Advancing Affordability through Water Efficiency

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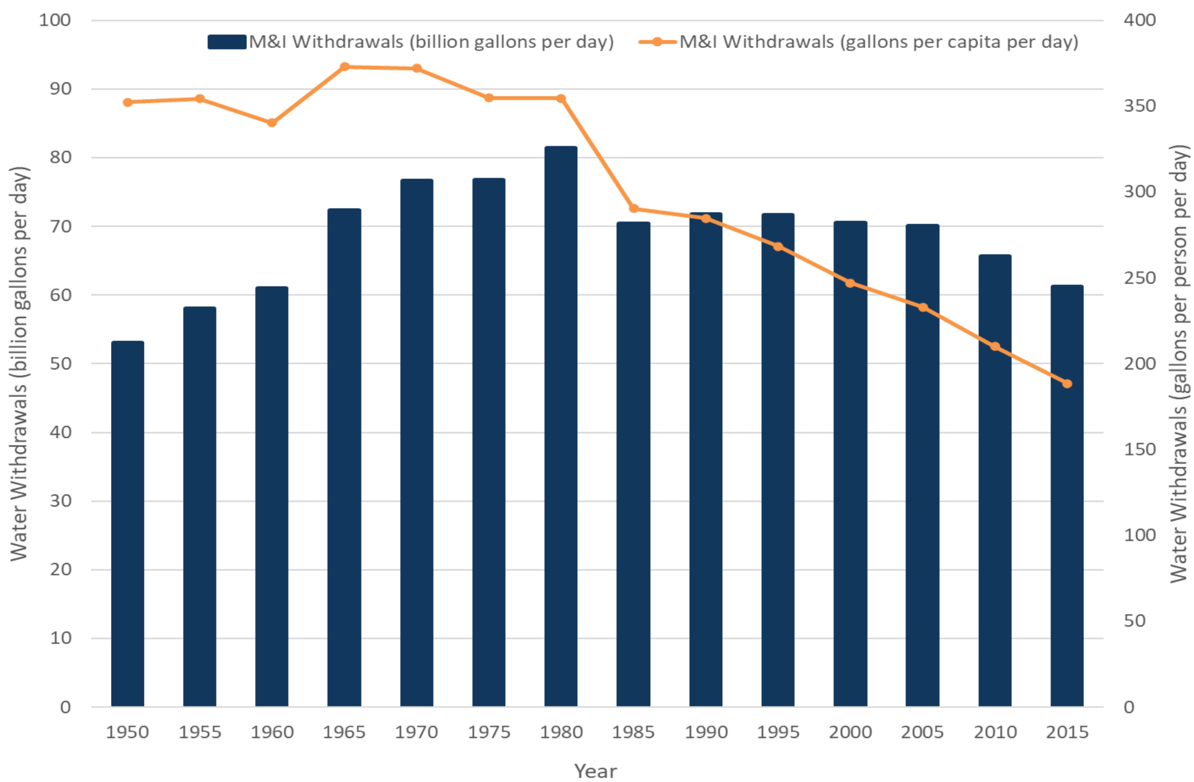
Introduction

During much of the 20th century, municipal and industrial water use in the United States increased as the population and economy grew. This trend suddenly reversed in the mid-1970s, when water use began to level off and then decline. Municipal and industrial water use peaked in 1980 at 81 billion gallons per day and has consistently declined since then, reaching a low of 61 billion gallons per day in 2015 (Figure 1), even as the population and economy continued to grow.[1] As a result, per capita water use has declined dramatically, from 373 gallons per person per day (gpcd) in 1965 to 183 gpcd in 2015, the most recent year for which national data are available. Water conservation and efficiency improvements were major drivers for the decoupling between water use and growth, along with a shift from manufacturing to a more service-oriented economy.

FIGURE 1. Municipal and Industrial Water Use Trends, 1950-2015



Note: Municipal and industrial water use includes public supply and self-supplied domestic, industrial, mining, and commercial use.
Data Source: Dieter et al. (2018)

This trend has been found in communities across the western United States. Cohen (2011) found that per capita water use in most midsize and large cities in the western United States declined by an average of 1% annually between 1990 and 2008. Similarly, in a more recent survey, Richter et al. (2020) found that nearly two-thirds of western US counties experiencing population growth reported reductions in

