 previously separate utilities. Within that area, EJ Water provides service to more than 200 small and medium-sized towns in Illinois spread across 13 counties, resulting in a service area of over 5,500 sq. mi. Including wholesale supply, EJ Water provides water to over 75,000 people. EJ Water has its own billing software, construction crew, and trained water operators. Operators are sometimes loaned out as needed to utilities outside its system and often initiate a process of collaboration and eventual merger.

Recognizing the related challenges of providing affordable clean drinking water and a reliable internet connection in rural areas, EJ Water also provides broadband services through a joint venture, Illinois Fiber Connect. To assist rural water systems in other parts of the country without jeopardizing its cooperative model, EJ Water recently created a new entity, EJ Water Trust, as a not-for-profit organization under IRS section 501(c)(3). The Trust is envisioned to become the first and one-of-its-kind non-profit utility that will outright own a few "anchor" water systems with excess capacity, which will allow the Trust to absorb and provide service to nearby satellite communities who give up their independent utility, thus replicating the EJ Water Coop model nationwide.

A more descriptive version of this case study is available on the EPIC website.

Connections to recommended interventions:

4. Support a comprehensive analysis of recent mergers of utilities to assess the impact on water quality, affordability, and public health as a result of consolidation.

We have clear evidence that larger water and wastewater utilities are better than their smaller counterparts on parameters such as cost, water quality violations, and technology implementation. However, it is less clear if those efficiency gains are due to size alone, or are partly due to related factors such as network density effect, labor productivity, or access to cheaper materials and technical support by being in or near a metro region. The gray literature on consolidation is filled with success stories of small, marginally-performing utilities pursuing consolidation with their larger, more solvent neighbors and improving varied outcomes like water quality, customer service, and affordability.

States have a variety of administrative, policy, and financial tools to promote consolidation, ranging from incentives in the DWSRF program to court-ordered receivership or takeover. An EPA guide documents the existing policies in all 50 states.[37] In talking to water experts, no state is perhaps mentioned more than Kentucky in the context of consolidation. Another state that is aggressively taking action on this issue is California that is using new provisions to improve water quality in some of its smallest and poorly run water systems (see the case of **Pratt Mutual Water Company** and the **City of Tulare**).

Consolidation of utilities is a long process that sometimes ends in failure. Even if ultimately successful, outcomes may not match expectations. Our inability to account for failed consolidation attempts could bias our overall assessment of sector-wide utility consolidation ("survivorship bias"). To get a better understanding of the outcomes, there is a need for a comprehensive assessment of mergers and consolidation attempts, starting in states like Kentucky and California that have undertaken large number of consolidations but also of individual consolidations that are happening across the country.

Kentucky Regionalization

Since 1979, Kentucky went through a major regionalization and consolidation effort reducing the number of water systems within the state, from 2,000 to 400.[38] Many water systems in Kentucky have resorted to regionalization and consolidation as it is believed to "...help rural water systems leverage economy of scale and available expertise to make better use of resources and opportunities."[39] In 1974, Pike County was comprised of 189 public water systems, compared to the 3 active systems present in the area as of 2018. The state's Public Service Commission was given powers to facilitate this transformation.[40] The State of Kentucky Public Service Commission has authority to "...initiate and carry out feasibility studies to determine the possibility of merging water districts or merging water associations into water districts. Upon completion of a study, and after a public hearing, the PSC can order the merging of water districts or associations into a single water district, and make any additional orders in connection with rates and charges."[32] Additionally, the Kentucky Infrastructure Authority has prioritized the Drinking Water State Revolving Fund (DWSRF) by awarding priority points for projects that result in "elimination of a PWS through a merger or acquisition, elimination of a water treatment plant as a result of an interconnection, or acquisition of an emergency potable water supply."

California Mandatory Consolidation

In 2015, legislative changes to the California Health and Safety Code (HSC 116680-116684) gave the State Water Board's Division of Drinking Water the right to decide whether a water system would partake in consolidation. This rule was implemented to assist disadvantaged communities which are "a community with an annual median household income that is less than 80 percent of the statewide annual median household income."[41] If the public water system continuously experiences chronic water quality failures or has unreliable supplies, they are first provided with technical assistance to analyze the problem and then are recommended a course of action, which may include voluntary consolidation. If voluntary consolidation is suggested but unable to be negotiated within a certain time frame, the State Water Board has the authority to commence a direct mandatory consolidation, in which consolidation letters are sent to the subsumed system and receiving system notifying that they have six months to make plans for voluntary consolidation. If the systems don't develop a plan within six months of notification, the Board may then issue a mandatory consolidation notice.

[37] United States Environmental Protection Agency. 2017. Water System Partnerships: State Programs and Policies Supporting Cooperative Approaches for Drinking Water Systems.
[38] Earth and Water Law Group, "Rural Communities Contemplate the Costs and Benefits of Consolidating Water Systems," (Sep. 2017).
[39] Ibid.
[40] Environmental Protection Agency, "Building the Capacity of Drinking Water Systems," (Dec. 2018).
[41] California Water Boards, "Frequently Asked Questions on Mandatory Consolidation," (Nov. 2016).

Mandatory consolidation: Pratt Mutual Water Company and the City of Tulare

The consolidation between the water utilities Pratt Mutual Water Company and the City of Tulare, was the first mandatory consolidation to be issued by the State Water Board. For years, the water supplied to over 1,500 Matheny Tract residents by Pratt Mutual Water Company had levels of arsenic that exceeded the drinking water standard.[42] Matheny Tract, deemed "the Flint of California" by a national publication, consists of a largely lower income and Latino population, and for years, the City of Tulare refused to extend its services to Matheny Tract.[43] In 2010, Pratt Mutual Water Company received a compliance order as a result of frequent arsenic violations, and discussion of consolidation was prompted between the two utilities. In 2013, $4.9 million was dedicated to the construction of water system improvements and for a connection to Tulare's water system.[44] Finally, in March of 2016, after numerous delays in the process and recognizing the water quality issues at hand, the State Water Resources Control Board issued an order for mandatory consolidation between Pratt Mutual Water Company and the City of Tulare. This order followed a monumental and multi-year community organizing effort to implement the consolidation project, targeting the City and the state. Prior to the mandatory order, the City sued Pratt Mutual but ultimately lost their case before the state water board. The construction of the connection was finally completed in May of 2016, and by June the Matheny Tract connection to the City of Tulare's water system was providing clean water to residents. The success of mandatory consolidation issued by the Division of Drinking Water allowed over a thousand consumers to have clean water supplied after years of contamination.a course of action, which may include voluntary consolidation. If voluntary consolidation is suggested but unable to be negotiated within a certain time frame, the State Water Board has the authority to commence a direct mandatory consolidation, in which consolidation letters are sent to the subsumed system and receiving system notifying that they have six months to make plans for voluntary consolidation. If the systems don't develop a plan within six months of notification, the Board may then issue a mandatory consolidation notice.

[42] California Water Boards, "Pratt Mutual Water Company," (Oct. 2016).
[43] Brown, P.L. 2016. The Flint of California. POLITICO. May 25. Accessed at: https://www.politico.com/agenda/story/2016/05/is-clean-drinking-water-a-right-000129
[44] California Association Local Agency Formation Commissions, "SB 88 Case Study"

ELIMINATING LEAD CONTAMINATION FROM WATER PIPES

Goals

- Eliminate a public health problem by removing lead water pipes within the next 20 years
- Develop financing models to pay for lead service line replacement projects that don't burden lower income ratepayers

Background

The issue of lead contamination in water was brought to the national attention by the crisis in Flint, MI, though the problem has persisted for many years.[45] Lead pipes have been historically used to carry water, starting from ancient Rome. In fact, lead was so synonymous with the piping infrastructure that the word 'plumbing' was derived from the Latin word for lead, *plumbum*. The use of lead pipes found a resurgence in the growing cities of the United States and Europe during the Industrial Revolution, when pipes containing lead were used to carry drinking water and wastewater.[46] Although lead was more expensive than iron, it lasted longer and its malleability meant that it could be easily shaped around existing buildings and structures. This led to the installation of lead pipes on a massive scale in U.S. cities. By 1900, more than 70% of the cities with more than 30,000 persons used lead water lines.[47] Most of the lead pipes, however, were installed in service lines that connected homes and businesses to the water mains running along major streets. Additionally, lead is also present in small quantities in solder, joints, and water heaters used within properties.

The best estimates available suggest there are more than 9 million lead pipes (service lines) in residential properties across America today.[48] Lansing was a national leader in replacement of lead service lines. They replaced all 12,150 lead service lines by 2016. The project took 10 years and cost the city $44 million, without making bills unaffordable.[49] The city benefited from the fact that it is one of the few utilities to have accepted ownership of its entire distribution network (on private property and public property).

Lead is a neurotoxin and is especially harmful to young children under the age of 6, whose blood-brain barriers are not fully developed. Although much of the attention in this debate has focused – rightfully so – on the impacts on young children, it is increasingly clear that adults too face significant health risks due to lead intake. One recent study concluded that "low-level environmental lead exposure is an important, but largely overlooked, risk factor for cardiovascular disease mortality in the USA."[50] The Environmental Defense Fund estimates that full replacement of lead service lines would result in $205 billion in benefits over 35 years due to reduced mortality from cardiovascular diseases.[51] That is a payback of $3 for every $1 invested in lead pipe replacement. Pregnant women have increased risks to their fetus, and women who later become pregnant have similar risks if lead stored in the mother's bones is released during pregnancy.

Lead in drinking water is regulated under a few key federal laws and regulations that include the requirement to use "lead-free" pipe, solder, and flux[52] in water installations through the Safe Drinking Water Act (SDWA), the Lead and Copper Rule (LCR) first promulgated in 1991, and various state and local laws focused on lead monitoring and reporting requirements at schools and child care centers and its subsequent revisions. The federal rule went through minor amendments in 2000 but lead standards have remained unchanged for years. EPA is now in the process of finalizing a major revision to the rule.

[45] A similar crisis occurred in Washington, D.C. in the early 2000s.
[46] Vedachalam, S. 2018. Lead in water: From Ancient Rome to Flint and beyond. Global Water Forum. Accessed at: http://www.globalwaterforum.org/2018/05/07/lead-in-water-from-ancient-rome-to-flint-and-beyond/
[47] Troesken, W. 2006. The Great Lead Water Pipe Disaster, MIT Press
[48] Environmental Defense Fund and American University. 2020. Lead Pipes and Environmental Justice: A study of lead pipe replacement in Washington, DC. Accessed at: https://www.edf.org/sites/default/files/u4296/LeadPipe_EnvironJustice_AU%20and%20EDF%20Report.pdf
[49] Lansing Board of Water & Light. 2018. 2018 Annual Water Quality Report. Accessed at: https://www.lbwl.com/sites/default/files/inline-files/2018%20BWL%20Water%20Quality%20Report_2.pdf
[50] Lanphear, B. P., Rauch, S., Auinger, P., Allen, R. W., & Hornung, R. W. 2018. Low-level lead exposure and mortality in US adults: a population-based cohort study. Lancet Public Health, 3(4), e177-e184. doi:10.1016/s2468-2667(18)30025-2.

A longer discussion of the current and proposed changes to the federal **Lead and Copper Rule** is available on the EPIC website.

The current regulation as of today requires public water systems to monitor for lead in drinking water and for large water systems to provide treatment for corrosive water. If the monitoring shows that more than 10% of samples taken from high-risk residences exceeds a lead action level of 15 parts per billion (ppb), water systems must undertake a series of actions. These include system-wide corrosion control treatment, source water monitoring, and ultimately lead service line replacement. There is no safe level of lead in blood of humans, so the 15 ppb action level for public water systems is not a health-based standard, but simply a "trigger for treatment." The regulation does not directly apply to schools or childcare facilities, unless they are labeled a public water system.

"The federal Lead and Copper Rule is dumb and dangerous… Unless the federal rules are changed, this tragedy will befall other American cities."

– Former Michigan Governor Rick Snyder (2017)

The Flint water crisis and earlier crisis in Washington DC exposed limitations of the lead testing and monitoring framework under the Lead and Copper Rule. This became particularly evident in the case of multi-family housing, daycare centers, and K-12 schools. Childcare centers and schools house young children – who are most vulnerable to harm from lead.

One of the most challenging facets of the lead problem is a long-standing interpretation by most utilities that the portion of water pipes between a home and the street or a curb shut off valve is owned by the homeowner, not the utility (**Figure 4)**. Put another way, utilities claim to not know the composition of tens of millions of service lines and the utility may be unwilling to replace the 'private' portion of the line even if lead is detected.

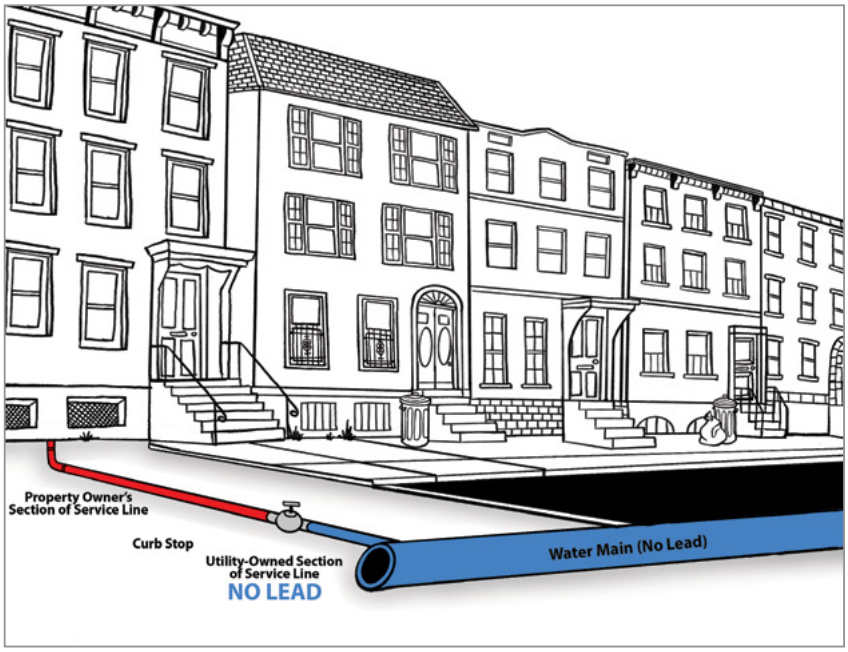

Figure 4. Water service line ownership split between the utility and the property owner. The utility has replaced the public portion of the lead service line, while the private portion of the service line (which is the homeowner's responsibility) still contains lead.

MYTH BUSTING

MYTH: Lead pipes are largely in inner city neighborhoods, and therefore affect low-income individuals and communities of color

Fact: In some places, the prevalence of lead service lines may be correlated with presence of communities of color or lower income populations, but it is a mistake to frame the problem this way. First, it is inaccurate to do so on a national scale, and second, it undermines the ability to bring additional constituencies in as advocates for lead service line replacement. It is critical that solutions for lead service lines address the problem proportionally for these populations, or even disproportionately do so, but that focus on health equity solutions shouldn't overwhelm the messaging about the problem. Homes worth $1 million in Washington, D.C. neighborhoods like Chevy Chase have lead service lines. Use the broad relevance of the risk of lead exposure to all populations to the advantage of advocacy while focusing on strategies that push utilities to a) fully fund replacement on private property, b) prioritize replacements in lower income neighborhoods, c) build information and awareness campaigns to reach communities of color and lower income residents.