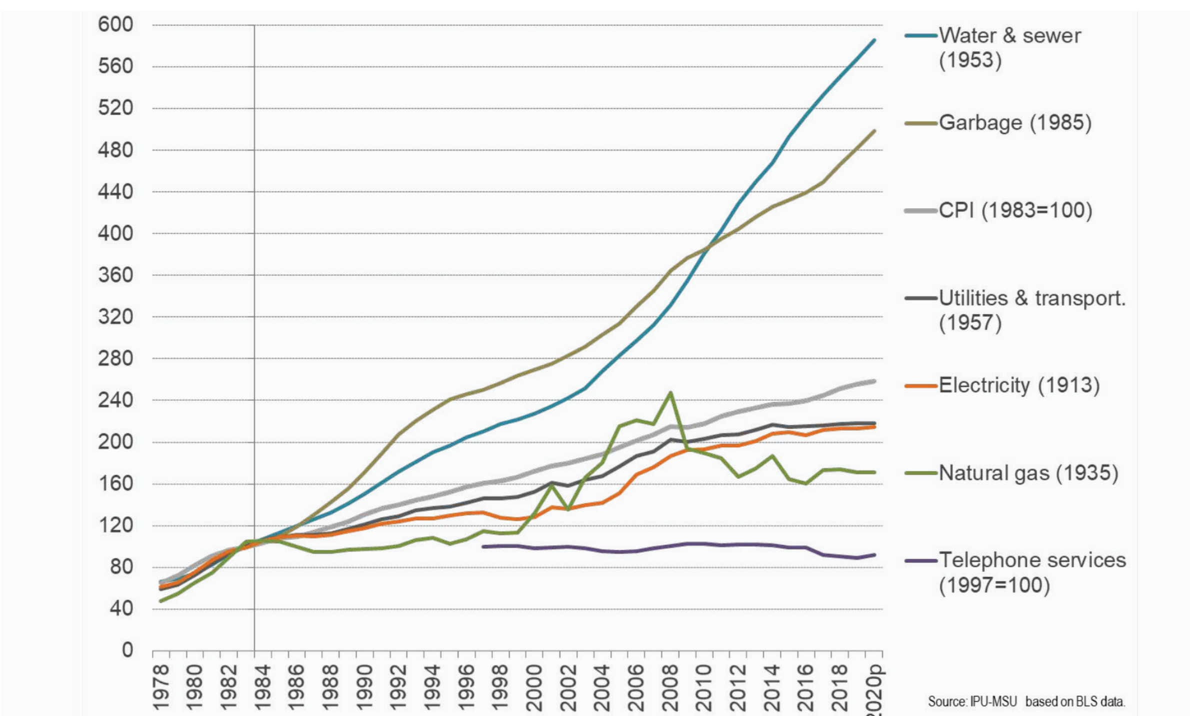
1 Municipal and industrial water use refers to water used in homes for both indoor and outdoor purposes, including cleaning, bathing, cooking, and sustaining gardens and landscapes, as well as commercial and industrial water used to produce the goods and services society desires. It also includes water used by institutions, such as schools, municipalities, prisons, and government agencies, and water losses due to system leakage, theft, and hydrant flushing.

municipal water use between 2000 and 2015. Among 20 cities in these counties for which sufficient data were available, population increased by an average of 21% between 2000 and 2015, while total water use decreased by 19%—largely due to reductions in per-capita residential water use.

These trends are likely to continue. Standards and codes have been major drivers for efficiency gains and will continue to drive reductions in per capita water use. California was one of the first states to adopt appliance standards, and the Energy Policy Act of 1992 established national standards for toilets, showerheads, faucets, and urinals. Today, at least eight states now have efficiency standards for water-using devices that exceed these national standards. Water savings from standards and codes (sometimes referred to as passive savings) are complemented by active savings provided by programs run by water utilities, including rebate programs, education and outreach, and conservation-oriented rate structures. Voluntary labeling programs like ENERGY STAR and WaterSense and certification programs like LEED or the Alliance for Water Stewardship also promote water efficiency improvements.

At the same time, water rates are rising faster than inflation and all other utility costs (Figure 2). Deferred maintenance, emerging contaminants, climate change, rising construction costs, and other factors are putting an upward pressure on water and wastewater costs. Yet, with the recent exception of the US Infrastructure Investment and Jobs Act, federal investments in water and wastewater have been declining, resulting in higher costs for ratepayers. These impacts are disproportionately felt by people with the lowest income, who have been spending a higher percentage of their income on water and wastewater bills than other income groups (Beecher 2021). These concerns have been intensified by the COVID-19 pandemic, and resulting economic recession and rising household debt (Congressional Research Service 2021).

FIGURE 2. Trends in the Consumer Price Index for Utilities



Data Source: Beecher 2021

This paper examines the relationship between water conservation and efficiency and affordability.[2] Specifically, it examines the near-term effect of water conservation and efficiency on utility bills, i.e., water, wastewater, and energy bills, for conserving households and the longer term effect on water and wastewater costs for the larger community. Finally, the paper identifies common barriers for low-income and other hard-to-reach customers to participate in conservation and efficiency programs, and proposes strategies to overcome those barriers.

This study finds that water conservation and efficiency improvements support efforts to improve water affordability for both conserving households and the larger community. Reductions in household water use provide an immediate reduction in water bills and, in some instances, wastewater and energy bills for the conserving household. With adequate planning, water conservation and efficiency can also help utilities avoid the need to build expensive new water and wastewater infrastructure, resulting in lower water and wastewater bills and connection fees for the larger community. Conserving households realize the largest benefits, and as a result, greater effort is needed to ensure that low-income and other hard-to-reach customers can participate in and benefit from utility conservation and efficiency programs.

Near-Term Effect of Water Conservation and Efficiency on Household Utility Bills

Water conservation and efficiency measures reduce household water use and, as a result, reduce water bills. In some instances, they also reduce wastewater and energy bills. Table 1 provides estimated water savings and utility bill savings for a typical household for several common water-efficiency measures. Water and wastewater rates represent national averages for 2021 based on a WaterSense analysis of data from rate surveys conducted by the American Water Works Association (US Environmental Protection Agency 2022). Electricity and natural gas rates were based on national averages from the US Energy Information Administration (2021) and US Energy Information Administration (2022a), respectively. To estimate energy bill savings, we assumed 65% of household water heaters were powered by natural gas and 35% by electricity based on US Energy Information Administration (2022b). It is important to note that utility bill savings in areas with higher utility rates will be even larger. For example, the average price for electricity in California exceeds $0.20 per kilowatt-hour (kWh), compared to just $0.13 per kWh for the national average.

For a typical home, estimated water bill savings range from nearly $16 per year for a WaterSense-labeled showerhead to more than $210 per year for replacing turf with low water-use plants.[3] Measures that reduce indoor water use, such as clothes washers, showerheads, and toilets, also reduce wastewater bills. Because wastewater rates are typically higher than that of water, wastewater bill savings are 22% greater than water bill savings.

2 Throughout this paper, water conservation and efficiency are defined as measures that reduce water use without affecting the services and benefits water provides, such as replacing old, inefficient devices with more efficient models and replacing lawns with climate-appropriate plants and improving irrigation efficiency. Some distributed water supply options, such as cisterns and greywater systems, have a similar effect on the amount of water purchased from a water supplier and, by extension, on water and wastewater costs, and the findings in this paper are also relevant for those measures.

3 Water savings for replacing turf grass with low water-use plants vary based on local climate; values here are based on estimated savings for Southern California (MWD 2022).

Some measures, such as showerheads and clothes washers, reduce hot water usage and the energy required to heat that water. For the measures evaluated, household energy bill savings are comparable to, and in some cases exceed, water and wastewater bill savings. For an ENERGY STAR clothes washer, for example, energy bill savings are similar to water bill savings but less than wastewater bill savings. But for WaterSense-labeled showerheads, energy bill savings exceed water and wastewater bill savings, i.e., $46 per year in energy bill savings compared to $35 in water and wastewater bill savings.

TABLE 1. Annual Water, Wastewater, and Energy Bill Savings Associated with Various Water Efficiency Measures

	High-Efficiency Toilet		High-Efficiency Showerhead	High-Efficiency Clothes Washer		Turf Replacement
	Low Estimate	High Estimate		Low Estimate	High Estimate	
Annual Water, Wastewater, and Energy Savings						
Water Savings (gallons/yr)	3,400	12,000	2,700	7,600	10,600	36,000
Wastewater Savings (gallons/yr)	3,400	12,000	2,700	7,600	10,600	-
Energy Savings (kWh/yr; therms/yr)	0	0	350 kWh; 18 therms	350 kWh; 25 therms	500 kWh; 35 therms	0
Annual Utility Bill Savings						
Water Bill ($/yr)	$19.89	$70.20	$15.80	$ 44.46	$62.01	$210.60
Wastewater Bill ($/yr)	$ 24.24	$85.56	$19.25	$ 54.19	$75.58	$-
Energy Bill ($/yr)	$-	$-	$29.57	$35.49	$50.05	$-
Total Utility Bill Savings ($/yr)	**$44.13**	**$155.76**	**$64.61**	**$134.14**	**$187.64**	**$210.60**

Notes: Water and energy savings for showerheads and clothes washers (high estimate) are based on the EPA WaterSense Calculator. Graham (2022) provided water savings estimates for high-efficiency toilets, clothes washers (low estimate), and turf replacement. Average water and wastewater rates are for 2020 and based on a WaterSense analysis of data from rate surveys conducted by the American Water Works Association (US Environmental Protection Agency 2022). Electricity and natural gas rates are based on national averages from the US Energy Information Administration (2021) and US Energy Information Administration (2022a), respectively. To estimate energy bill savings, we assumed 65% of household water heaters were powered by natural gas and 35% by electricity based on US Energy Information Administration (2022b) for the Pacific region.

In response to a sudden reduction in water use, such as occurs during a drought, utilities may increase water rates to cover their fixed costs. Conserving households are still likely to save money through lower utility bills (see Box 1). Moreover, water utilities can and sometimes do use financial reserves and other strategies to avoid rate increases during a drought or other sudden reductions in water use.

BOX 1. DROUGHT AND WATER COSTS

Most water utilities are public agencies that set rates to generate enough revenue to cover their costs. These costs have two major components: fixed and variable costs. Fixed costs do not vary according to the amount of water provided, such as payment of interest and principal on past infrastructure investments and insurance. Variable costs, by contrast, vary based on actual water use, such as purchasing water, electricity, and chemicals.