> **"Right now, lead service line removal is viewed as an urban issue; that doesn't make sense. It is as much a rural issue."**
>
> *– Non-profit leader based in Washington, D.C.*

Studies have shown that partial lead service line replacements often result in the release of lead particulates, causing elevated levels of lead in the short- and medium-term, before ultimate stabilization in the long-term.[53] Government agencies and utilities acknowledge this fact, even as they stop short of banning partial replacements, citing financial and legal impediments.[54] Reviews have found little legal merit to the belief that utilities are precluded from spending ratepayer dollars to carry out full lead service line replacement.[55] Nonetheless, utilities continue to make this case, including by litigating state requirements (e.g. Michigan) that they carry out full replacements.[56]

Other utilities are supporting comprehensive lead pipe replacement. For example, DC Water provides financial support to homeowners for complete replacement of lead service lines after concerns that the earlier policy of voluntary replacement resulted in differential participation rates based on economic status.[57]

[53] Cartier, C., Doré, E., Laroche, L., Nour, S., Edwards, M., & Prévost, M. (2013). Impact of treatment on Pb release from full and partially replaced harvested Lead Service Lines (LSLs). Water Research, 47(2), 661-671.
[54] Renner, R. 2010. Reaction to the solution: lead exposure following partial service line replacement. Environmental Health Perspectives, 118(5): A203-A208.
[55] Neltner, T. 2019. Laws in states with the most lead service lines support using rates to fund replacement on private property: New analysis. EDF Health Blog. Accessed at: http://blogs.edf.org/health/2019/04/02/laws-states-support-rates-fund-replacement-private-property-new-analysis/
[56] https://www.detroitnews.com/story/news/2018/12/12/coalition-detroit-area-officials-sue-state-lead-rules/2279901002/
[57] A recent analysis by Environmental Defense Fund and American University researchers confirmed this hypothesis.

RECOMMENDATIONS

Lead pipes are not the only source of lead exposure. Some may argue that lead is not the most important health risk associated with water. **Our opinion differs. We believe it is a rare circumstance where an entire vector for a public health problem can be eliminated in 20 years.** It is a profound opportunity for the water sector to be part of a comprehensive solution that eliminates a real public health problem. It also has the potential to eliminate an issue that has been a debacle for public perception of drinking water safety that complicates many other efforts to build prosperity in disadvantaged communities and address health equity. The elimination of lead pipes will help rebuild trust in and use of public drinking water supplies, increasing consumption of tap water, and saving money for lower income families.

1. **Support cities and utilities committing to replace all of their lead service lines with additional public and private funding, assistance in designing equitable rate structures, as well as communications strategies to help build support among customers and decision-makers**
2. **Support state legislative efforts to prohibit partial lead pipe replacements, prohibit repair (without replacement) of lead service lines, and allow utility rates to be used to replace pipes.**

We have the technologies to find lead pipes and cost-effective practices to replace them. While we recommend a focus on speeding up the timeline for full replacement of all lead pipes, utilities have two other strategies they have used to lower lead exposure: a) adding chemical inhibitors that can prevent lead from leaching from service lines, or b) providing point-of-use lead filters. Since replacement of lead service lines across the utility service area is an expensive endeavor, utilities have mostly resorted to using chemical inhibitors while they incrementally replace lead service lines. This strategy can mostly work (see Denver, Colorado), until it doesn't, as seen in Newark, New Jersey in 2019. Denver has recently proposed replacing 75,000 lead service lines (on public and private land) within 15 years at a cost of $500 million and requested a Safe Drinking Water Act exemption from the lead action level until all lead service lines are replaced.[58] On December 16, 2019, their proposal was approved by the EPA and the Colorado Department of Public Health.[59]

Like Denver, Newark had a 10-year plan to replace 15,000 lead service lines. But during the process, the city discovered spikes in lead levels in certain areas of the city supplied by water from one of the city's two treatment plants. A program to provide water filters to all the residents didn't go as planned when the city found excessive lead levels in two residences. The EPA subsequently forced Newark to issue a "do not drink" advisory, and the city is working with the state and other partners to speed up the lead service line replacement. This forced Newark to borrow additional money from Essex County, NJ, which borders Newark, to replace all lead service lines in a 3-year timeframe at a cost of $120 million. It remains a question if Newark, or any similar cash-strapped city, would be able to borrow large sums of money at low-interest from the state or neighboring jurisdictions in the absence of a significant crisis.

[58] Kenney, A. 2019. Denver Water proposes to replace all lead pipes in system. The Denver Post. July 1. Accessed at: https://www.denverpost.com/2019/07/01/denver-water-lead-pipes-epa/
[59] Proctor, C. 2019. Denver Water gets approval to fast-track removal of lead service lines. Denver Water Tap. December 16. Accessed at: https://denverwatertap.org/2019/12/16/denver-water-gets-approval-to-fast-track-removal-of-lead-service-lines/

This same type of crisis was on the minds of city leaders in Lansing, Michigan and Madison, Wisconsin. Before lead contamination regularly made front-page news, Madison was deliberating whether to add phosphates to the water supply to inhibit lead leach-off or take the more expensive option of replacing all lead service lines.[60] Madison's decision was made easier by the fact that the addition of phosphates was likely to increase nutrient levels and cause algal growth in the city's lakes which are a critical recreational and economic resource for the city. It took the city 11 years and $15.5 million to remove 8,000 lead service lines and make related infrastructure investments. In doing so, they avoided the capital and operating costs of adding a phosphate treatment system, as well as the cost of additional phosphorus removal from the wastewater going into the lakes.

Other cities have found ways to make incremental changes. Buffalo, NY changed the city's regulations to make it illegal to repair lead service lines, forcing the water utility to remove lead service lines when they encounter one. Despite prohibitions on spending money on private laterals, the water utility is replacing lead service lines as and when a service line needs to be repaired.

Each of these jurisdictions is finding ways to eliminate the problem of lead service lines. Many more communities across the country could do so with the help of stronger national and state policies.

EPA's Proposed Lead and Copper Rule Revision

Proposed revisions

The proposed revisions to the Lead and Copper Rule maintains the action level of 15 ppb for lead in 10% of the tested samples. However, it adds a new "trigger level" of 10 ppb, when water utilities are required to take action. Those required actions include consulting with their state agencies on planning and monitoring, and implementation of corrosion control treatment. Any systems with lead service lines must develop a lead service line removal plan. Additionally, if a private property owner chooses to replace their portion of a lead service line, utilities are required to replace the utility-owned section of the same lead service line within 45 days. In a major change, the proposed rule requires utilities to replace 3% of the lead service lines annually for two years if the action level of 15 ppb is attained during regular testing. On paper, this is a significant rollback of the current regulations which require 7% annual lead service line replacement. However, the current rule's requirement is rarely implemented and testing is less extensive, so this change may prove a positive one in practice (once the rule is finalized).

Major positive changes in the revision include a requirement for all utilities to develop and make publicly available and annually update their lead service line inventory, notify customers within 24 hours if the lead action level is reached, and test for lead in 20% of K-12 schools and daycare centers annually. The draft requires utilities to notify customers if the presence of lead pipes in their water supply is unknown. And the revisions also provide flexibility to water systems serving under 10,000 people to decide their lead mitigation approach.

[60] Corley, C. 2016. Avoiding a future crisis, Madison removed lead water pipes 15 years ago. National Public Radio. March 31. Accessed at: https://www.npr.org/2016/03/31/472567733/avoiding-a-future-crisis-madison-removed-lead-water-pipes-15-years-ago

What happens next?

After its publication in the Federal Register on November 13th, EPA accepted public comments on the rule over a 90-day period.[61] The EPA is now considering all the comments (nearly 80,000 received at the end of comment period, of which about 700 are unique and substantial) as it develops the final rule. EPA says it expects to finalize the rule in the Fall of 2020, but an extended comment period, coupled with the volume and breadth of comments, could push that final rule to 2021.

A change in the administration through the 2020 election could totally upend this process. Although inadequate in some respects, the proposed revisions to Lead and Copper Rule represent the most significant update to the original regulations adopted in 1991. While there is much to like in the Lead and Copper Rule revisions, public health advocates are not thrilled by the retrogression in the lead service line removal requirement for utilities that reach the lead action level as well as the lack of a national ban on partial lead service line replacement. It is conceivable that if the current administration fails to win reelection in 2020, the incoming administration would be under pressure to review the Lead and Copper Rule revisions and come up with another draft rule. That could set up a new process that could take 2-3 years. Completing the rulemaking process before the next Presidential election in 2024, regardless of its content, would then become a challenge in and of itself.

3. **Continue advocating for stronger consumer protections in the revised Lead and Copper Rule, whether it is finalized in 2020 or in a different Presidential administration.**

In the event the currently proposed revisions to the Lead and Copper Rule are not approved by 2020 and there is a change in administration, advocate strongly for incorporating health-based lead standards in the rule in any future iteration. Also, support efforts to revise the Rule so the final rule contains rigorous provisions that mandate faster pipe replacement in states and for utilities with large number of lead service lines. Evidence from Michigan, which recently adopted stringent lead standards, supports the claim that stricter standards result in better problem identification and provide an easier solution pathway. It would be a mistake to lose this opportunity to complete a major revision to the Rule and restart the process were there to be a transition to a new federal administration in 2021. Restarting the process could delay adoption of a rule for 4 years or longer. The Trump Administration's draft rule can be modified and finalized; it does not need to be shelved.

[61] A 30-day extension was added to the usual 60-day comment period, after numerous requests from utilities, trade groups, and community advocates.

AFFORDABILITY OF WATER SERVICES

Goals

- Ensure water is affordable to all residents, especially the lowest 20th percentile of households, even as utilities make enough profit to run sustainably
- Develop and implement a variety of tools including single tariff pricing, progressive rate structures, and rate assistance programs to alleviate affordability concerns among low-income customers
- Facilitate consolidation of municipal utilities to ensure they can leverage economies of scale to provide good water and wastewater services at competitive rates

Background

"Water is undervalued and unaffordable at the same time." This comment, from Katherine Baer at River Network, sums up a conundrum facing the entire country. Across the US, drinking water and wastewater costs have more than doubled since 2000, far exceeding price increases of electricity, rent and gasoline. Families with the lowest 20% of income pay an average of 10% of their monthly household income on water; this is equivalent to nearly 10 hours per month of labor at minimum wage at pay water bills.[62]

The transcript of an interview with **River Network's Katherine Baer** is available on the EPIC website.

Utilities broadly underinvested in infrastructure through the 1980s to early 2000s, while important health and water quality standards and requirements were only slowly improved or updated. Now deferred maintenance and upgrades are unavoidable and drinking water/wastewater effluent standards are more stringent. A new generation of utility leaders have recognized the need to dramatically expand investment and are building fiscal management strategies to do so. As a result, we are at a moment where many utilities, especially in urban areas, are raising rates dramatically which results in low-income users not being able to afford the same water. The increasing requirements on utilities to treat legacy and emerging contaminants (e.g. removal of lead service lines and PFAS treatment) make future increases in rates likely as well.

Across the US, drinking water and wastewater costs have more than doubled since 2000, far exceeding price increases of electricity, rent and gasoline.

For many years, utilities resisted increasing rates by deferring maintenance and delaying or forgoing new capital expenditures. But more recently, utilities have had to share the cost burden with their consumers, resulting in a significant increase in water rates in the last 10 years. There are examples of communities over-building infrastructure by taking on too much debt that made the water unaffordable.[63] Nationwide, water utility rates are rising at a faster pace than inflation, creating an affordability crisis in many municipalities across the U.S., especially for low-income residents.[64] **Average water costs are 30% more expensive at smaller utilities than larger ones across states like Indiana.**

[62] Teodoro, M. P. 2019. Water and sewer affordability in the United States. AWWA Water Science, 1(2), e1129.
[63] Rigsby, G.G. 2012. Commissioners face $28 million water-sewer debt. Savannah Morning News. April 12. Accessed at: https://www.savannahnow.com/article/20120412/NEWS/304129710
[64] Teodoro, M.P. 2018. Measuring household affordability for water and sewer utilities. Journal-American Water Works Association, 110(1), 13-24.

"As a country we don't pay for the true cost of water. We don't value water."

– Utility leader based in the Midwest

At the same time, many water utilities run directly by municipal governments or elected boards are fearful of raising rates and upsetting their voters. Rather than display leadership to improve the system, municipal leaders act as 'caretakers' keeping the system in status quo, fearful of having a Flint- or Newark-level crisis on their watch. In the last year, we have interviewed more than two dozen officials of small and very small utilities across the country. A number of those managers described the ways that elected boards have been unsupportive of necessary infrastructure investments or the changes they have experienced when a formerly supportive board is replaced. Elected leaders' fears of raising water rates are not unfounded, because political opponents frequently campaign on water rate increases.

"Shutoffs should be the last thing we do. I know they're effective [at getting people to pay], but there are certain things you can't do."

– Utility leader based in the Northeast

The issue of affordability and the water sector's response came up repeatedly in our discussions with water experts. One community water leader, in particular, highlighted the fact that lower-income families and households of color end up paying twice for water: once for their utility bill and a second time when they purchase bottled water (that is 1000 times more expensive than tap water on a volume basis) because tap water is of poor quality or not trusted.[65] A commonly used practice to get customers to pay for water bills is the threat of 'water shutoffs,' where utilities will simply turn off water supply. While most utilities claim to make multiple attempts to remind customers of any unpaid bills including a door knock, shutoff policies are often set by utilities themselves, who have wide latitude in implementing those policies.

[65] The fixed portion of the water bill is typically higher than the volumetric portion, so even at low consumption rates, a household could pay significantly for their water bill. Since bottled/vended water is quite expensive compared to tap water on a volumetric basis, using it for just drinking and cooking can increase the household expenditure.

Racial bias in utility shutoffs

The mechanics of how some utilities cut water services to customers who don't pay bills offers one more example of a health equity impact of water policies. In Cincinnati, Ohio, data collected by the city's water utility, Greater Cincinnati Water Works, showed that seven of the top 10 neighborhoods experiencing shutoffs (as a fraction of the total connections) were predominantly African American.[66] This was not a coincidence. The utility's process for sending crews to manually shutoff water was set up such that the utility tried to maximize its work in a particular neighborhood. So, if a maintenance crew was going to a low-income neighborhood to handle a few shutoffs and other repairs, the utility tried to maximize its time there by shutting off even more water services for others nearby who were behind on their bills. Conversely, the utility often neglected to pursue non-payment in wealthier neighborhoods.

In Philadelphia, the city's water department uses a somewhat similar model. The utility crew that handles shutoffs first targets the worst offenders – households that owe the city thousands of dollars. After shutting off those connections, the crew will turn off connection at nearby houses that are behind on their bills, regardless of the size of the arrears.[67] Although the city hasn't revealed the racial breakdown of the shutoffs, it is extremely likely that this method targets neighborhoods with concentrated poverty and majority African American residents. It is likely that many more utilities have adopted similar, seemingly routine and logical time-saving approaches to maximize the work their crews do in the field, but that have significant racial and demographic consequences.

Other utilities like the Seattle Public Utilities and San Antonio Water System have consciously tried to avoid this trap by dividing the city into several zones and rotating their maintenance crews so that any one particular area is not disproportionately targeted. Since understanding its shutoff data, Cincinnati changed its approach, and the utility provides customers who are behind on their bills with many more options to avoid shutoff. This has led to a significant drop in shutoffs across the utility's service area. These subtle, but significant tweaks, suggest that large utilities can maximize revenue collection while minimizing shutoffs and be race-conscious in their policies.

Philadelphia's water utility is one example of a utility trying to create a new model for pricing water. Previously, more than 40 percent of the city's water customers would have delinquent bills and 20 percent of households faced a water shutoff since 2012. The city's new 'tiered assistance program' (TAP) applies to any household with an income less than 150 percent of the poverty line and caps the amount those households will have to pay for water at a fraction of their income.

An evaluation of the 25 largest utilities in the country ranked Phoenix's water rates as the most affordable. Another affordability-friendly rate structure design comes from the City of Phoenix, which uses a steeply inclined-block structure and a very low fixed charge of approximately $4.50 per month that also includes an allowance of 5,000 gallons for basic indoor household needs.[68] The use of single tariff pricing to spread the cost across multiple systems is perhaps one of the more promising, yet under-utilized pricing structures in use in multiple states (see **Case Study 2**).

In addition, while most rate structures are designed without any consideration of equity, many publicly owned utilities do not even face scrutiny of proposed rate increases because their rates do not go before a public utility commission for approval.

[66] Based on conversation with Cathy Bailey of Greater Cincinnati Water Works (April 7, 2020) and her presentation at The Utility Management Conference at Anaheim, CA in February 2020.
[67] Walton, B. 2018. When the water is shut off? Circle of Blue. January 11. Available at: https://www.circleofblue.org/2018/world/water-shut-off/
[68] Sorenson, K. 2019. Water management and water equity in Phoenix, Arizona. Meeting of the Minds. Accessed at: https://meetingoftheminds.org/water-management-water-equity-in-phoenix-arizona-32010 on January 15, 2020.

RECOMMENDATIONS

Although some water utilities have adopted progressive rate structures that charge higher rates for larger volumes and offer rate assistance programs to certain disadvantaged groups, affordability of water services remains a major challenge for utilities of all sizes across the country.