During a drought, there may be a sudden reduction in water use. All else being equal, this reduction in water use reduces variable costs but has no immediate effect on fixed costs.[4] For most water utilities, the larger component of those costs is fixed and, as water use declines, those fixed costs are spread over a smaller number of gallons sold, leading to a higher cost *per gallon of water*. But overall, reducing water use reduces the total cost to operate the water system, and the total of all customers' bills would be lower.

This can be confusing, so let's look at a simplified example. Utility A delivers 100 million gallons of water per month. The monthly cost to operate this system is $500,000, of which $400,000 are fixed costs and $100,000 are variable costs. The water rate is calculated by dividing the cost of the system by the water delivered. In this case, it is $500,000 divided by 100,000,000 gallons, or $5 per 1,000 gallons.

If demand goes down by 10%, then the fixed costs remain $400,000, while the variable costs decline by 10% to $90,000. The total cost is now $490,000. The new cost to produce water would then be $5.56 per 1,000 gallons ($490,000/90,000,000 gallons). Thus, while conserving water raised the cost per gallon of water, the total of customers' bills is lower, i.e., $490,000 compared to $500,000.

Importantly, water bill savings are not spread equally among all customers. Those who conserve the most have the greatest savings on their water bill and, depending on the type of water savings, may also have lower energy and/or wastewater bills. Non-conserving households, on the other hand, may have higher bills.

The above example is focused on the effect of reducing demand on utility costs during a drought. However, the reality is that other utility costs may go up during a drought. For example, water quality often worsens during a drought, which can increase water treatment costs. Utilities may also need to ramp up their efficiency programs or tap more expensive supplemental water supplies.

Raising rates to cover fixed costs during or immediately after a drought can result in significant customer backlash. Water utilities have several options for minimizing these impacts. Cash reserves, for example, are funds set aside that can be used to fund the operating and capital-related costs of a water and/or wastewater system. They can be used to cover revenue losses from lower-than-expected water sales. Additionally, drought surcharges, especially for high water-use customers, can increase revenue recovery while also sending a conservation signal to those customers.

4 All costs are variable in the long run, i.e., reductions in water use can avoid future infrastructure investments.

Longer Term Effect of Water Conservation and Efficiency on Community Water Costs

Water conservation and efficiency measures are typically less expensive than developing new water supply and treatment infrastructure, especially when evaluated from the combined perspective of the customer and the utility. As a result, investments in efficiency measures—rather than in new water supply and treatment facilities—reduce costs for ratepayers. Indeed, in the absence of conservation and efficiency improvements, customer bills and connection fees would be higher. Better water demand forecasting and planning are essential for realizing the cost savings of water conservation and efficiency improvements and avoiding stranded assets.

AVOIDED WATER AND WASTEWATER COSTS

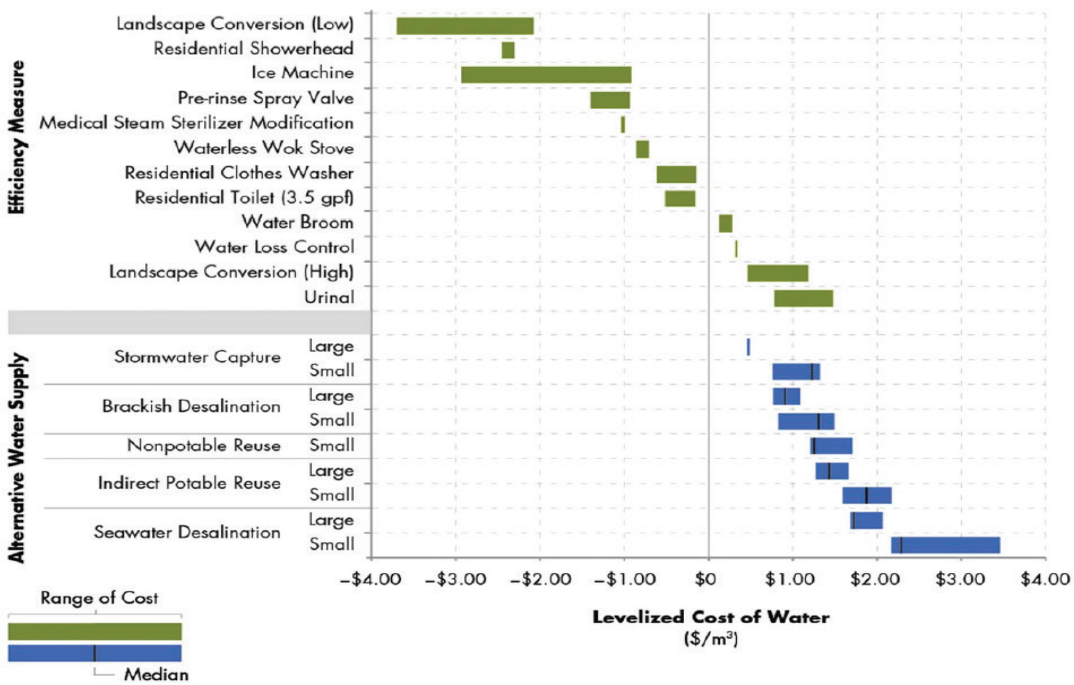
Studies show that urban water conservation and efficiency measures are among the most cost-effective ways to meet water needs. For example, using data from over 800 utilities in California, Georgia, Tennessee, and Texas, Rupiper et al. (2022) estimated that real water losses ranged from 10 to more than 250 gallons per connection per day. They found significant opportunities to save water through pressure reduction and leak detection and repair at a cost of $277 per acre-foot of water saved, far less than the cost of developing new water sources.[5]

Likewise, Cooley, Phurisamban, and Gleick (2019) compared the levelized cost of water—which accounts for the full capital and operating cost of a project or device over its useful life—for various water supply and efficiency options in California. The authors found that water conservation and efficiency was less expensive than other water supply options, including stormwater capture, recycled water, and brackish and seawater desalination (Figure 3). They also found that some efficiency measures have a "negative" cost. For these measures, reductions in operation and maintenance (O&M) expense that accrue over the lifetime of the device exceed the cost of the water efficiency investment.

This is especially true for efficiency measures that save customers energy but also for those that provide savings in labor, fertilizer or pesticide use, and reductions in wastewater treatment costs. For example, a high-efficiency clothes washer costs more than a less-efficient model; however, over its lifetime it uses less energy and produces less wastewater than inefficient models, thereby reducing household energy and wastewater bills. Over the estimated 14-year life of the device, the reductions in energy and wastewater bills are more than sufficient to offset the cost of the more efficient model, resulting in a negative cost of conserved water.

5 Real water losses refer to the physical losses of water through leaks.

FIGURE 3. Levelized Cost of Alternative Water Supplies and Efficiency Measures



Source: Cooley, Phurisamban, and Gleick (2019)

Because water conservation and efficiency are typically cheaper than other water supply options, investments in these measures reduce long-term costs for ratepayers. When evaluating the long-term effects of conservation and efficiency on water costs, the key question is: "what would be the cost of water and wastewater in the absence of conservation?" Economists typically answer this question using an avoided cost analysis. An avoided cost analysis begins with selecting a baseline year that represents the year prior to investments in efficiency. Then, a hypothetical non-conserving scenario is developed in which the current population is multiplied by per capita water use (and wastewater generated) in the baseline year. The difference between water use and wastewater production in the conserving and non-conserving scenarios represents the additional water and wastewater production needed in the absence of conservation. The capital and O&M for meeting the additional water and wastewater demands under the non-conserving scenario are then estimated.[6] Finally, the effects on customer bills and connection fees are determined.

Table 2 summarizes the results from avoided cost analyses for four water utilities in the western United States.[7] Each community experienced both population growth and reductions in per capita water use over the period examined. Because of the per capita water use reductions, each avoided significant capital and O&M costs. These studies found that, in the absence of efficiency, customer bills would have been 6.1% to 91% higher and connection fees about 80% higher.

6 Capital costs include, for example, new water resources, new wastewater capacity, water pumping and treatment capacity, wastewater conveyance and treatment capacity, and interest. Operating costs include operating costs for water and wastewater treatment facilities, including costs for commodities, vehicles, maintenance, replacement, staffing, chemicals, energy, and more.

7 Each of these studies used the same methodology to estimate avoided water and wastewater costs.

TABLE 2. Summary of Avoided Cost Estimates for Four Utilities in the Western United States

	City of Westminster (Feinglas, Gray, and Mayer 2013)		Tucson Water (Mayer 2017b)		Town of Gilbert (Mayer 2017a)		Los Angeles Department of Water and Power (Chesnutt, Pekelney, and Spacht 2018)	
Years Compared	1980	2010	1989	2015	1997	2015	1990	2016
Population	Not Reported		512,000	717,875	75,144	247,542	3,650,000	4,100,000
Water Use (gpcd)	180	149	188	130	244	173	180	110
Costs Avoided by Water Conservation and Efficiency Improvements								
Avoided Capital Costs	$591,850,000		$350,862,732		$340,807,075		$9,455,060,179	
Avoided Operations and Maintenance Costs	$1,238,000 per year		$29,387,158 per year		$3,671,346 per year		$1,600,448,745	
Bill Impacts without Conservation								
Additional Charges on Annual Customer Bills	$596		$133		$38		$13.48 per Hundred Cubic Feet	
% Increase in Customer Bills	91%		13.3%		6.1%		36.4%	
Additional Connection Fees	$16,952		Not Reported		$7,733		Not Reported	
% Increase in Connection Fees	80%		Not Reported		81.7%		Not Reported	

Notes: Water and wastewater costs are included for all agencies except the Los Angeles Department of Water and Power (LADWP). Avoided costs shown for Los Angeles are for water supply and do not include wastewater. Previous studies show that avoided costs for wastewater were at least as large as for water supply, suggesting that actual bill savings for water and wastewater would be at least twice as high as is shown in the table. LADWP uses an increasing tiered billing structure, and the estimate provided for additional charges on customer bills is for the Tier 4 billing rate.