1. **Support state-based efforts that would allow utilities to restructure pricing to incorporate affordability concerns and expand funding for rate assistance programs. We believe it is worth considering a national standard that all utilities above a certain size must design affordability-influenced rates and provide rate assistance services to their low-income customers.**
2. **Explore single-tariff pricing in consolidated county or regional water systems**

There is a debate within utilities, government agencies, and academia over whether water should be priced by its cost and discounts offered (by the utility or a poverty-focused agency) separately or whether rate structures themselves should be changed to incorporate affordability. Traditional utility culture, which favors the former approach, still dominates the rate setting we observe in water utilities. The switch to affordability-influenced rates is barely happening. Philadelphia became the first city in the country to redesign its rates and offer income-based pricing for water consumption.[69] Baltimore is now following suit by restructuring its rates to assist low-income users.[70] Philadelphia's program, which has been in existence for a few years now, offers the first test of whether income-based water rates can be easily administered and its health and societal effects outweigh the cost of the subsidy. We note that some academics argue that despite their intuitive appeal, means-tested[71] affordability programs are expensive to administer, have difficulty enrolling their target audience, and their effectiveness has not been systematically evaluated.

Previously, utilities have adapted to this complex landscape – and followed EPA guidelines - by restructuring rates in such a way that the first units of water are charged at very low rates while larger units of water are charged higher, all the while ensuring that the utility is able to run without incurring operating losses. In theory, this helps lower income customers who might be less likely to use high volumes of water, but it is also a major subsidy for the middle class. For example, a homeowner earning $200,000 per year would pay the same rate for their first 6,000 gallons of water use as a senior citizen on a small fixed income.

Case Study 2: Regionalizing water rates

One way to avoid a large water rate increase is to spread the cost over multiple water systems, especially if they are under the same ownership or management using a concept known as 'single tariff pricing.' Since everyone in the service area gets charged the same rate, the single tariff model benefits smaller municipalities where the cost of treatment and distribution is typically higher due to its small size and weak network density. Although not restricted to private investor-owned utility (IOU) systems, this is where it is most commonly observed. In states that allow single tariff pricing such as Pennsylvania, this provision has resulted in low rate increases spread across the entire user base despite large capital improvements in one or more select systems in any given year. This model can also work in a publicly-owned utility, as seen in the Hampton Roads Sanitation District (HRSD) in Virginia, which was chartered by the state to protect the sensitive water in the Chesapeake Bay, and now provides wastewater service to 18 cities and counties of southeast Virginia, over an area of more than 3,000 square miles with a population of 1.7 million.

A more descriptive version of this case study is available on the EPIC website.

Connections to recommended interventions:

[69] Water Finance and Management. 2017. Philadelphia launches new water pricing model for low-income residents. August 16. Accessed at: https://waterfm.com/phillys-new-water-pricing-model-low-income-residents-u-s-first/
[70] Walton, B. 2019. Baltimore Council approves income-based water bills. Circle of Blue. November 21. Accessed at: https://www.circleofblue.org/2019/world/baltimore-council-approves-income-based-water-bills/
[71] These include income-based rates as well as subsidies offered for low-income customers

3. Expand research on and develop standards for rate assistance programs.

In contrast to the above approaches, cities can leave their rate systems intact, but offer assistance programs and boost participation in them by expanding the scope of the program and enhancing the ease of participation. Existing rate-assistance programs are hard to evaluate, and their inability to reach targeted audiences suggests the need for a best practices guide on this issue. In a pilot study of 50 randomly selected water utility websites, we found only five utilities – mostly large or very large – that offered rate assistance programs for low-income customers.[72] The remaining utilities either did not offer such programs or failed to highlight them on their websites. Even when available, rate assistance programs are notoriously under-subscribed[73] or cater to a small section of the population, typically homeowners and seniors. Community advocates also described the concern among immigrant households about utilizing subsidy programs due to "public charge" rules that may affect their impending or future citizenship claims.[74]

One of the most notable rate assistance programs is offered by the San Antonio Water System (Texas), whose affordability program, Uplift, contains 14 different assistance initiatives. Unlike most assistance programs that require annual reenrollment, Uplift enrolls subscribers for seven years at a time. The program also takes a wider view of hardship and considers factors such as being a victim of domestic violence, in addition to others such as income, age, and disability status.[75] Another way to identify customers deserving water rate assistance is to automatically enroll those households that are already signed up for the Low-Income Home Energy Assistance Program (LIHEAP), a well-known federal program that assists with energy bills.[76] An early pioneer of such an arrangement is the District of Columbia (DC). For the past 30 years, the DC government has organized a Joint Utility Discount Day, where low-income customers can sign up for rate assistance with multiple utilities, including water, electric, and natural gas, by filling out a single application form.[77]

4. Revise state laws that preclude rate assistance programs and differential rate-setting for low-income customers.

Utilities encounter multiple challenges when offering rate assistance programs. At its core, any discounts offered to some customers need to be offset by greater revenue from other customers such as commercial users or high-volume residential users. But often, there are bigger forces at play. Some states such as Arkansas, California, and Mississippi prohibit public utilities from offering assistance programs that are funded by ratepayer revenue.[78] Several others do not explicitly authorize the use of ratepayer funds for customer assistance programs, leaving a lot of ambiguity. Some states such as West Virginia prohibit charging differential rates for customers, so a lower water rate for low-income customers would be illegal.[79] California has a similar restriction based on a voter-approved constitutional amendment, Proposition 218 enacted in 1996; some utilities have gotten around this limitation by dedicating penalty fee revenue from overdue bills toward rate assistance programs.

[72] Vedachalam, S. and Kirchoff, M. 2020. Analysis of water utility websites reveals missed opportunities. Journal AWWA, 112(3), 62-69.
[73] Giammarise, K. 2019. Few are using PWSA's programs for low-income customers. Pittsburgh Post-Gazette. May 28. Accessed at: https://www.post-gazette.com/news/social-services/2019/05/28/PWSA-programs-low-income-customers-few-using-pittsburgh-water-sewer-authority/stories/201905210097
[74] Phoebe Seaton, personal communication, January 10, 2020.
[75] See more information at: https://uplift.saws.org/helping-neighbors-in-need/
[76] Despite being well-known, LIHEAP is not all that subscribed. Over the past twenty years, participation in the program has averaged around 16 percent of the eligible households, and has never been greater than 22 percent. See Perl, L. 2018. LIHEAP: Program and Funding. Congressional Research Service Report. Washington, DC: Congressional Research Service
[76] See press release for the event conducted in 2007: https://doee.dc.gov/release/dc-residents-can-apply-energy-assistance-joint-utility-discount-day
[78] Walton, B. 2017. Water Bill Assistance for the Poor Hindered by State Laws. Circle of Blue. July 24. Accessed at: https://www.circleofblue.org/2017/water-management/water-bill-assistance-poor-hindered-state-laws/
[79] Burgess, M. 2016. Three states with laws allowing water utility customer assistance programs. The Environmental Finance Blog. UNC Environmental Finance Center. August 12. Accessed at: http://efc.web.unc.edu/2016/08/12/3-states-laws-allowing-water-utility-customer-assistance-programs/

5. **Rate setting should be independently regulated by a state PUC for all public and private water utilities.**
6. **In cases where PUCs regulate water utilities, policy changes should be adopted to ensure utilities submit information on how they will assist or shield low-income customers from proposed rate increases submitted to PUCs. In addition, establishment of reporting standards on the effectiveness of such programs for low-income customers are required.**

Wisconsin is the only state that requires the state public utility commission (PUC) to regulate rates and revenue for all water utilities, including publicly-owned ones. North Dakota, South Dakota, Minnesota, Michigan, and Georgia do not provide any financial regulation for private water and wastewater utilities. Lack of independent or any oversight could have grave equity implications for low-income customers and communities of color. Indiana has an "opt-out" provision where public utilities are financially regulated by the state public utility commission unless they choose to opt out of regulation.[80] Utilities might choose to stay under a PUC's approval process because rate increases can be more consistently justified.[81] West Virginia is an interesting outlier as it regulates smaller water and wastewater utilities that serve less than 4,500 customers, including by reviewing rate increases.[82] All of these are interesting models worth pursuing in states that have limited independent financial regulation of municipal water utilities.

7. **Effectively leverage existing federal financing through SRF and WIFIA programs by improving state bonding.**

Another strategy that should complement any effort to address rate structures is to focus on existing federal funding. At present, federal funding from the Clean Water State Revolving Fund and Drinking Water State Revolving Fund (SRF) and loans under the Water Infrastructure Finance and Innovation Act (WIFIA) can provide about $6-10 billion annually. However, far less than that is actually spent. No one has produced a systematic analysis of underutilized revolving fund borrowing authority, but anecdotal information suggests the amount is in the billions. An audit conducted by the EPA Office of the Inspector General in 2014 found that in just five states – California, Connecticut, Hawaii, Missouri, and New Mexico – $231 million remained in unspent funds under the DWSRF.[83] According to the report, "Three of the five states reviewed did not use financial tools to assist in projecting future DWSRF funds and predict the number and value of projects needed to be ready for loan execution in any given year. When loans are not issued, intended drinking water improvements may not be implemented and states lose opportunities to infuse funds into their economy and create jobs."

It's not just a problem of budget forecasting by state agencies - this problem also arises because communities don't know how to develop eligible, fundable application packages, lack the creative understanding of finance necessary to develop a loan proposal, or are simply unaware of funding. In addition, state agencies that coordinate the loans often do a poor job of connecting these programs to communities and populations most in need of them. Less than half the states leverage federal SRF money in the bond market (and most of those states still leverage far below the potential), leaving proverbial "money on the table."[84]

[80] Beecher, J. 2018. Potential for economic regulation of Michigan's water sector: Policy brief for the incoming 2019 Gubernatorial administration. Michigan State University Extension. November 7. Accessed at: http://ipu.msu.edu/wp-content/uploads/2018/12/Policy-Brief-for-the-Incoming-2019-Gubernatorial-Administration.pdf
[81] Teodoro, M. 2019. Remarks at the National Academies of Science, Engineering, and Mathematics. November 21.
[82] Beecher, J. 2018. See footnote #59.
[83] U.S. EPA, Office of Inspector General. 2014. Unliquidated Obligations Resulted in Missed Opportunities to Improve Drinking Water Infrastructure, Washington, D.C. Accessed at: https://www.epa.gov/sites/production/files/2015-09/documents/20140716-14-p-0318.pdf
[84] Moore, R. 2018. States Need to Go Back to the Well and Leverage SRF Dollars. NRDC Blog. May 15. Accessed at: https://www.nrdc.org/experts/rob-moore/states-need-go-back-well-and-leverage-srf-dollars

8. EPA's pollution compliance policies should incorporate environmental justice and equity considerations to guide what EPA can mandate under consent decrees for wastewater and stormwater non-compliance. Consent decree must ensure that the cost of any new infrastructure will not exacerbate equity problems.

In the case of wastewater and stormwater, EPA has strong tools available to get utilities to comply with regulations under the Clean Water Act. Often, EPA, the Justice Department, the state agency, and the offending utility will agree to what's known as a "consent decree." These consent decrees will specify the set of remedial actions under a set timeframe to improve water quality. In return, the EPA will usually hold off on charging violations or levying fines on the utility until the remedial action is taken. As a result, utilities are often required to spend millions or billions to upgrade their wastewater and stormwater facilities, separate combined sewer systems, and remediate contamination. For example, the most recently agreed-upon consent decree will cost the City of Houston $2 billion to reduce sewage discharge into local waters.[85] This consent decree, just like several others addresses the environmental harm caused by that city's untreated wastewater, and will likely result in higher wastewater bills. But it fails to take into account the disproportionate impact of these fines and remedial measures on the city's low-income residents if costs are subsequently built into utility bills (or local tax bills).

[85] U.S. Department of Justice. 2019. Press release dated August 27. Accessed at: https://www.justice.gov/opa/pr/houston-texas-agrees-implement-comprehensive-measures-aimed-eliminating-sanitary-sewer-0

ADDRESSING MISTRUST OF TAP WATER

Goals

- Improve public trust in tap water and utilities
- Make data, technology, and analysis available that allow consumers to test water and understand water quality data

Background

A third of the customers served by large utilities rate the water as 'unsafe' or 'not safe at all', and a quarter admit to never drinking tap water.[86] Such mistrust is only enhanced by high-profile water contamination incidents at Flint and Newark, as well as nearby local events. Poor perceptions of water are especially high among Latino and Black Americans.[87] In conversations, water professionals made similar observations about Alaska Natives and Wisconsin-based Hmong.[88] Feelings of mistrust among communities of color sometimes have a connection to actual health risks, but often do not. For example, on average Safe Drinking Water Act (SDWA) violations are greater in low-income communities with higher Black and Latino populations.[89] Similarly, the lack of clear standards relating to emerging contaminants such as PFAS and hexavalent Chromium and the utilities' ambivalence toward treating high concentrations of these pollutants as public health crises exacerbates such concerns. However, in cities like Philadelphia where there are few or no differences in water quality across consumers, individuals of color and lower income consumers differ dramatically in their purchase of bottled water (**Figure 5**).

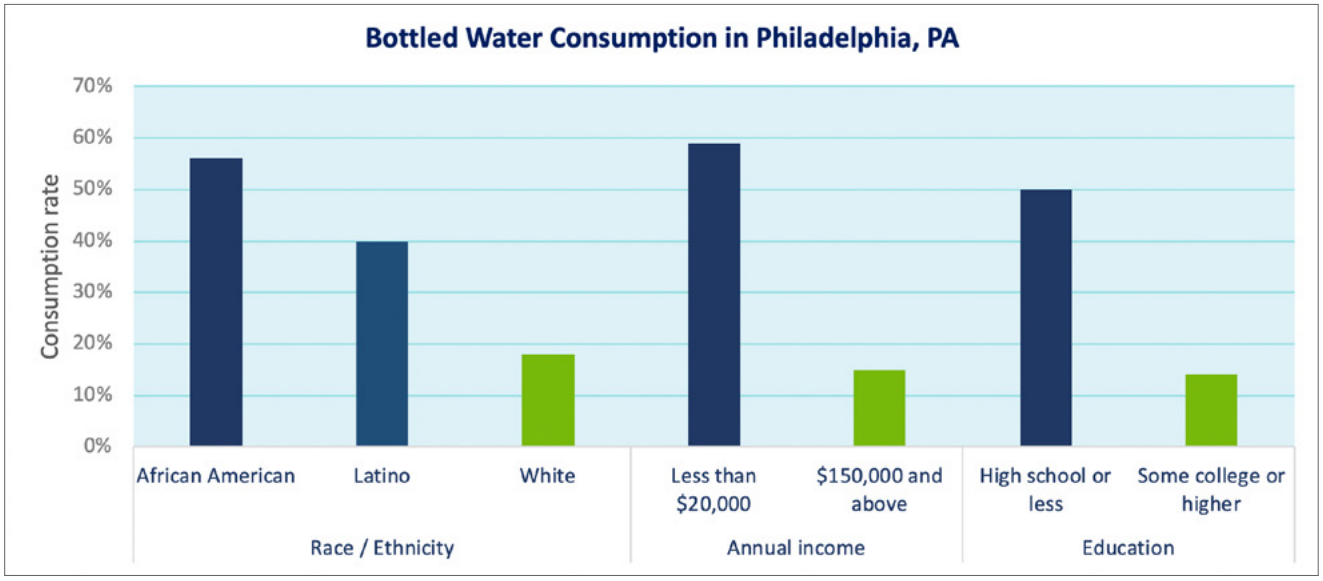

Figure 5. Bottled water consumption across various groups in Philadelphia, PA. Data from a survey of Philadelphia Water Department customers.[90]

[86] Results from the J.D. Power customer satisfaction survey conducted in jurisdictions served by 89 large utilities.
[87] Javidi, A. and Pierce, G. 2018. U.S. households' perception of drinking water as unsafe and its consequences: Examining alternative choices to the tap. Water Resources Research, 54, 6100–6113.
[88] Personal communication with Marleah LaBelle (August 1, 2019) and Nancy Quirk (July 24, 2019)
[89] Teodoro, M. and Switzer, D. 2017. The color of drinking water: Class, race, ethnicity, and Safe Drinking Water Act compliance. Journal AWWA. 109(9): 40-45.
[90] Hoe, N. 2019. Customer satisfaction with the Philadelphia Water Department: A report of the 2018 survey. ImpactED, University of Pennsylvania.

PFAS: 'Forever chemicals' or forever trouble?

Per- and polyfluorinated Alkyl Substances (PFAS) are a class of over 4,700 chemicals used in a wide variety of products including nonstick cookware, firefighting foam, waterproof apparel, and grease-resistant food packaging, to name a few. Over time, these chemicals have found their way from these products and their manufacturing facilities to our water and food. Due to their widespread use and persistence in the environment, they are dubbed 'forever chemicals' and most people in the U.S. are likely already exposed to PFAS. The EPA claims that continued exposure above specific levels to certain PFAS may lead to adverse health effects. Lab tests on animals subjected to high levels of certain PFAS have shown negative impacts on growth and development, reproduction, thyroid function, the immune system, and the liver. As of March 2019, at least 610 locations in 43 states are now known to be affected by PFAS contamination.[91] This includes several drinking water systems serving an estimated 19 million people. However, government agencies at all levels, including local water utilities, have been less than forthcoming on the presence and severity of these chemicals in local water supplies, thereby creating mistrust among consumers.[92]

The Regulatory Process

Currently, utilities are guided by a health advisory of 70 parts per trillion (ppt) combined for two of the widely known PFAS chemicals: perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS), but these are not enforceable regulations. The Safe Drinking Water Act (SDWA) allows EPA to include new chemicals in its list of regulated contaminants, but the process is extremely long and rigorous. This process has worked well for individual contaminants such as arsenic and nitrates. But PFAS presents an altogether different challenge. The sheer number of PFAS chemicals and their complexity overwhelm the process.

The SDWA regulatory process allows EPA to add only 30 contaminants in a 6-year cycle. At this rate, even if we had perfect knowledge about each one of the 4,700+ PFAS, it would take nearly 1000 years at a minimum to develop regulations for each one of them. Of course, one could prioritize and design regulations for the most pervasive and harmful chemicals. Public health advocates argue that EPA ought to break from the precedent and regulate the whole family of PFAS chemicals as one contaminant and thus dramatically cut down the regulatory process. Water utilities are extremely skeptical of this approach and want to "follow the science." As this debate continues, the health and safety of millions is at stake. The EPA's slow pace of action has spurred intense regulatory action at the state level. Several states now have regulations on certain PFAS chemicals that are more stringent than the EPA health advisory levels (see **Figure 6**).

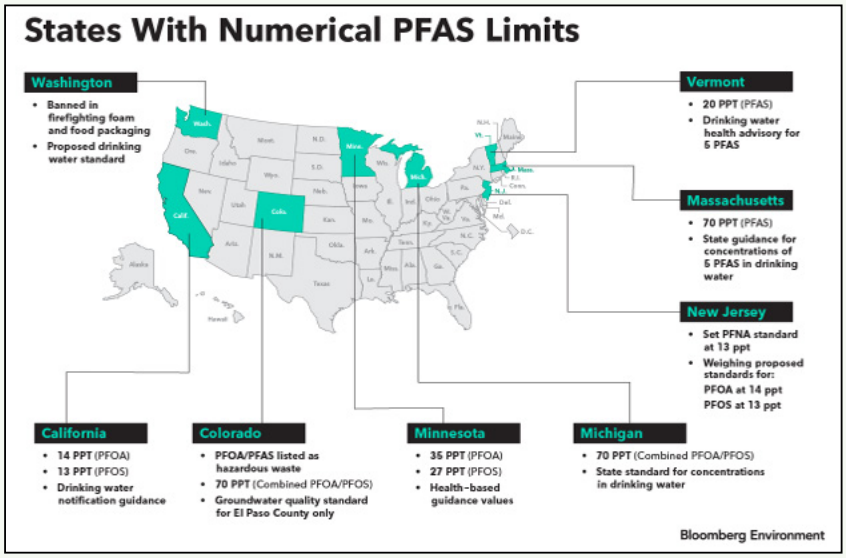

Figure 13. State regulations in certain states now supersede EPA advisory on PFAS. Source: Bloomberg News.[93]

[91] This is according to the PFAS Project, a database of PFAS contaminated sites maintained by the Environmental Working Group and the Social Science Environmental Health Research Institute at Northeastern University. Available at: https://pfasproject.com/mapping-the-pfas-contamination-crisis-new-data-show-610-sites-in-43-states/

[92] PFAS is also impacting water quality in private wells that draw groundwater.

[93] Silverman, G. 2018. Glass Half-Full on State Solutions to Chemicals in Water (Corrected). Bloomberg News. September 18. Accessed at: https://news.bloombergenvironment.com/environment-and-energy/glass-half-full-on-state-solutions-to-chemicals-in-water-corrected

Federal Update

On February 21, 2020, EPA made a positive preliminary determination in the case of PFOA and PFOS – two of the most well-known and prevalent PFAS chemicals – which will eventually result in setting regulations, the extent of which will be determined during the regulatory process. The publication of the preliminary regulatory determination now opens a public comment process, followed by a final regulatory determination. A positive final regulatory determination to regulate PFOA and PFOS might still mean at least a few years before a proposed regulation is released.

Recommendations

The EPA's positive preliminary determination for PFOA and PFOS is certainly a welcome step, and we expect that to result in their eventual regulation and setting of contaminant standards. The EPA and the water industry must arrive at some consensus that results in setting standards for additional PFAS chemicals by making suitable modifications to the SDWA that result in the evaluation of more chemicals for their toxicity and prevalence in water systems within a reasonable timeframe. Furthermore, EPA must provide additional funds to utilities for testing, remediation, and treatment of water supplies. Other management actions outlined in the EPA's Action Plan must be accelerated to provide relief to water utilities and their customers. Utilities, on their part, must be proactive in communicating test results to their customers and develop a trustworthy relationship that helps in times of real crises.

A longer discussion of the federal actions to regulate **PFAS** is available on the EPIC website.

The Flint crisis, especially its racial implications, has made trust in utilities, public officials, and tap water a defining question for the water sector, but the issue of trust has plagued the sector for decades for varying reasons. Even in the 1980s and 1990s, polls showed nearly a third of the American public "thought their home tap water was unsafe to drink."[94]

> **"You never hear a good story about the water departments or utility."**
>
> *– Utility leader based in the Midwest*

[94] Roper Center for Public Opinion Research. 2016. Water crisis: Worry and a lack of trust. Accessed at: https://ropercenter.cornell.edu/water-crisis-worry-and-lack-trust

Mistrust of tap water is linked to decreased water consumption and use of expensive or unhealthy substitutes such as bottled water and sugary beverages. Using data from the 2015 American Housing Survey, researchers found that minority households more commonly perceived their tap water to be unsafe and chose bottled water as an alternative. The study estimated that U.S. households spend a minimum of $5.65 billion annually to buy bottled water as an alternative to perceived unsafe tap water.[95] Findings of minority distrust of water have been demonstrated repeatedly in the scientific literature. The question is why? In some cases, cultural biases perpetuate distrust of tap water in communities with recent histories as immigrants.[96] Women have much higher levels of distrust of tap water than men. Bottled water companies intentionally build marketing campaigns directed at specific populations, intended to further undermine faith in tap water (**Figures 7 and 8**).[97]

MYTH BUSTING

MYTH: Bottled water is always better than tap water

Fact: Some advocates and all bottled water companies benefit from people being afraid of their drinking water supplies, even when that fear has no basis in any evidence of a health or safety risk. Fear changes behavior. More accessible information and data on water quality – specifically designed to reach marginalized and excluded groups is desperately needed. Data tools and technologies are arising that can make that information available in nearly real time, whenever people are facing a choice about the water they use. We need to use these and other strategies and tactics to build accurate perceptions of water across the country. Bottled water companies often use municipal water supplies as their source water, so they may be no different from tap water, but since they are regulated by FDA under a different statute, they may not undergo certain checks that municipal water is required to undergo by EPA or state agencies.

Public water systems in the U.S. are confronting multiple challenges from legacy and emerging contaminants to increasing cost of treatment to overall aging of the infrastructure. Even as utilities improve water quality for all their customers, utilities will need to pay special attention to minority neighborhoods. Providing real-time transparent information about the challenges facing the utility as well as planned mitigation programs can win back the trust of wary customers who feel slighted by the lack of information and behind-the-doors decision-making process.

Figure 7. An advertisement for packaged water seen in a suburban Washington, D.C supermarket. Photo credit: Timothy Male

Figure 8. Bottled water vendors use a variety of marketing techniques to convince the need for their product. The above water can awkwardly rephrases a sports-themed call to declare "go big or go thirsty." Photo credit: Sridhar Vedachalam

[95] Javidi, A. and Pierce, G. 2018. U.S. households' perception of drinking water as unsafe and its consequences: Examining alternative choices to the tap. Water Resources Research, 54, 6100–6113.
[96] One expert we interviewed (a consultant based in the West) dismissed this explanation as "too simplistic and it lets the utilities off the hook."
[97] Details about the packaged water company's marketing: https://consumergoods.com/primo-turns-its-target-away-tap-water

RECOMMENDATIONS

1. **Support organizations that work with Black communities and first-generation immigrants, particularly from Latin America and South Asia, to emphasize the importance of water consumption and services provided by water utilities.**

Fear of tap water is more widespread than warranted, especially in lower income neighborhoods in large cities. This perception bias leads to the purchase of millions of bottles of bottled water at a high cost to lower income families. Using data from the 2015 American Housing Survey, researchers examined factors influencing both perception of tap water and the choice of tap alternatives and found that minority households more commonly perceived their tap water to be unsafe and chose bottled water as an alternative.[98] The study estimated that U.S. households spend a minimum of $5.65 billion annually to buy bottled water as an alternative to perceived unsafe tap water. Using the 2010 Census population, we calculated the total expenditure on bottled water by each of above racial/ethnic groups in the 10 largest cities. Assuming the bottled water expenditure by non-Hispanic Whites to be the baseline, it appears that Black and Latino households spend approximately $36 and $89 annually in addition to this baseline due to their perceived mistrust of tap water. Considering the fact that Black and Latino households are on average poorer than White households, this additional expenditure solely as a result of mistrust exacerbates inequity for minority households. This translates to an average of $36 million spent per city on bottled water by Black and Latino individuals in the country's largest 10 cities (**Figure 9**). Any success in reducing unwarranted purchase of bottled water by lower income residents or by individuals of color would provide financial resources for other household purchases.

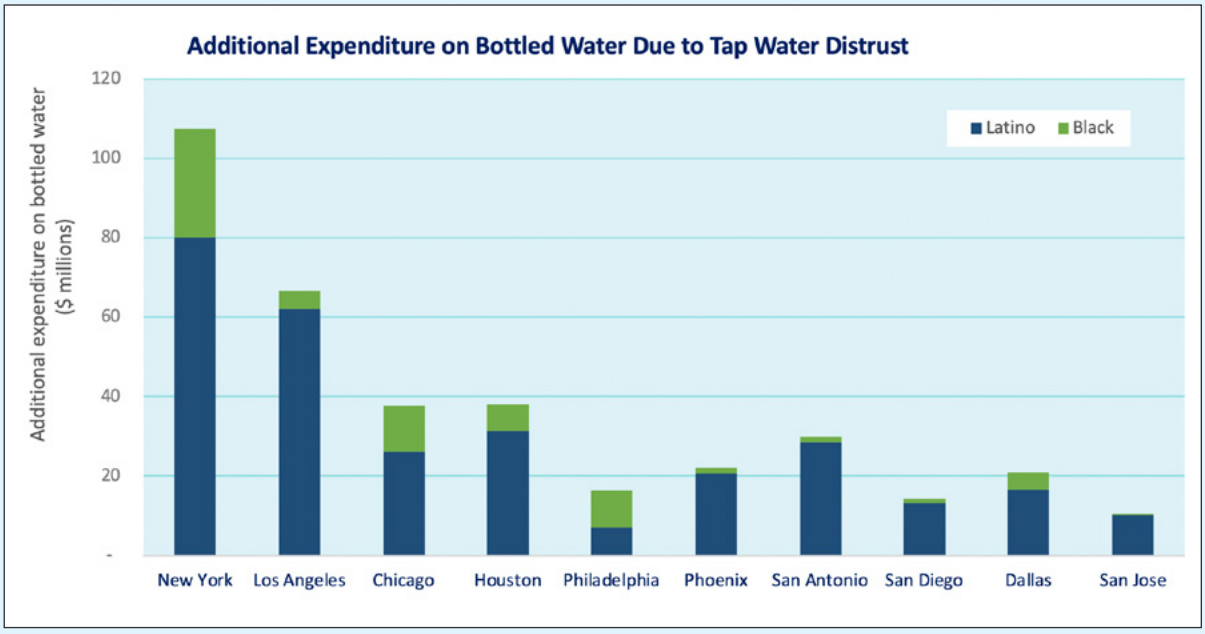

Figure 9. Estimated $360 million in additional expenditure on bottled water by African Americans and Latinos in 10 large cities due to tap water distrust.

[98] Javidi and Pierce. 2018. Water Resources Research.

"On the Navajo reservation where I'm from, people drink bottled water. It's expensive and inconvenient."

– Consultant based in the West

2. Strengthen technology applications and testing tools that allow residents to test and understand water quality data

Too often, water quality tests are still conducted the traditional way: the testing lab provides bottles; samples are collected by the resident following a protocol and mailed to the testing lab. Results are sent by email or regular mail after 3-7 days. As a result, such tests are cumbersome and expensive, and are rarely instantaneous. These all limit their use to consumers. Companies like SimpleWater and 120 Water recognize this gap and are testing new approaches to provide faster and more accessible technology solutions to businesses, utilities, and residents, allowing for much faster and easily understood results.[99] In our view, success in water quality testing would involve more than 100,000 consumers that were as diverse as the Americans who drink water, getting water tests every year, and those results being anonymized but available in ways that help others in communities better understand the data obtained from the testing.

3. Increase utility reporting requirements and transparency measures

Water utilities are required by law to provide water quality data to their customers annually through "Consumer Confidence Reports (CCRs)." According to the EPA, CCRs are intended to "improvepublic health protection by providing educational material to allow consumers to make educated decisions regarding any potential health risk pertaining to the quality, treatment, and management of their drinking water supply." An evaluation of a nationally representative sample of CCRs conducted in 2013 found that CCRs didn't effectively communicate drinking water information to the public.[100] The CCRs evaluated in the study were found to be written at the 11th-14th grade level, well above the recommended 6th-7th grade level for public health communications. Moreover, very few utilities directly evaluate consumer understanding or the effect of CCRs on consumer perceptions.[101] Reports are provided almost exclusively in English, often in non-machine-readable pdfs, and buried on utility websites. Utilities must work toward increased and more frequent disclosure, along with making sure that the material is accessible to readers of all levels and language skills.

Recent changes to the law might force these actions to happen sooner. The America's Water Infrastructure Act of 2018 (P.L. 115-270) made several changes to the SDWA, including sections that govern CCR. Utilities that serve more than 10,000 persons will need to provide CCRs at least twice a year. The option for electronic delivery is now codified in the law, rather than an interpretation of previous law. The law also requires increasing the "readability, clarity, and understandability" as well as "accuracy" of the information within the CCR. These changes are expected to increase transparency and earn consumer trust.
ers in communities better understand the data obtained from the testing.

[99] SimpleWater is based in Berkely, CA. See https://www.simplewater.us/. 120 Water (formerly 120 Water Audit) is based in Zionsville, IN. See https://120wateraudit.com/

[100] Roy, S., Phetxumphou, K., Dietrich, A.M., Estabrooks, P.A., You, W., Davy, B.M. 2015. An evaluation of the readability of drinking water quality reports: a national assessment. J. Water Health, 13, 645–653. DOI:10.2166/wh.2015.194.

[101] Evans, J., & Carpenter, A. T. 2019. Utility approaches to evaluating the effectiveness of consumer confidence reports. Utilities Policy, 58, 136-144.

4. Support initiatives to involve diverse local champions in local efforts to improve trust in water services.

Work to improve trust in utilities cannot just be carried out by the utilities themselves or by EPA because these institutions are distrusted and seen as part of the problem. A significant outside investment is needed, to support local groups or trusted third parties, who focus science and communications capacities in ways that appropriately build trust – and increase the use of tap water – in service areas where water is safe. One example of trust-building comes from Philadelphia, where the local water utility, working with the University of Pennsylvania, utilizes local celebrities and community leaders as water ambassadors to communicate the value of water and the utility's work to the city's residents.