For example, in Gilbert, Arizona—the smallest of the communities evaluated—water conservation and efficiency reduced water use from 244 gpcd to 173 gpcd and wastewater discharge from 72 gpcd to 57 gpcd between 1997 and 2015. Mayer (2017b) estimated that these reductions avoided $341 million in capital costs for water and wastewater infrastructure and an additional $3.67 million per year in operating costs. In the absence of efficiency, combined water and wastewater bills would have been 6.1% higher ($657 compared to $619 per year) and connection fees 82% higher ($17,000 compared to $9,500).

In Los Angeles—the largest of the communities evaluated—per capita water use averaged 180 gpcd prior to the 1990s. After 1990, however, per capita water use steadily declined, reaching about 110 gpcd in 2016. Chestnutt et al. (2018) found that reductions in per capita water use allowed the City of Los Angeles to avoid additional water supply, water treatment, and pumping costs totaling more than $11 billion between 1990 and 2016. In the absence of water conservation and efficiency, customer water bills would have been more than 36% higher. Water conservation and efficiency also avoided wastewater costs and paying for these costs would have increased customer bills even more.

The water and wastewater costs avoided by water conservation and efficiency can vary dramatically from community to community. Moreover, they are likely to increase over time due to rising construction costs and growing water scarcity. As a result, water managers should evaluate avoided costs for their utility and update those evaluations periodically.

REALIZING AVOIDED COST BENEFITS

Water conservation and efficiency can provide significant capital and O&M cost savings for water and wastewater. These savings, however, can only be realized if water and wastewater utilities effectively integrate water conservation and efficiency improvements into their long-range planning and avoid unnecessary investments in expensive new capital projects. Yet, studies show that water demand forecasts routinely overestimate future water demand due, in part, to failures to adequately account for future water conservation and efficiency improvements that are driving reductions in per capita water use (Diringer et al. 2018).

For example, Abraham, Diringer, and Cooley (2020) evaluated long-range demand forecasts developed by the 10 largest water suppliers in California from 2000 to 2015. The authors found that all water suppliers projected increases in future water demand.[8] However, data for this period showed that total water use declined for all but one water supplier. For the water supplier that experienced an increase in demand, actual demand was about one-third less than projected. Likewise, in a review of global water demand forecasts, Gleick and Cooley (2021) found that the growth in global water demand has been far less than projected.

When water demand forecasts exceed actual water use, utilities can face unnecessary capital and operating costs associated with developing and operating new water supply and treatment systems. These costs are then passed to consumers in the form of higher water bills and connection fees. Greater effort is needed to improve the accuracy of long-range demand forecasts, particularly related to integrating conservation and efficiency standards, codes, and trends into forecasts (Diringer et al. 2018; Abraham, Diringer, and Cooley 2020).

Making Water Conservation and Efficiency Programs Accessible to All

Water conservation and efficiency reduces water and wastewater costs by avoiding expensive new infrastructure and ongoing maintenance costs. The greatest cost savings are provided to those households that conserve water (Beecher, Chesnutt, and Pekelney 2000). Yet, studies show that customers and households from lower income brackets and other hard-to-reach groups, such as renters, are less likely to participate in conservation and efficiency programs (Pierce, El-Khattabi, et al. 2021; Clements et al. 2017). This section outlines several barriers to participation in water conservation and efficiency programs for low-income households, renters, and those in multi-family housing, and provides examples of existing programs from around the country that have been designed and implemented to help overcome those barriers.

8 The authors assessed urban water management plans from 2000, 2005, 2010, and 2015. These water management plans projected demand for the following time periods: 2005-2020, 2010-2030, 2015-2035, and 2020-2040.

REDUCING UP-FRONT COSTS

A key barrier for participation in utility-sponsored efficiency programs is that many are structured as rebates that require participants to pay the up-front cost before receiving monetary compensation, which can take several months. These programs are cost-prohibitive for households with lower incomes that cannot afford the up-front investment (Clements et al. 2017; Pierce, Rachid El-Khattabi, et al. 2021). Several alternatives are available for making efficiency programs more accessible for low-income households. Utilities can, for example, partner with retailers to provide vouchers for discounts on water efficient devices upon sale, rather than on a reimbursement basis. Vouchers have been used for many years by water utilities across the country to incentivize water conservation and efficiency measures. To ensure that lower income households know about this opportunity, it is important to use targeted marketing and outreach to income-qualified households.

Another approach is to offer fixtures and appliances at no cost for qualified households through device give aways or direct-install programs. For example, Seattle Public Utilities offers a free toilet, installation, and disposal of the old toilet to income-qualified homeowners (Seattle Public Utilities n.d.). California's Long Beach Water is piloting a direct install program for sustainable landscapes to homeowners living within low-income designated census tracts (Long Beach Water 2022). The program is operated in partnership with two local nonprofit organizations, one of which provides maintenance for the garden for the first year after installation. This second example offers an important consideration for program design for low-income households: funds may need to be allocated to provide customers with follow-up services for these new devices or landscapes. Partnering with organizations already providing these services, including through energy efficiency and weatherization programs, can help to reduce the cost to the water utility of offering these programs.

Household water audits that incorporate leak repair can also help low-income households save water and reduce their water bills. As one example, the City of Dallas offers a free Minor Leak Repair Program to low-income customers that own a home (Dallas Water Utilities 2022). Repairs cover leaking faucets, hose bib leaks, easily accessible pipe joint leaks, and replacements for faucets, showerheads, and up to two toilets. The City of Westminster, Colorado has a similar program but a unique approach to identifying potential program participants. City staff create a list of income-qualified customers with potential leaks to share with a regional housing authority partner, who then contacts the customers and hires plumbers to fix the leaks. The housing partner is reimbursed up to $3,000 per home (EPA WaterSense 2021; Westminster Colorado 2022).

ENSURING COST SAVINGS PROVIDE BENEFITS TO CUSTOMERS WHO NEED IT MOST

Those with lower incomes are more likely to rent and/or live in multi-family housing, and often pay for their water indirectly through their rent (Hynek, Levy, and Smith 2012; Pierce et al. 2020). As a result, these customers may not receive the direct monetary benefits of conservation and efficiency programs (Mee et al. 2014),[9] but monetary savings from these programs can still be meaningful. For example, in Florida, Holt et al. (2015) found that combined water and energy efficiency programs could save $806 per year per housing unit, based on Florida energy, water, and wastewater rates. The challenge

9 There are multiple challenges to delivering utility programs to indirect customers, such as lack of direct contact with occupants of rental homes, lack of incentive to pursue conservation and efficiency by landlords due to payment coverage by renters, and others.

is figuring out how to pass on these benefits to the people living in these households, especially when they are indirectly paying their utility costs through rent.

In cases where utility bills are a large proportion of the cost of maintaining multi-family housing, reducing water usage could contribute to keeping rental rates low. In New York City, for example, the Department of Environmental Protection has water conservation and efficiency as an eligibility criterion for receiving the Multi-Family Water Assistance Program credit (NYC Department of Environmental Protection 2022). Housing projects must prove, among other requirements, that the average rent is affordable to households earning up to 60% of Area Medium Income, the property has been part of certified affordable housing efforts for a minimum of 15 years, all buildings have automated meters, and high-efficiency fixtures are installed in at least 70% of units. These requirements incentivize efficiency improvements and long-term affordable housing in New York.

OVERCOMING CULTURAL AND TRUST BARRIERS

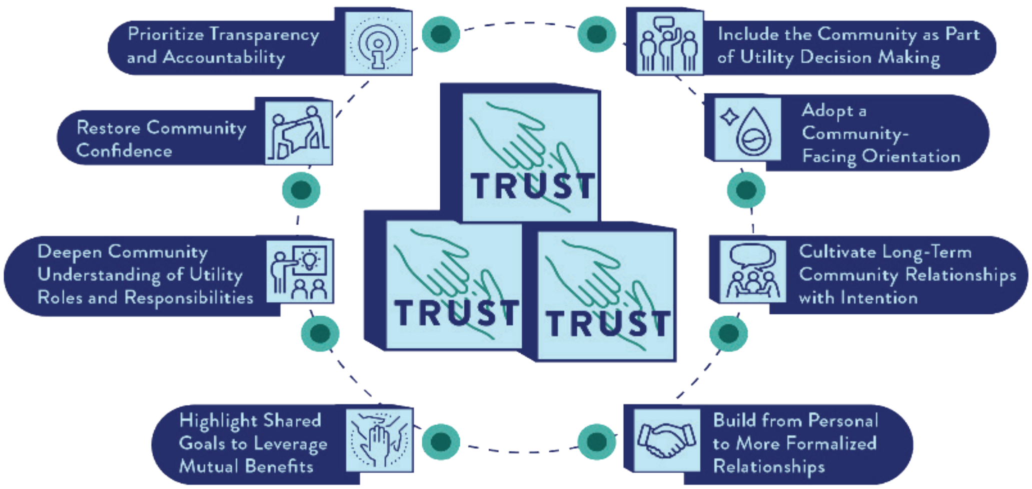
Cultural and trust barriers can limit participation in utility-sponsored efficiency programs. Research and case examples have shown that partnering with community-based organizations and other third parties offer trust-building opportunities and improve customer communication and recruitment (e.g., EPA WaterSense 2021; River Network and WaterNow Alliance 2021). Third parties may also be better positioned to implement programs, provide customer service, and evaluate the impact of the program than utilities themselves. If already delivering in-home services, such as energy efficiency upgrades or general repair services, these groups can more easily add water efficiency measures, reducing time burdens for the customer and the utility.