> **"The basics of safe and reliable water drive 50% of the customer satisfaction, and the rest is engagement with the utility."**
>
> *– Consultant based in the West*

IMPROVING REPRESENTATION IN UTILITY LEADERSHIP

Goals

- Create inclusive leadership that reflects the diversity of the community served by the utility
- Increase public trust in utilities by hiring diverse leaders from non-traditional backgrounds

Background

Water utilities often do not resemble the consumers they serve. Utility leadership, including appointed and elected board members and general managers, are more likely to be older, white, and male compared to their consumers.[102] A 2011 study found water utility general managers/CEOs to be 94% men, 96% white, 99% non-Latino, and having a median age of 54 years.[103] There is ample research to suggest that even in racially diverse and highly educated cities, the composition of elected officials does not adequately reflect the gender and racial diversity of the municipality (see examples from the Bay Area, California and Omaha, Nebraska). An analysis from the southern San Joaquin Valley in California found that during a four-year period, 87% of the 565 local water boards were uncontested, suggesting poor interest or awareness among local residents as well as structural barriers to having full civic participation in this democratic process.[104] This lack of diversity hampers the utility's understanding of the needs of its diverse customers and changing priorities for service improvements.

> **"90% of water board spaces were uncontested elections. Basically no one runs, and then those who do stay for inordinate amounts of time."**
>
> *– Leader at a philanthropic funder based in the West*

Selecting water board leaders through democratic elections, rather than closed-door nominations, seems an inherently better process. However, several barriers prevent a representative process from playing out in these local elections. Elections are expensive and the local jurisdiction (county, city, or water district) bears the cost. The costs can be especially steep in the case of off-cycle elections (which are quite common for local elected offices) and during special elections to fulfil a vacant seat.[105] Therefore, there is intense pressure to hold minimal number of elections and avoid one where possible. Challengers are pressured not to run against incumbents or to withdraw in favor of a preferred nominee, so the water utility district or the local jurisdiction can avoid the cost of holding an election.

Based on a pilot study of 50 water utilities, women comprised only 31% of utility leadership positions.[106] Individuals of color held 11% of leadership positions – the vast majority of whom were affiliated with large or very large utilities – and underrepresented their share of the community by an average of 17%. We expect this pattern repeats in other infrastructure sectors,[107] especially transportation, but lack comprehensive statistics.

We estimate there are roughly 10,000 general managers and senior managers at water utilities and more than 50,000 board members supervising them. Smaller utilities are more likely to be supported by part-time staff and staff who have multiple roles within a community or local government.

[102] Radhika Fox, personal communication, August 8, 2019.
[103] Teodoro, M.P. 2011. Water Utility Executive Leadership for the 21st Century. Water Research Foundation, Denver, CO
[104] Weiner, C. 2018. Untapped Opportunity: Local Water Boards and the Fight for Water Justice. Community Water Center. Sacramento, CA.
[105] Off-year local elections have poor rates of voter turnout. Except in a few jurisdictions like Tacoma Park, MD, non-citizens are barred from voting in local elections, even though they participate in and benefit from local government services.
[106] Vedachalam, S. and Kirchoff, M. 2020. Analysis of water utility websites reveals missed opportunities. Journal AWWA, 112(3), 62-69.
[107] https://www.ey.com/Publication/vwLUAssets/EY-diversity-and-disruption-in-utilities/$File/EY-Diversity-and-disruption-in-utilities.pdf

RECOMMENDATIONS

The leadership of water utilities needs to include more women and people of color. Their inclusion in leadership will bring a stronger focus on health equity into the utility's decision-making and will also increase the extent to which customers trust their utility. There is evidence of such a change in behavioral response in other sectors. For instance, in 139 countries that enacted quotas for women during 1995-2012, an increase in the number of elected women resulted in a significant increase in public health spending.[108]

1. **Replicate efforts like California's Water Education for Latino Leaders and Community Water Center, to expand leadership nurturing and training programs in other states**

Increased diversity and inclusivity in water utilities can be accomplished in several ways. There are a number of organizations that have recently formed to recruit or retain local leaders that come from underrepresented groups. For instance, Water Education for Latino Leaders (WELL), educates local Latino elected officials on California water policies. Another group, Community Water Center based in California, provides resources for residents to run in elected water boards and provides ongoing training through the Community Water Leaders Network. We are not aware of any independent analysis that shows how effective this work is in the water sector, but have no reason to think it would be any less effective than the Victory Fund and the Victory Institute have been in supporting LGBTQ progress in government representation or similar efforts focused on expanding the power of other populations through leadership placement strategies.

The transcript of an interview with CWC's **Susana De Anda** is available on the EPIC website.

2. **Support data gathering efforts to assess the extent (or lack) of diversity in water utility leadership. A 2011 Water Research Foundation report on water utility CEOs is the only relevant study that can be used as a baseline.[110] Similar studies that analyze the composition of the utility's board and senior staff are needed to establish a baseline and identify trends in leadership diversity.**

In addition to the efforts of outside groups, utilities must institutionally address inequities in their hiring and retention policies to attract diverse leaders. For instance, when hiring for senior leadership and board positions, either having an explicit quota to hire women and minority candidates or a requirement to interview at least one individual from underrepresented groups (similar to NFL's Rooney Rule) can boost diversity.[111] California's recently enacted SB 826 (approved in 2018) seeks to do just that in publicly traded companies by mandating gender diversity.[112] Water utilities in other countries have made significant progress in achieving gender parity on water boards through targeted recruitment and focused interview strategies.[113]

We have only anecdotal evidence to support this, but utility leaders have told us that the applicants for staff positions at water utilities are now disproportionately women. This perspective comes from leaders who work with multiple, large utilities. However, there is no evidence of a similar trend within leadership positions. Gender diversity is likely very important to achieve in smaller and rural utilities.

[108] Clayton, A. and Zetterberg, P. 2018. Quota shocks: Electoral gender quotas and government spending priorities worldwide. The Journal of Politics. 80(3): 916-932.
[109] See https://www.communitywatercenter.org/water_board_elections
[110] Teodoro, M.P. 2011. Water Utility Executive Leadership for the 21st Century. Water Research Foundation, Denver, CO.
[111] The National Football League adopted the "Rooney Rule" in 2003, based on the recommendations from Dan Rooney, then-chair of the league's diversity committee. The rule requires teams to interview ethnic-minority candidates for head coaching and senior football operation jobs. The rule's implementation is credited for a significant increase in minority head and assistant coaches in NFL. Since, then, several sporting bodies around the world have considered or adopted a version of the Rooney Rule.
[112] This new law would cover investor-owned water utilities operating in California. More background is available here: https://www.vox.com/2019/11/14/20964673/california-board-diversity-lawsuit-sb826
[113] https://www.wsaa.asn.au/sites/default/files/publication/download/Tapping%20the%20Power%20of%20Diversity.pdf

3. Assess water board election practices to identify ways to reduce electioneering costs, increase number and quality of candidates, and improve voter turnout

Some localities choose to elect their water board (or commission) members through democratic and open elections. Inherently, it seems like a better way than appointing the well-connected and friends of the current utility leaders. But discussions with community advocates pointed to several challenges with such elections, especially in rural areas with limited funds. To reduce costs and avoid the possibility of an election, challengers are often discouraged from participating, and in the case of an open seat, the water board secretly prefers a particular candidate and forces others to drop out. Other decisions such as the timing of a retirement, when to hold elections, and signature and voting requirements likewise significantly limit the diversity of candidates and that of the electorate.

4. Develop model legislation that allows water utilities to create alternate board positions and resident advisory councils that become incubators for diverse and non-traditional leadership.

Utilities can create alternate board positions (DC Water, for instance, appoints an alternate member for each regular board member) to recruit and train women and minority candidates so they are ready and prepared for the job, when the regular member is termed out. Alternate members often participate in meetings, thus providing their perspective to the board's deliberations.

In addition, utilities may benefit from setting up advisory councils to bring under-represented voices to the discussion table. Apart from gender and race, a water utility can become inclusive in other dimensions such as gender orientation, socio-economic class, disability status, professional and life experience. These councils can provide feedback on rate changes, accessibility of assistance programs, and ongoing water quality challenges. Examples of such advisory committees can be found in Madison Borough, NJ, North Las Vegas, NV, and Seattle, WA. A survey of water utilities that work with public advisory groups conducted by AWWA in 1993 found "the participation of the advisory groups improved utilities' operations rather than detracting from them, in some cases increasing community support for projects."[114] We did not find any similar studies conducted more recently, and note this is a potential area for exploration.

5. Work with trade organizations such as AWWA, WEF, and NACWA to develop guidelines and model practices for water utilities to hire non-traditional candidates for leadership roles.

Available research suggests that general managers and CEOs are increasingly being hired from non-engineering backgrounds. This is a positive trend for utilities. In addition, older leaders who came from the ranks of technical staff have adapted to the changing nature of utility leadership by prioritizing community relationships, staff development, and public health outcomes as critical elements of their jobs (see **Case Study 3**). We wonder whether more work could be done to attract public health experts to serve as water leaders, including promotion of chemists and biologists who already work on the testing and quality control side of water services, but report few opportunities to rise into the management of water utilities.

[114] Becker, J. 1993. Survey says water utility advisory councils are a success. Journal AWWA. 85(11):58-61

Case Study 3: The Future of Water Leadership: Camden, NJ and Buffalo, NY

Water and wastewater utility leaders are notoriously not very diverse. In large part this reflects the pipeline of engineers, lawyers, and scientists who often feed into the lead role at utilities and private sector firms in water fields. With the traditional demographics come traditional approaches to providing water services. This often means viewing the utility as a commodity provider, meet permit requirements, and run a financially sustainable enterprise. While these traditional values continue to be embedded in every water utility's mission, new leaders are seeking ways to provide more value to their communities. No two people exemplify this new breed of water leaders more than Andy Kricun and Oluwole McFoy.

When Andy Kricun joined the Camden County Municipal Utility Authority more than 30 years ago, the utility, like so many around the country, was narrowly focused on complying with its discharge permit. With Andy's encouragement, the utility adopted a "do no harm" attitude toward its neighbors starting with odor control. With his leadership, the utility evolved as an "anchor institution" for the county, and particularly for the city of Camden. At each step of the way, he's tried to put people– particularly disadvantaged people – first, and to look for creative ways to bring multiple benefits in the solutions he adopts. Farther northwest, Oluwole "OJ" McFoy, is bringing about big changes to the Buffalo Sewer Authority. One of the first things that OJ tackled as a leader was to overhaul all aspects of how they communicated with the public, including redesigning the utility website to instill public trust. While there are other such leaders worth highlighting, Andy and OJ are indeed inspirational and deserve to be a model for others.

A more descriptive version of this case study is available on the EPIC website.

Connections to recommended interventions:

ADDRESSING THE INEQUITY OF STORMWATER IMPACTS

Goals

- Improve community resilience to storms, especially in lower income areas and communities of color
- Improve co-benefits like aesthetic, recreational, and property values by expanding installation of green and other distributed stormwater infrastructure

Background

Stormwater runoff is generated from rain and snowmelt events that flow over land or impervious surfaces, such as paved streets, parking lots, and building rooftops, and does not soak into the ground. This runoff gathers pollutants on its way such as soil sediment, chemicals, oils, and trash that can degrade the quality of water in streams, lakes, and rivers. In the early 20th century, some cities, predominantly in the Northeast and the Midwest, combined their stormwater systems with pipes used for carrying wastewater, overwhelming their wastewater treatment plants during heavy precipitation and resulting in overflows (often referred to as "Combined Sewer Overflows" or CSOs). As of 2004, there were approximately 828 combined sewer systems in the U.S. with 9,300 CSO discharge points that release more than 3 million m3 of untreated sewage to surface water bodies annually.[115]

Uncontrolled stormwater runoff has many cumulative impacts on humans and the environment. These include, but may not be limited to, nutrients and sediment from agricultural farms causing eutrophication in lakes and rivers, impairment of water for recreational uses like swimming and fishing, increased flooding causing property damage, streambank erosion, contamination of drinking source waters, and increased cost of water and wastewater treatment. Localized actions like building in floodplains and wetlands, stream channelization, expansion of agricultural drainage, and conversion of natural habitat to impervious cover, coupled with larger events like climate-induced weather changes, sea level rise, and ground subsidence have exacerbated the impacts of what were once "natural" storm events.

> **"In California, all the climate calamities are coming to a head – drought, flood, and now fire."**
>
> *– Academic expert who has studied California and its water systems*

Even though the problem is not one of their own making, low-income communities are most likely to be in harm's way of stormwater impacts. Evidence from Baltimore suggests that basement backups are more likely in census tracts with a higher proportion of Black residents. And because low-income communities are more likely to live near sources of toxic chemicals, flooding in these areas is much more likely to bring a double-burden of flooding and toxicity.

Furthermore, even in communities that have stormwater programs, vulnerable communities are, ironically, least likely to be receiving the benefits. A case in point is Houston, Texas where, in Black and Latino communities, stormwater infrastructure is often no more than a roadside ditch. In addition to being outmoded, outdated, and severely under-capacity, there is a further inequity: the burden of maintenance falls on the property owner rather than the city at large.[117]

[115] EPA. 2004. Report to Congress: Impacts and Control of CSOs and SSOs. EPA 833-R-04-001. August. Available at: https://www.epa.gov/sites/production/files/2015-10/documents/csossortc2004_full.pdf

[116] Ezell, F. 2019. Residential Sewage Backups in Baltimore City. Master of Science Thesis. Johns Hopkins Bloomberg School of Public Health, Baltimore, MD. Accessed at: https://www.cleanwateraction.org/sites/default/files/docs/publications/Residential%20Sewage%20Backups%20in%20Baltimore%20City.pdf

[117] Marccus D. Hendricks. 2017. "The Infrastructures of Equity and Environmental Justice". Dissertation, Texas A&M University. https://oaktrust.library.tamu.edu/bitstream/handle/1969.1/161342/HENDRICKS-DISSERTATION-2017.pdf?sequence=1&isAllowed=y.

Though the Clean Water Act of 1972 and its subsequent amendments have improved the quality of water in our rivers, lakes and oceans, the Act's notable exclusion of non-point sources like stormwater, along with agricultural discharge, has left regulators and advocates scrambling for options to deal with the growing threat of stormwater pollution. Sustained action over the past two decades by the EPA, state governments, wastewater utilities, and local environmental groups has resulted in several cities reducing their incidences of CSOs and a move toward separating sanitary sewage and stormwater. The impetus for this separation came from the EPA's CSO Control Policy issued in 1994 that mandated communities to sharply reduce or eliminate CSOs to meet the goals set forth in the Clean Water Act.[118] Under this policy, cities with CSOs were required to establish short-term and long-term control plans (LTCPs) to manage the CSO discharges.

As a result of this policy and ensuing consent decrees agreed upon between the USEPA, Department of Justice and the involved communities, cities with CSOs have largely pursued two principal types of new infrastructure investment: 1) increase capacity of wastewater treatment plants to accommodate the stormwater during heavy precipitation without the threat of overflow or discharge, or 2) separate the stormwater and wastewater by constructing new stormwater drains that do not interact with the wastewater lines at any point.[119] Often, utilities have pursued both options simultaneously. DC Water, for instance, recently commissioned a 7-mile long tunnel with a 23-foot inside diameter that can hold up to 100 million gallons of stormwater at a cost of $1.6 billion.[120] This was in addition to the construction of a new 225 MGD wet weather treatment plant at a cost of $4 billion.[121]

Though such expensive "gray" solutions might only be pursued in larger cities, even those places have increasingly turned to a third option to complement, or at least supplement, the above two options: control the entry of stormwater into the combined systems in a decentralized manner through green infrastructure (GI) techniques such as rain gardens, infiltration ponds, porous pavements, etc. Over time, more cities are recognizing that smaller scale, dispersed investments in stormwater management can save money while also bringing previously unimagined community enhancements (see **Case Study 4**).