As one example, Colorado's Mile High Youth Corps provide water and energy fixture retrofits that can save households an average of $250 pear year on utility bills (Mile High Youth Corps 2022). The program is funded by a variety of federal, state, and private organizations and grants, but importantly, includes water utilities whose service areas overlap with the program. It also serves rural areas where most small water utilities lack capacity to offer water conservation and efficiency programs. The program also provides career training opportunities that help youth gain skills necessary for work in the construction, conservation, and healthcare fields.

In Portland, Oregon, the Water Bureau offers an income-qualified leak repair program through a partnership with Multnomah County, the African American Alliance for Homeownership, and Community Energy Project (EPA WaterSense 2021). The Water Bureau prioritizes historically underserved customers identified by assessing, for example, neighborhood income, race, and household income (EPA WaterSense 2021).The partners also support program marketing and outreach, helping to reach households that might not have heard of the program.

There are additional components and tools for building trust and addressing any cultural barriers. The River Network and WaterNow Alliance (2021) explored key components of successful partnerships between utilities and community-based organizations to address conservation, affordability, and other water-related issues, and identified eight best practices (Figure 4). Using these as a guidepost, water providers can expect to achieve more equitable outcomes and build public support for water investments in their communities.

FIGURE 4. Foundations of Trust: Eight Foundational Best Practices and Building Blocks



Source: Reproduced with permission from River Network and WaterNow Alliance (2021).

Conclusions and Recommendations

The uptake of water-efficient appliances and fixtures and installation of low water-use landscapes have been tremendously effective in reducing per capita water use in communities across the United States. Water efficiency measures inside and outside the home can dramatically reduce household water use, reducing water bills and potentially wastewater and energy bills.

Additionally, water conservation and efficiency avoid the need to build, operate, and maintain costly new water and wastewater infrastructure to accommodate population and economic growth. This can represent a tremendous cost savings, especially in areas with limited and increasingly expensive sources of new supply. To realize these avoided cost benefits, water suppliers must improve the accuracy of their long-range water demand forecasts. Water suppliers routinely overestimate future water demand because they fail to adequately capture water efficiency improvements. This can lead to unnecessary and costly new water and wastewater infrastructure. It is not water conservation and efficiency that lead to higher water costs, but the failure to adequately plan for it.

Finally, while water conservation and efficiency help to reduce water and wastewater costs for all customers, those that receive the greatest benefits are those able to conserve. To date, the design and implementation of efficiency programs are typically not accessible to low-income households, renters, and those living in multi-family housing. Greater effort is needed to ensure that water conservation and efficiency programs are accessible to these groups; a growing number of examples of efficiency programs designed to address affordability demonstrate that this can be done.

We offer the following recommendations:

Improve communications and outreach about the avoided costs of water conservation and efficiency improvements.

Avoided costs can be difficult for many people to understand because it requires evaluating what didn't happen. Several recent studies sponsored by the Alliance for Water Efficiency, however, have used avoided cost analyses to powerfully and effectively communicate the costs avoided by water conservation and efficiency improvements. Water suppliers should develop and periodically update avoided cost analyses, including for water and wastewater, and share this information with ratepayers and elected officials. This will help to increase customer and decision-maker support for conservation and efficiency investments and programs.

Increase investment in water conservation and efficiency improvements.

Water conservation and efficiency are typically the least expensive sources of new water, and can help to improve community water affordability. Yet, investments in water conservation and efficiency are far less than investments in other water sources. Federal, state, and local governments should increase investments in water conservation and efficiency to levels commensurate with other water supply options.

Improve demand forecasting to avoid stranded assets.

Water conservation and efficiency can avoid expensive new supply and treatment infrastructure, providing significant cost savings. Accurate demand forecasts are essential for fully realizing those benefits. Yet, water suppliers routinely overestimate demand, forecasting that water demand will increase when it remains unchanged or even declines. Forecasters should regularly examine water-use trends, assumptions within their models, and the accuracy of past projections, and adjust their models as needed. State agencies should also convene stakeholders to develop standards and guidelines for improving the accuracy of urban water demand forecasts.

Target and design water conservation and efficiency to ensure program offerings are accessible to customers in lower household income tiers.

Water conservation and efficiency programs have not always been designed with accessibility in mind, presenting barriers for lower income households by necessitating up-front spending or by lacking mechanisms to ensure cost savings are delivered to indirect utility customers, such as renters. They can also fail to find uptake in communities with lower socioeconomic standing due to cultural and trust barriers. To overcome these barriers, water providers can offer free efficiency devices and leak detection services to income-qualified households, particularly via direct install programs. Intentional program design that supports keeping rental units affordable and/or offers mechanisms to deliver cost savings from conservation measures to tenants is also key. Finally, building trust and overcoming cultural divides take time, but partnerships with community-based organizations has proven to help many utilities make improvements in this arena as well.

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