Case Study 4: Stormwater Management through Green Infrastructure: Youngstown, OH

Like other older cities in the Northeast and the Midwest, Youngstown, Ohio has a combined sewer system to manage its stormwater and is under a consent decree to upgrade its wastewater system and separate the stormwater. After significant depopulation due to suburban flight and the collapse of manufacturing, Youngstown has shrunk to from 170,000 to 65,000, earning the moniker "America's fastest shrinking city." The consent decree requires infrastructure investments of roughly $200 million over 30 years, a tall order for a city whose median household income today is less than half the national one.

The high cost of the gray infrastructure plan led the city to investigate the feasibility of implementing green infrastructure as an alternative way to achieve compliance with the Clean Water Act. The city is working with consultants and engineering firms to develop community-focused green stormwater solutions. So far, the city has installed five GI structures, mostly as demonstration. But the city is actively engaging the citizens in the process of installing GI structures throughout the city. In Mill Creek Park, one of the largest metropolitan-owned parks within the city limits in the U.S. and Youngstown's best natural resource, GI features such as porous parking lots and oxbows have reduced peak flows and incidences of flooding within the park.

A more descriptive version of this case study is available on the EPIC website.

Connections to recommended interventions:

[118] EPA. 1994. Combined Sewer Overflow (CSO) Control Policy. United States Environmental Protection Agency, Washington, DC. Available at: http://water.epa.gov/polwaste/npdes/cso/CSO-Control-Policy.cfm

[119] Tibbetts, J. 2005. Combined sewer systems: down, dirty, and out of date. Environmental Health Perspectives, 113(7), A465–A467.

[120] DC Water press release dated March 28, 2018, accessed at: https://www.dcwater.com/whats-going-on/news/dc-water-delivers-cleaner-anacostia-river-opening-first-leg-massive-tunnel

[121] DC Water. Undated. Blue Plains Advanced Wastewater Treatment Plant brochure. Accessed at: https://www.dcwater.com/sites/default/files/Blue_Plains_Plant_brochure.pdf

GI installations slow the impact of rain, while also improving water quality in local water bodies, and increasing groundwater recharge. A substantial body of evidence now exists that documents that green infrastructure is significantly beneficial for human health and wellbeing and that it has many applications for climate adaptation.[122] The truism, "plant a tree, save a life" captures the wide-ranging impact of GI on other sectors. Increased vegetation results in air quality improvements, reduction in ozone and particulate pollution, and a drop in surface temperature that has energy use implications.[123] Reduction in urban heat and air quality improvements alone are highly valuable in densely-packed urban city centers. The development of public recreation areas through bioswales and rain gardens provides community spaces for interaction and outdoor physical activity. Increase in property values, crime reduction, and demand for green and local jobs are additional co-benefits of GI.

Green infrastructure

The federal Clean Water Act defines green infrastructure (GI) as a range of measures that "store, infiltrate, or evapotranspirate stormwater and reduce flows to sewer systems or to surface waters." GI implementation can vary in size and scope. Small elements can be integrated into specific sites (home, garden, or sidewalk), while larger elements can span entire watersheds. Commonly used GI structures include rain barrels, rain gardens, bioswales, green roofs, and permeable pavements.

RECOMMENDATIONS

1. Support NGOs working at the interface of environmental justice and stormwater impact.[124]

There are a handful of examples where nonprofit organizations, often in partnership with local sewer utilities, have been providing capacity to neighborhood and community groups. This capacity helps them take advantage of funding and programs that they otherwise wouldn't be able to apply for. For example, American Rivers has, for many years, been providing this type of support in San Pablo, California where a highly urbanized waterway was causing localized flooding. The local watershed council had identified restoration needs, but the city's mostly low-income residents didn't have the capacity to fund them. American Rivers' provided help raising grant funds, matching grants with neighborhoods, and writing grant proposals. In Cleveland, American Rivers has helped the utility (Northeast Ohio Regional Sewer District) work with local partners to apply for funding. Greenprint Partners, a women-owned business based in Illinois, is working with cities like Youngstown, Ohio and Peoria, Illinois to provide low-cost green infrastructure solutions by engaging the local communities and ensuring they are sited in lower income neighborhoods and that construction and maintenance jobs associated with those projects go to historically disadvantaged populations.

Launched specifically to lift the voices of those hardest hit by climate-exacerbated flooding, the Anthropocene Alliance "combats climate change and environmental abuse by building grassroots coalitions in the communities most badly affected." Its signature project is Higher Ground[125], a coalition of over 45 community-based organizations advocating for flood victims. In addition to creating a peer-to-peer network, a low-cost/high-value investment, they offer capacity building, communications materials, and policy briefings. Similar efforts are needed in 100 or more cities and communities around the country and would be best supported by local or place-focused philanthropies. Municipal governments should themselves provide grants for such capacity to fund trusted intermediaries to help create momentum for green infrastructure work in disadvantaged neighborhoods.

[122] Bowen, K. J., & Lynch, Y. 2017. The public health benefits of green infrastructure: the potential of economic framing for enhanced decision-making. Current Opinion in Environmental Sustainability, 25, 90-95.
[123] Chuun-Heer, J. 2013. EPA articulates the multiple benefits of green infrastructure. Surfrider Foundation. March 13. Accessed at: https://www.surfrider.org/coastal-blog/entry/epa-articulates-the-multiple-benefits-of-green-infrastructure
[124] In addition to American Rivers and Anthropocene Alliance mentioned earlier in the text, there are a number of other organizations working at this forefront. On the national level, this includes NAACP, River Network, and Groundwork USA among others. Local examples include Center for Neighborhood Technology's Rain Ready program (Chicago, Illinois), Depave.org (Portland, Oregon), and Tree People (Los Angeles, California).
[125] https://anthropocenealliance.org/higherground

Higher Ground is a coalition of community organizations focused on flooding.

Higher Ground members advocate for:

1. Stop paving wetlands and building in flood-prone areas
2. Prevent excessive runoff into rivers, creeks, streams and bayous
3. Secure federal funds to elevate or buy out vulnerable homes
4. Install rain gardens and bioswales to locally manage stormwater
5. Protect and expand natural buffers against floods: wetlands, forests and barrier islands
6. Ensure that the National Flood Insurance Program puts communities & science first
7. Use climate predictions in every local government zoning, building regulation and finance decision
8. Reduce global warming by using only clean, renewable energy sources

2. Expand knowledge of federal policy that allows debt-financing of small-scale, dispersed stormwater infrastructure projects including those on private property and improve state policies and programs so they incentivize it as well.

Communities can turn to an array of income streams from stormwater fees, sewer fees, property taxes, development impact fees, general municipal revenue, as well as philanthropic support. The biggest opportunity is the use of debt financing as a source of funding. Under the previous standards set by the Governmental Accounting Standards Board (GASB), it was unclear whether distributed systems like GI installed on private property were eligible for this mode of financing.

In 2010, the GASB established an alternative accounting mechanism for public investments, which was later clarified in a guidance issued in 2018.[126] The revised and expanded GASB guidance makes it clear that utilities can deploy municipal bond proceeds to finance distributed water infrastructure, just as they do for gray infrastructure. For example, Prince George's County, Maryland used the State Revolving Fund borrowing to finance more than $220 million in dispersed stormwater projects on private (and public) lands through a novel public-private partnership (PPP) that prioritized social equity goals in addition to water quality ones.[127] The county set specific targets for the PPP contractor to use local, minority and woman-owned businesses, focus on restoration projects in lower-income neighborhoods, partner with churches and 501(c)(3) nonprofits, and deliver low-impact development (LID) projects. Such innovative projects are, for the moment, only occurring in a few large jurisdictions, as many utilities, especially smaller ones, remain unaware of the flexibilities offered under traditional financing programs in the light of the new GASB guidance.

[126] Koehler, C. and Koch, C. 2019. Innovation in Action: 21st Century Water Infrastructure Solutions. WaterNow Alliance. Accessed at: https://tapin.waternow.org/wp-content/uploads/sites/2/2019/11/WaterNowAlliance_Innovation-In-Action_FINAL-1.pdf.
[127] Male, T. and Caggiano, T. 2018. Stormwater Innovation. Environmental Policy Innovation Center. Accessed at: http://policyinnovation.org/wp-content/uploads/2018/11/StormwaterInnovation.pdf

3. Support green infrastructure workforce development through partnerships between NGICP and NGOs working to build green infrastructure in communities.

Ensuring the capacity to design, install, and maintain sustainable stormwater practices is another arena in need of additional investment. Utilities and cities, many of whom are legally mandated to sharply accelerate their green stormwater programs, are looking for ways the need can be met while also using the investment to develop local capacity in the form of new small businesses and a trained workforce. At the forefront of this effort is the National Green Infrastructure Certification Program (NGICP), an effort launched as a partnership between DC Water and the Water Environment Federation and now expanded to fourteen utilities, provides standards and training platforms for entry-level field workers as well as those who train them.[128] These programs are proving to be especially successful with NGO partners at the table. Support for national groups like AmeriCorps, the National Recreation and Parks Association, Groundworks USA, or local workforce groups like Landforce[129] (Pittsburgh, Pennsylvania) and Verde (Portland, Oregon)[130] to obtain the workforce training increases the likelihood of follow-through and impact in local communities.

MANAGING SEPTIC SYSTEMS FOR PUBLIC HEALTH

Goals

- Ensure homeowners have access to tools and resources to design, install, and repair onsite systems
- Create a change in mindset where onsite septic systems are better seen as an alternative for a safe, reliable, and affordable wastewater solution for small communities

Background

Septic systems, the simplest and most prevalent type of onsite wastewater treatment systems, serve about 25 percent of the U.S. population. There are more than 25 million septic systems operating in the U.S., roughly half of which are concentrated in the South.[131] Typically, these systems are found in rural and low-density suburban areas of the country where centralized sewer systems are economically infeasible. Despite their prevalence, septic systems are poorly understood and widely reviled.

A septic system consists of a holding tank, known as the septic tank, where wastewater enters from toilet, sinks, and other household drains. After 2-3 days, solids settle to the bottom and fats, oil, and grease float to the top and are trapped in filters. The remaining effluent exits the septic tank and is then spread across a soil leach field using pumps or gravity and a network of subsurface pipes. Septic systems require periodic pumping to remove solids that collect at the bottom of the tank. Several state agencies and the EPA recommend pumping every 3-5 years. Failure rates of 20-30%, as recorded in Pennsylvania and Ohio, are common, but not widely reported due to challenges in large scale assessment of these systems.[132]

While regulations vary widely across and even within states, a depth of 4 feet of unsaturated soil is commonly required for removal of pollutants such as suspended solids, organic matter, bacteria, and viruses.[133] It is hard to find such deep soils in some regions of the country. For instance, only 6.4% of the soils in Ohio are deeper than 4 ft and suitable for traditional leach fields.[134] Soils lacking in adequate depth can be augmented by "mounds" and peat filters, such that a lesser depth is enough for removal of most pollutants.

Failure of an existing system may force homeowners to install a new system, an expensive endeavor. According to a study conducted by the Ohio Department of Health in 2008, the average estimated cost of installing a basic septic system with leach fields was $7,250, while mound systems cost double that at $14,150.[136] The cost of a new system tends to come all at once and can be a significant percentage of the property value. Rural communities, often poor, have access to very few experts or resources when needing new systems or repairs.

While a system might be expensive for an individual property owner, at a community scale, such distributed systems are often less expensive. In studies that compare the two options decentralized systems such as septic are competitively priced with centralized treatment and, if well managed, work well to meet the needs of small communities.[137]

[131] Though there are many forms of OWTS – some more sophisticated and technologically advanced than the others – the vast majority of systems in use are the most basic version involving a septic tank and a soil leach field. Therefore, this report synonymously uses 'septic system' to refer to OWTS.
[132] Day, R. L., Zhu, Y., Bruce, S. & Franklin, A. 2008. An Examination of Failing Private Septic Systems in Pennsylvania. The Center for Rural Pennsylvania, Harrisburg, PA, USA; and Vedachalam, S., Hacker, E. B. & Mancl, K. M. 2012. The evolution of septic systems practices in Ohio. Journal of Environmental Health, 75(5), 22–27.
[133] Mancl, K. and Slater, B., 2001. Suitability assessment of Ohio's soils for soil-based wastewater treatment. Ohio Journal of Science, 101 (3/4), 48–58. Reprinted in The Ohio Journal of Environmental Health, 52 (1), 29–37, 2002.
[134] Vedachalam, S., Vanka, V. S., & Riha, S. J. 2015. Reevaluating onsite wastewater systems: expert recommendations and municipal decision-making. Water Policy, 17(6), 1062-1078.
[135] Mound systems involve the construction of a sand mound, and the septic tank effluent is treated within both the sand mound and the shallow soil beneath. See schematic at the EPA website: https://www.epa.gov/septic/types-septic-systems#mound
[136] Ohio Department of Health. 2008. Report to the household sewage and small flow onsite sewage treatment system study commission. Columbus, OH: Author
[137] A summary of such comparisons can be found in Vedachalam et al. 2015. Water Policy.

The impacts of poorly maintained septic systems are a tragedy of the commons type problem. The rational decision for the septic system owner is to undertake minimal maintenance, even though such a practice conducted on a large scale by multiple owners will eventually result in compromised water quality throughout the community. Stories from Alabama's Black Belt (see **Case Study 6**) highlight localized health challenges due to poorly designed and maintained septic systems. Failing systems also make properties difficult to sell and create social stigma and isolation.[138]

RECOMMENDATIONS

1. **Expand government funding for septic systems and expand state programs that also serve this purpose, while using innovative procurement approaches to better scale up septic system maintenance and replacement.**

Unlike with the centralized infrastructure that serves most of the urban population, there are few loan or financing programs for septic system installation or repair. This inequitable system means that rural taxpayers subsidize their urban counterparts through federal taxes supporting EPA wastewater programs that don't serve them. USDA's rural development program provides grant and loan support for small communities, but much of it goes toward centralized solutions.

Distributed systems under individual ownership can still be coordinated and maintained through networked capacity. EPA categorizes distributed systems under five levels of management.[139] Several communities have successfully demonstrated the use and maintenance of such systems to meet their wastewater challenges. Septic systems expert Karen Mancl at The Ohio State University chronicled experiences in four such communities in California, Colorado and Iowa.[140] Communities in upstate New York around Keuka Lake, Otsego Lake, and Skaneateles Lake and several others have employed a mix of advanced technology, expert advice, and homeowner cooperation to maintain onsite septic systems and preserve local water quality.[141,142] Others such as Cuyler, NY, embraced cluster systems, which are a hybrid of onsite septic systems and centralized treatment.[143]

These programs have worked best when communities have been involved in planning, development, and program implementation. Rhode Island's Infrastructure Bank operates a Community Septic Loan program offering up to $25,000 interest-free loans to homeowners. Similar programs are common in the Northeast and mid-Atlantic.

In addition, alternative procurement models could be better used to support maintenance, repair, or replacement of septic systems. There are a limited number of public-private-philanthropic partnerships that provide loans for repair or replacement of septic systems. Washington state has the most notable program with a regional loan program, administered by a nonprofit lender, to finance private septic systems.[144] The development of appropriate technology for treatment and diagnostic measures as well workable financing models can extend the lifecycle of septic systems. Culturally appropriate alternatives have also been developed such as the PASS system for Alaska's Native communities (see **Case Study 5**).

[138] The converse is equally true. Research has found that well-functioning septic systems result in an increase in property values. See Vedachalam, S., Hitzhusen, F. J., & Mancl, K. M. 2013. Economic analysis of poorly sited septic systems: a hedonic pricing approach. Journal of Environmental Planning and Management, 56(3), 329-344.
[139] EPA. 2012. Decentralized Wastewater Management Case Studies. United States Environmental Protection Agency, Washington, DC, USA
[140] Mancl, K. 2002. Model for success in on-site wastewater management. Journal of Environmental Health, 64(9), 29–31.
[141] Allee, D., Raymond, L. S., Skaley, J. E. & Wilcox, D. E. (2001). A Guide to the Public Management of Private Septic Systems. Community and Rural Development Institute, Cornell University, Ithaca, NY.
[142] Blanco, A., Somboolakana, D. & Murdock, E. 2010. National community decentralized wastewater demonstration project for the City of Skaneateles Lake, New York. Proceedings of the Water Environment Federation, 2010(13), 3833–3859.
[143] Feuss, J. V., Farell, R. P. & Rynkiewicz, P. W. 1994. A small community success story. Small Flows Journal, 1(1), 11–16.
[144] Harshman, M. 2018. Septic systems loans available for Clark County homeowners. The Columbian. March 29. Accessed at: https://www.columbian.com/news/2018/mar/29/septic-system-loans-now-available/

Case Study 5: Providing Safe Sanitation Options to Alaska's Most Vulnerable Communities

Access to water and basic sanitation are recognized as fundamental human rights by the United Nations. Most of the international attention on filling the gaps is on Asia and Sub-Saharan Africa, yet even in the United States, one of the world's wealthiest nations, we fall short. Nowhere in the U.S. is this starker than in Alaskan Native communities, 33 of which do not have running water or sanitation available for their residents. Living in situations that would be foreign to most Americans, these residents haul their household's human waste to central collection facilities, often miles from their homes (a 'honey bucket' system). Hauling the waste exposes family members to disease and bacterial infection. In addition to having no piped sanitation, and soils that are unacceptable for pit latrines, the lack of running water makes it challenging to wash and clean thoroughly.

Taking matters into their own hands, the Alaskan Native Tribal Health Center (ANTHC) has developed the Portable Alternative Sanitation System or PASS, giving a new option to the roughly 3,000 Alaskan Native households without safe water or sanitation. Each PASS unit is designed as a stand-alone, off-grid installation appropriate for Alaska's harsh conditions. Special urine-diverting toilets separate the relatively benign liquid component of human waste from the more biologically active sold component. Urine can be safely disposed of in drainage pits near the home, while dried feces can be safely and easily transported to a landfill or burned on site. Water tanks, which can be filled with rainwater or trucked water, provide a reliable source of indoor water. PASS units, although expensive to build, are affordable to operate, and demonstrate the importance of transitional measures before more mainstream sanitation alternatives are designed for Alaskan communities.

A more descriptive version of this case study is available on the EPIC website.

Connections to recommended interventions:

2. States must require periodic inspections to ensure proper functioning of septic systems.

Many state agencies recommend periodic inspection or even periodic emptying of the septic tank to prevent a majority of the septic tank failures, yet they stop short of making definitive regulations about it. Virginia has a requirement to pump out septic tanks every 3-5 years, but only for those systems located within the Chesapeake Bay watershed.[145] We are not aware of any statewide program that mandates periodic inspection of septic systems to ensure their functionality and to recommend remedial measures in case of failure. Florida had adopted a statewide law in 2010 which required septic tank inspections every five years. However, the law had to be scaled back significantly after public pressure over the cost of inspection as well as recommended repairs and installation, providing a preview of the politically uphill battle if an aggressive scale-up effort is attempted.

Florida's septic tank inspection program

Florida has more than 2.6 million septic systems that serve roughly a third of the state's population. Approved in 2010, SB 550 was seen as a significant environmental and public health victory. However, concerns over the cost to homeowners quickly escalated. Although the roughly $150-$300 inspection cost once every five years was not prohibitive, especially considering the bill included a grant program to alleviate this concern for low-income homeowners, opponents of the law were concerned the inspections would reveal other failures requiring additional repair or replacement. Under pressure from constituents, the legislature delayed implementation and after Governor Rick Scott – who ran on a campaign to repeal the inspection law – took office in January 2011, the inspection requirement was repealed for all but the 19 counties with large springs, though even those could opt out of the inspection requirement.[146] Since then, some counties have voted to opt out, and the current geographic reach of the inspection law is unclear. A pair of bills were introduced in the Florida legislature in early 2020 that would revive the inspection requirement for the entire state.[147]

3. A need for robust census of septic systems and well through either an EPA rule mandating all states assess decentralized systems, or support from water- and rural-focused foundations for a rigorous effort to map private water and wastewater systems.

One of the most basic challenges with septic systems management is the sheer lack of data regarding how many treatment units there are and where they are located. The U.S. Census Bureau used to collect this information as part of the Decennial Census until 1990, when it was dropped from the questionnaire, and made part of the annually conducted American Community Survey that has a much smaller sample size (100,000 respondents). As a result, all national and many statewide estimates are outdated or still based on projections from 1990 data. Some states, particularly those experiencing rapid suburban growth like Georgia and Florida, keep a good track of septic systems, but most others do not.[148]

[145] Virginia Department of Health. 2020. What you should know when buying a house with an onsite system. Accessed at: http://www.vdh.virginia.gov/environmental-health/what-i-should-know-when-buying-a-house-with-an-onsite-system/ on January 9.
[146] List of Florida counties with first magnitude springs: https://static-lobbytools.s3.amazonaws.com/press/20120508_counties_with_1st_magnitude_springs.pdf
[147] Lindsey, A. 2019. Florida bill would require regular septic tank inspections. WEAR TV. January 3. Accessed at: https://weartv.com/news/local/florida-bill-would-require-regular-septic-tank-inspections
[148] Landers, M. 2020. Unlike its neighbors, Georgia knows where its septic lies. Savannah Morning-News. March 13. Accessed at: https://www.savannahnow.com/news/20200313/unlike-its-neighbors-georgia-knows-where-its-septic-lies

ENSURING THE RIGHT WATER INFRASTRUCTURE FOR THE NEED

Goals

- Right-size future water infrastructure investments to more accurate growth and demand forecasts
- Create a culture of thinking more flexibly about water infrastructure

Background

Although most people associate water infrastructure with the water that comes out of their tap and gets flushed out of their toilet, there is much more to it than that. The treatment plants (which can feel like mini-cities themselves), pumps, a network of underground pipes, efforts to keep both the source and receiving waters clean, and a trained staff to keep it all working make up the "hidden" portion of this infrastructure. That's why the cost of water and wastewater services is rarely just the cost of providing that one gallon of water; it includes all these "hidden" costs. This is the reason why customers may find their water bills go up a year after a wet summer resulted in them (and all their neighbors) using less water.

A corollary to this problem is that communities do not get many chances to adjust their water infrastructure costs. Much of the cost is locked in at the time of building a new treatment facility, expanding water or sewer lines, or acquiring rights to a new water source. Those water infrastructure decisions, especially wastewater treatment capacity and sewer network, are intimately tied to economic growth, resulting in a "chicken-and-egg" problem, where one is often needed for the other.

All too often, however, the infrastructure is built, the growth doesn't materialize, and the community is still on the hook for paying off the bill for the excess capacity.[149] Many communities are saddled with costs from past decisions where they built the wrong infrastructure. For example, Uniontown, Alabama purchased land and developed it into a second spray field for the dispersal of treated effluent (see **Case Study 6**). Unfortunately, the soils, which were not tested in advance, could not absorb the effluent and the land acquisition and infrastructure costs are now a stranded asset.[150]

> **Before the housing market crash, the SRF program … had given loans to coastal communities to expand their wastewater systems to accommodate expected growth. The growth never came. Communities can't pay back loans but they are still on the hook. It's not pretty."**
>
> *– Consultant based in the South*

[149] There are multiple examples of this, including: Rigsby, G.G. 2012. Commissioners face $28 million water-sewer debt. Savannah Morning News. April 12. Accessed at: https://www.savannahnow.com/article/20120412/NEWS/304129710 and Ross, Kirk. 2019. "With Town of Eureka drowning in sewage bills, state takes control." News & Observer. August 7, 2019. https://www.newsobserver.com/news/politics-government/article233635952.html

[150] Ben Eaton, President of Black Belt Citizens Fighting for Health and Justice. Personal communication with Lynn Broaddus, November 14th, 2019.

Case Study 6: The Face of Sanitation for the American Poor: Uniontown, Alabama

Uniontown, Alabama sits in the heart of America's Black Belt, roughly 80 miles west of Montgomery. A small city with 2,400 residents, Uniontown is a struggling city with one-third the national median income and half the households below poverty level. Catfish farming is a big business in the region, and Harvest Select is the most well-known brand selling sustainable, local / US-raised food. Uniontown does not have a mechanical treatment plant for its sewage, instead collecting sewage and pumping it to lagoon system where solids settle out. The liquid effluent that remains is pumped to a spray field where, in theory, the natural vegetation, microbes, and soils absorb the nutrients and degrade the pathogens. This type of system is typical for small, rural communities and in addition to being inexpensive, the simple technology makes it easier to maintain.

In theory, this should be a good solution, but the city's system is not designed to handle the industrial-scale waste that Harvest Select sends to it. The catfish processing operation can readily use the lagoon's entire capacity, leaving no room for residential sewage. Furthermore, waste from animal processing facilities is high in organic content meaning that it needs a longer residence time in the lagoons. Harvest Select does not "pretreat" the wastewater at their facility, thereby overloading the entire system. The city's proposed alternative to carry sewage in a pipeline 18 miles away to another town has been controversial, especially given its $30 million price tag. The city may also have trouble attracting federal funding due to its poor financial records and lack of an operating budget for the past two decades. The grassroots group, Black Belt Citizens Fighting for Health and Justice, is the city residents' best advocate in this long and difficult fight to obtain good sanitation and wastewater solution.

A more descriptive version of this case study is available on the EPIC website.

Connections to recommended interventions:

Good management does not end with building the right infrastructure. Taking care of the assets and budgeting for their maintenance and eventual replacement is often overlooked, especially when money and expertise are in short supply. "Asset management" is a process that some utilities use to inventory and track capital assets, and build decadal or longer plans to plan for their future replacement or maintenance. This approach minimizes surprise expenses and ensures that rate structures are sufficient for both current and future needs.[151] Asset management is much less common in small- and medium-sized communities.

Even with the best planning, inadequate or improper maintenance of water and sewer systems is a big driver for cost overruns especially for smaller utilities. Water and sewer systems are made of expensive collection and distribution networks as well as pumps, lift systems, purification, and testing systems. Without the daily, weekly, monthly, and annual maintenance protocols, these components wear out well before their expected lifetimes, resulting in unexpected costs.

Generally, maintenance shortfalls are a side-effect of the overall shortage of qualified, licensed water and sewer operators and of technical and managerial capacity. These challenges, especially those related to workforce capacity, are felt throughout the sector but are especially acute in small communities.

Communities can lower their financial risk by including smaller scale or distributed improvements that can be added as needed.[152] For water supply, this includes simple approaches like cisterns for rain-water catchment and offsetting demand for potable water from the central utility. For wastewater, there are a wide variety of options including septic tank effluent systems and industrial pretreatment that can alleviate the need for expensive municipal upgrades. This type of intervention is increasingly common for cities that are at or near their maximum sewage treatment capacity. The rising popularity and use of green infrastructure to address stormwater pollution is a bright spot that showcases the change in culture and highlights multiple benefits of distributed infrastructure.

[151] EPA. Asset Management at https://www.epa.gov/sustainable-water-infrastructure/asset-management-water-and-wastewater-utilities
[152] Broaddus, L. 2019. Opportunities in Distributed Water Infrastructure. Broadview Collaborative. Accessed at https://broadviewcollaborative.com/opportunities-in-distributed-water-infrastructure/

RECOMMENDATIONS

1. Strengthen the regulatory oversight process to guide water infrastructure decisions through state agency requirements (as a precondition for SRF/USDA funding) or PUC review.

Small towns and utilities often come to depend on one or a few consulting engineers with whom they have open contracts with a 'not to exceed' monthly budget. These relationships are crucial for utilities that simply do not have the resources to hire or retain full-time technical expertise on their own staff. However, poor infrastructure investment decisions can often be tied back to the advice received from consulting engineering firms. Selection of the firm might be based on long-standing relationships with city leadership rather than on objective measures of qualifications. Often the more qualified firms are looking on from the sidelines, knowing that they could offer appropriate, more financially sustainable solutions. The result is that small communities often purchase technically demanding solutions they can neither maintain or afford. They might acquire and rely on technologies that are familiar to the consultant but not the best match for the utility's needs. An intervention that may reduce this problem is the development and adoption of state or local rules to strengthen water expertise requirements in order to bid on water projects. Doing so would empower more engineering firms to submit bids for contracts. State agencies could also create technical service agreements with organizations like Isle Utilities or Moonshot Missions to allow them to provide small dollar (< $2,000) technical assistance services to utilities within the state to better match technology with problems and budgets.

2. Think more flexibly about water infrastructure. Fixing leaks in water distribution systems could be the first step.

A cultural shift to thinking more flexibly about water infrastructure can help communities avoid specific challenges of over-sized infrastructure. Water conservation and addressing the integrity of distribution/collection systems needs to be the first consideration for system improvements. Infrastructure expansion for both water distribution and sewage collection can often be avoided, and tremendous cost savings realized, by tightening up the existing system.[153] Fixing leaks is an equity issue because approximately 20 percent of all drinking water (2.1 trillion gallons) that goes through expensive treatment ends up leaking out of pipes before reaching customers, but someone still has to pay for those treatment costs.[154] And of course, there is a cross-over effect between water distribution and sewage treatment: using less water, even in water-rich communities, should be part of the solution for overburdened wastewater facilities. However, financing such repairs may not qualify for most water utility loans. Instead, leak repair is paid for through the much more limited annual operating expenses.

Working with communities and their state regulators to find ways to capitalize on-premises, distributed "infrastructure" such as low-flow toilets and behavioral changes can avoid much greater expenditures in large-scale projects such as new wells or reservoirs. Utilities like the San Antonio Water System realize the importance of household water leaks to their overall system resiliency; their "Plumbers to People" program provides emergency water leak repair assistance to low-income residential customers at no cost.[155]

Approximately 20 percent of all drinking water, amounting to 2.1 trillion gallons, that goes through expensive treatment ends up leaking out of pipes before reaching customers, but someone still has to pay for those treatment costs.

[153] Cynthia Koehler, and Caroline Koch. 2019. Innovation in Action: 21st Century Water Infrastructure Solutions. San Francisco, Calif.: WaterNow Alliance. https://tapin.waternow.org/resources/innovation-in-action-21st-century-water-infrastructure-solutions
[154] https://www.cnt.org/publications/the-case-for-fixing-the-leaks-protecting-people-and-saving-water-while-supporting
[155] San Antonio Water System. 2020. Plumbers to People. Accessed on April 7 at https://www.saws.org/service/affordability-programs/plumbers-to-people/

Distributed infrastructure

Distributed systems are located at or near the point of use and may or may not be connected to nearby larger centralized systems. Distributed systems can service individual homes or small communities, and they can be adopted in urban and rural settings. For instance, private wells and onsite septic systems can serve the water and wastewater needs of rural communities, while green infrastructure can be a useful tool in urban settings to manage stormwater and achieve a variety of co-benefits.

3. Promote the application of asset management[156] and Effective Utility Management[157] to small and mid-sized water and wastewater utilities throughout the U.S.

Asset management is the practice of managing capital assets to appropriately budget for operation, maintenance and replacement of these assets while delivering optimum service levels. Asset management provides utility managers and decision-makers with critical information on capital assets and timing of investments. In its best practices guide, the EPA list five core questions that would help utilities do asset management: 1) current state of assets, 2) level of service, 3) critical assets, 4) minimum life-cycle cost, and 5) long-term funding plan.[158]

The EPA, working along with key water and wastewater stakeholders identified a set of key practices, called Effective Utility Management, which are described as "the foundation for building and sustaining the technical, managerial, and financial capacity of the drinking water, wastewater, and stormwater systems."[159] These practices take a broad look at all aspects of water sector system sustainability and cover 10 broad areas, including product quality, customer satisfaction, operational resiliency, and stakeholder support. The expectation is that the water sector can improve the overall utility management as individual utilities address more, and eventually all, of the 10 areas.

Effective utility management and asset management (which can be seen as a subset of the former) can and should be practiced by utilities of all sizes, but this is not the case. Small utilities do not have the staff or the technical resources to conduct an initial asset management analysis or invest in leadership development, stakeholder support, and customer satisfaction. They are thus ill-prepared for future shocks arising from equipment breakdown, staffing shortages, loss of public trust, or external market risks. Appropriate partners like RCAP or state affiliates of trade organizations like AWWA and WEF are needed to develop and promote material targeted to small communities that would ultimately go a long way toward accelerating these practices at utilities of all sizes.

[156] https://www.epa.gov/sustainable-water-infrastructure/asset-management-water-and-wastewater-utilities
[157] https://www.epa.gov/sustainable-water-infrastructure/effective-water-utility-management-practices
[158] EPA. 2008. Asset Management: A Best Practices Guide. Washington, D.C.: Author. EPA 816-F-08-014
[159] EPA. 2020. Effective Water Utility Management Practices. Accessed on April 8 at https://www.epa.gov/sustainable-water-infrastructure/effective-water-utility-management-practices

4. Replicate collaborative models and explore the development of new entities that can serve tribal, small, and rural communities.

Small and mid-sized communities may benefit from joining forces with others for shared technical support for their water and wastewater operators. A traditional approach to this is to contract out the maintenance function to a private firm, or to simply consolidate with a larger, neighboring community. This may not always be financially or logistically feasible, or may be objectionable to a community which does not want to relinquish control. Fortunately, there are numerous examples of alternative approaches that could be replicated to provide the needed structure for many challenged communities. One approach that has been gaining a lot of attention lately is the EJ Water Cooperative, Inc.[160] Formed in the late 1980's to address rural water needs, EJ Water has grown into the water provider for more than 28,000 people across twelve counties in central Illinois (see **Case Study 1**). As a not-for-profit, member-owned, mission-based water cooperative, they can blend the needs of small communities with the expertise and reliability that comes with a larger base.

Another innovative cooperative approach is the EDEN – DSSC – SERCAP partnership which came together to address struggling community wastewater systems on the Delmarva Peninsula of Delaware. The region has an abundance of small, privately owned systems which were at or near the end of their lives and the communities that owned them did not have the expertise or financial reserves to address the mounting problem. SERCAP, the regional affiliate of RCAP[161], worked together with a range of stakeholders to create the Diamond State Sustainability Corporation (DSSC) to be the responsible management agency for the systems that join it, serving essentially as the "utility." SERCAP provides the technical expertise and overall strategic guidance, while EDEN (Energizing Delmarva Now) serves as the capital and financial management partner. DSSC is relatively new, with five communities under its management, and the hope is that it will eventually be able to take on more communities as demand grows.

5. Support state-based and regional organizations that can build capacity and confidence in grassroots citizen advocacy groups working to improve water and sanitation services in their communities.

A number of community advocates are working to improve water and sanitation services in their communities. The pervasiveness of challenges across communities means that we can learn from and share experiences through umbrella networks such as the Alabama Rivers Alliance, Community Water Center, and the Leadership Counsel for Justice and Accountability. Such organizations sometimes struggle to find long-term, secure funding to be able to hire and retain dedicated staff who can develop the relationships with local organizations and provide the technical and policy support needed over many years. The non-profit nature of these organizations means that they do not have a conflict when facilitating negotiations between two or more neighboring communities, allowing them to use their trust and goodwill for the betterment of the communities rather than pushing a particular solution.

[160] https://www.ejwatercoop.com/
[161] SERCAP is the southeastern affiliate for RCAP, whose territory includes Delaware, Maryland, and Virginia (the DELMARVA states) among others.

Conclusions

The water systems we use to deliver drinking water and remove wastewater from the homes and businesses of 327 million Americans are broken. Far too many Americans lack consistent access to affordable and safe water supplies to meet their needs. Far too many Americans distrust their tap water, even when it is safe. The failures of our water systems prevent all Americans, especially lower income and people of color, from having the healthy and prosperous lives they deserve. These disparities affecting some groups can be reduced and eliminated in much of the country and our water systems can simultaneously do a better job of providing even higher quality water services to all people.

Our report provides an overview of water services in the country, their connection to health equity issues, and opportunities to address those issues. While there is a general focus on water across the country in a profoundly higher level than in past decades, this moment won't last. We must show people that government, advocates, utilities, and experts can be trusted to provide reliable and accessible information on what is and isn't safe and healthy. The direction in which local and state governments and utilities are headed on water costs will result in the isolation of lower income populations from quality water services – we must change direction. And we must prove that we can solve problems of water quality, like the cities of Lansing, Madison, and Washington DC have done or are doing. That faith is critical to keeping all populations involved in efforts to keep making progress with America's water needs.

But what we have tried to provide are our best insights into how to make the most dramatic impacts that will have health, cultural, behavioral, and economic impacts that extend well beyond the strategies themselves and help the water sector get at the root causes of or obstacles to health equity in water infrastructure.

We believe that sustained intervention by any number of actors (federal and state agencies, utilities and their trade associations, community groups, philanthropies and the non-profit advocates) could make a dramatic difference in the inequities that are prevalent in America's water infrastructure system, and which have inequitable and unjust impacts on public health, particularly for low-income communities and people of color. There are dozens of paths towards rectifying these challenges, and we have identified many of them in this report. The report also provides our recommendations on where we think potential actors have the most influence. These recommendations and the paths we identify are not without critique. Rather than assuming this report to be a comprehensive review of the water sector, we urge you to consider this report as a blueprint for retooling the water sector to bring about better health outcomes across all communities, but especially in low income communities of color. Below, we offer some additional narrative about the issues discussed in this report.

Ensuring water security for all

Basic access to water cannot be overlooked. Access to water and sanitation have been recognized by the United Nations as fundamental human rights. Nearly 2 million rural Americans are still in need of basic water services, and Dig Deep's recent report recommended household-level solutions and the policy and funding needed to accelerate them.[162] We lack a sophisticated understanding of which areas could maintain viable, centralized water infrastructure if they only had short-term assistance to catalyze a change in the quality of their current infrastructure and capacity. Knowing this is critical to understand where to support significant infrastructure investments in rural areas that are expected to continue to experience population declines, and thus our report generally recommends creating partnerships to better manage decentralized systems in such areas, and leverage consolidation of utilities to bring maximum benefits to somewhat larger but currently underserved communities. Passage of more state laws that create a 'right to water' could also help shift this problem while simultaneously having large benefits for urban areas and disadvantaged customers of large, otherwise-successful utilities.

Utility Consolidation

The topic of utility consolidation received a significant attention in the report, and that's not without a reason. We expect utility consolidation to have spillover effects on rate affordability, right-sizing infrastructure, leadership and workforce representation, and trust-building. Small utilities with a small base of ratepayers simply cannot attract and retain the expert staff that are needed to meet today's water and wastewater demands. Nor can they meet the short or long-term needs for operating and updating their infrastructure in an affordable manner. There is much to be gained, both in terms of performance and affordability, each of which contribute to community health, from utility consolidation, or at least sharing some services and expertise.

There is no one-size-fits-all approach to helping utilities achieve economies of scale. There is a range of successful models for how utilities can approach this, including public, private, not-for-profit, and cooperative models. The physical manifestation of consolidation or cooperation also varies; in some cases, the communities will choose to be physically connected through distribution pipes or collection systems, whereas in others, the systems will remain physically independent but jointly managed.

Public versus private models of water service

Throughout this report, we did not attempt to provide any answers or guidance to a question policymakers often ask: is private provision of water services better or worse than the public utility model? We did not avoid this territory for wont of being cautious and to avoid controversy. In the U.S., private and public models of water service are quite comparable. Depending on one's experience, or perhaps ideology, there are numerous examples of poorly performing public utilities as there are cases of exceptionally run private water utilities, and vice versa. Private utilities are required to meet federal guidelines just like their public counterparts and are also highly regulated for rate-setting under state law by PUCs (something the public utilities are typically excluded from). In fact, there is evidence to suggest that investor- owned water systems are, on average, much more likely to comply with environmental regulations than are public water systems.[163] Although most private utilities in the U.S. are based on a profit model (exceptions include non-profit coops) suggesting consumers could suffer higher rates, the use of single tariff pricing in many states has limited sharp rate increases across private water systems. But that model can be adopted by public systems too, as the case of Hampton Roads Sanitation District in Virginia demonstrates. Our mission, in this report, as well as more broadly, is to find opportunities to address inequities in our water system and bring about large-scale improvement in public health outcomes. Both the public and private models can be used to bring about those changes, without having to choose one over the other.

[162] Dig Deep Right to Water Project, US Water Alliance. 2019. Closing the Water Access Gap in the United States. Accessed at: www.closethewatergap.org
[163] Konisky, D.M. & Teodoro, M.P. 2016. When Governments Regulate Governments. American Journal of Political Science, 60(3): 559-574.

Working strategically with institutional partners

There are a number of influential trade organizations working in the water sector that represent water and wastewater utilities. For instance, AWWA represents all water utilities, while the National Association of Clean Water Agencies (NACWA) and WEF represent wastewater (and stormwater) utilities. Other organizations represent private utilities (National Association of Water Companies, NAWC) and large utilities (Association of Metropolitan Water Agencies, AMWA). A number of large private engineering firms provide consulting support to individual utilities or their trade organizations. Ostensibly, they all work to improve the water sector and their larger goals are typically in line with societal expectations, but it is important to remember that their primary constituents are utilities regulated by EPA. Given their size and influence, they have the opportunity to be 'disruptive' and reimagine the water sector, but their size and diversity also ends up preserving the status quo. It is up to independent actors that truly represent communities, especially the disadvantaged individuals, to speak up for the wholesale changes needed to improve health equity for all individuals. Although any work in the water sector would likely be incomplete or ultimately doomed to failure if done without the cooperation of individual utilities or their trade organizations, we recommend anyone working in this space to be strategic about partnering with these organizations and beware of their institutional interests.

Building community power over water systems

Change happens when people engage. For far too long, water and wastewater utilities have operated under the radar and out of public view – generally unnoticed – unless they try to raise rates or there is a water contamination issue. That strategy worked reasonably well, especially when the federal government was footing more of the bill for capital needs. As water utilities start to address maintenance and capital backlogs, they need public support for rate increases, if nothing else. But public support is not likely to come without public engagement, which in turn does not come without demands and increased expectation for utility performance.

Water utilities and the public need each other more than ever. To forge a new relationship, community members need to actively engage, ask questions, and seek opportunities for elected and appointed leadership where available. Engagement often brings the benefit of better services, but it can also lead to more trust and support from the community. More trust and better services will hopefully also lead to less reliance on (expensive and inconvenient) bottled water. This is especially important for communities of color who have lower levels of trust in municipal water supplies. Very few utilities know how to do this well or have the interest in doing so. This is one reason why we have focused on a shift in agency leadership in our recommendations. We believe that shift will bring a different emphasis on community engagement and the marketing and branding and communications skills that utilities or local government need to do so effectively.

Appendix

A. About This Report

The report and its contents were generated based on several interviews and three roundtable discussions with water sector leaders over the course of seven months. In total, we received input from more than 100 water sector experts, based in 21 states and the District of Columbia (see Appendix B for a list of names). The interviewees were a mix of non-profit staff, utility officials, consultants, academics, trade group representatives, tribal representatives or those who work with tribes, elected officials or their representatives, and others from state agencies, and lobbying firms. Roughly half of the experts interviewed were women, and over a quarter were persons of color. The three roundtables, in particular, were used to get much deeper perspectives on a subset of the issues we examined and perspectives on the specific mix of challenges facing particular communities.

Date	Location	Scope	Topic(s)
August 21	Youngstown, OH	Youngstown and Mahoning Valley	Combined sewer overflow mitigation plan and use of green infrastructure
October 28	Austin, TX	Small systems in Texas	Water system governance, climate change, state policy
November 14	Uniontown, AL and nearby	Rural Alabama	Onsite wastewater management

Table A1. Background on three roundtable discussions.

B. Water sector experts interviewed during this project:

Judy Adler, Turner Foundation, Inc.
Keith Alexander, City of Decatur (IL)
Matt Alexander, Village of Wappinger Falls (NY)
Konstantine "Dean" Alonistiotis, Metropolitan Water Reclamation District (IL)
John Alston, City of Bozeman Water and Sewer Division (MT)
Janet Anderson, Twin Lakes Water Corporation (NY)
Katherine Baer, River Network
Cathy Bailey, Greater Cincinnati Water Works (OH)
Amal Bakchan, University of Texas
Stacey Isaac Berahzer, IB Environmental
Scott Berry, US Water Alliance
Erin Bishop, City of Youngstown
Courtney Boyle, Environmental Collaborative of Ohio
John Bralich, Youngstown State University
Nelson Brooke, Black Warrior Riverkeeper
Tito Brown, City of Youngstown
Adriana Caldarelli, Water Environment Federation
Esther Calhoun, Black Belt Citizens United for Health and Justice
Rose Carter, Alliance for Congregational Transformation Inspiring Our Neighborhoods (ACTION)
Bobby Chochran, Willamette Partnership
Tara Chioffi, City of Youngstown
Juliet Christian-Smith, Water Foundation
Chuck Clarke, Cascade Water Alliance
Susanne Cordery, Colorado State University
Rob Coleman, Cahaba River Solutions, Inc
Scott Cuppett, New York State Department of Environmental Conservation
J. Wheeler Crook, Garver
Matt Dannenberg, Wisconsin Voices
Wende David, National Recreation and Parks Association
Susana De Anda, Community Water Center
Michael Deane, National Association of Water Companies (formerly)
John Donahue, North Park Public Water District (IL)
Martin Doyle, Duke University
Stephanie Dyer, Eastgate Council of Governments (OH)
Ben Eaton, Black Belt Citizens United for Health and Justice
Jessica Eckdish, Bluegreen Alliance
Eric Emmerich, EJ Water Cooperative (IL)
Walter Farrow, Jr, Alabama Center for Rural Enterprise
Kristi Pullen Fedinick, Natural Resources Defense Council
Amanda Fencl, Texas A&M University
Debora Flora, Mahoning County Land Bank
Catherine Flowers, Alabama Center for Rural Enterprise
Radhika Fox, US Water Alliance
Jennifer Godzeno, Participatory Budgeting Project
Leigh Green, City of Youngstown
Teal Harrison, National Wildlife Federation
Andrew Heath, J.D. Power Associates
Robyn Hyden, Alabama ARISE
Nina Hoe Gallagher, University of Pennsylvania
Rikardo Hull, National Association of Water Companies
Kevin Jeffery, MRV Architects
Adam Johnston, Black Belt Citizens United for Health and Justice
Ashea Jones, Lone Star Legal Aid
Paul Joseph, City of Youngstown
Maria Kennedy, Kennedy Communications
Cynthia Koehler, WaterNow
Andy Kricun, Camden County Municipal Utilities Authority (NJ)
Marleah Makpiaq LaBelle, National Tribal Water Center
Jeff Limbian, City of Youngstown
Keland Logan, The Colony Youngstown
Lauren Loney, Texas Housers
Chad Lord, National Parks Conservation Association
Jonathan Lowell, University of Texas
Richard Lowerre, Texas Center for Policy Studies
Cindy Lowry, Alabama Rivers Alliance
Sarah Lowry, Community Foundation of the Mahoning Valley
William Luhn, City of Hagerstown Water Department
Robert Mace, Meadows Center for Water and the Environment, Texas State University
Charles Maddox, Austin Water (TX)
Maggie Mahan, Community Action Kentucky
Kelly Marshall, Alabama Rivers Alliance
Oluwole (OJ) McFoy, Buffalo Sewer Authority (NY)
Sally McGee, Black Belt Citizens United for Health and Justice
Terry McGhee, DuPage Water Commission (IL)
Brendan McGinnis, THG Advisors
George McGraw, Dig Deep
Ted Meckes, Springfield City Water Light and Power
G. Tracy Mehan, III, American Water Works Association
Erika Mora, San Antonio Water System (TX)
Olga Morales, Rural Community Assistance Corporation (RCAP affiliate)
Sapna Mulki, Water Savvy Solutions
Julie Nahrgang, Water Environment Association of Texas
Tom Neltner, Environmental Defense Fund
Nathan Ohle, Rural Community Assistance Partnership
Jascha Pettit, Midwest Assistance Program (RCAP affiliate)
Gregory Pierce, University of California Los Angeles
Nancy Quirk, Green Bay Water Utility (WI)
Tim Rogers, Village of New Paltz (NY)
Katherine Romans, Hill Country Alliance
Josh Sendejar, Texas Water Development Board
William Senft, EJ Water Trust
Brian Shannon, Garver
Eddie Sherman, Hilltop Public Solutions
Rachael Singer, University of Texas
Mae Stevens, Signal Group
Ted Stiger, Rural Community Assistance Partnership
Lynn Thorpe, Clean Water Action
Todd Votteler, Texas Water Journal
Jennifer Walker, National Wildlife Federation
Kevin White, Southern Alabama University
Wendi Wilkes, Association of State Drinking Water Administrators
Dorothy Young, Texas Council for Environmental Quality
Ebony Young, Lone Star Legal Aid

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