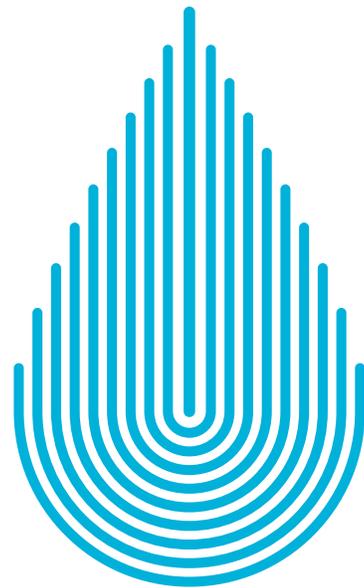




Water Ripples:

EXPANDING RISKS FOR U.S. WATER PROVIDERS

A Ceres Report
December 2012



Authored by
Sharlene Leurig, Ceres



ABOUT CERES

Ceres is a nonprofit organization advocating for sustainability leadership. It mobilizes a powerful network of investors, companies and public interest groups to accelerate and expand the adoption of sustainable business practices and solutions to build a healthy global economy. Ceres also directs the Investor Network on Climate Risk (INCR), a network of 100 institutional investors with collective assets totaling more than \$10 trillion.

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FOR MORE INFORMATION, CONTACT:

Sharlene Leurig

Senior Manager

Water Program

Ceres

99 Chauncy Street

Boston, MA 02111

leurig@ceres.org

www.ceres.org



Executive Summary

This report is a follow-up to *The Ripple Effect: Water Risk in the Municipal Bond Market*, published by Ceres and Water Asset Management two years ago. *The Ripple Effect* examined hidden risks facing investors who buy the municipal bonds that finance much of the country's vast water infrastructure.

For decades water utility bonds have been considered among the safest possible investments, an assessment that rested on two flawed assumptions: that fresh water supplies would always be plentiful and that demand for water would always increase. Neither investors, credit rating agencies nor the utilities themselves fully questioned these assumptions.

The Ripple Effect proved controversial at the time, but in the two years since it was published we have seen mounting evidence of the risks facing water utilities and their investors, as well as some encouraging actions by bond market participants.

- **Water stress has continued to intensify.** Back-to-back droughts in 2011 and 2012 brought increased attention to the vulnerability of the nation's water supplies, especially as the impacts of climate change grow. Though the droughts caused billions in economic losses, most water providers were able to meet demand. Hard-hit Texas was a different story: cities with strong water efficiency programs already in place saw supplies and revenues from water sales remain stable; those that did not, such as Midland, Texas, saw both their reservoirs and their credit ratings drop. Water supply security continues to challenge much of the West, and is forcing states such as Nevada, Utah and Colorado to consider hugely expensive pipeline projects to tap new water sources.
- **The market is beginning to change the way it prices water risks.** For years, investors financing public water systems viewed the sector as low risk an investment as you could find. But that perspective is changing. Since the market crash, more water systems have had their credit ratings downgraded than ever before. The economic downturn brought with it a significant drop in water demand as foreclosed homes went vacant and connections for new homes plummeted. Water revenues went down, but the obligation to repay the investors who bought bonds to finance new water projects did not. Consequently, credit rating agencies have begun boosting their focus on these growing risks. Fitch Ratings and Standard & Poor's released a number of special reports highlighting water availability constraints. In contrast, the largest of the credit rating agencies, Moody's, has neither upgraded its credit rating methodology for the water sector since 1999 nor issued special reports of relevance to the water sector.

→ **Declining revenue and rising costs are exacerbating water supply challenges.**

Credit risks associated with water providers are being heightened by four factors: growing needs for new investment to shore up old or failing infrastructure; a dearth of federal funding to support such projects; slow economic growth; and—most surprisingly—a pervasive trend of declining municipal water demand across the U.S. Together, these four factors have created a widening imbalance between borrowing costs for utilities and the revenue needed to cover those costs. Reduced water demand is desirable, but for utilities dependent on volume-based sales it often leads to rate increases, which in turn can further depress demand—a vicious cycle that is neither financially nor politically tenable for utilities.

→ **Projecting future water demand is a highly uncertain proposition.** Building costly infrastructure—such as water pipelines like those currently proposed in Nevada, Utah and Colorado—to meet future demand that doesn't materialize could cost ratepayers and investors billions. And while investments in water efficiency and demand management may reduce the need for costly investments in new infrastructure, the urgent need to maintain and repair existing infrastructure will likely drive higher rates for customers regardless. In short, water is going to cost more: the only question is, *how much more?*

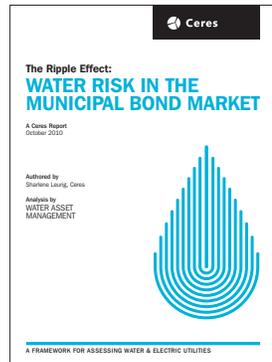
Since the publication of *The Ripple Effect* we have seen encouraging progress by investors, credit rating agencies and water utilities to address these issues, but much more remains to be done. Key focus areas should include:

- ✔ **Not waiting for a dry spell to manage water demand.** Conservation measures, such as lawn watering limits and tiered pricing must be done on an ongoing basis, not simply when drought hits, if water utilities are to protect their financial viability and keep costs to consumers stable over the long-term.
- ✔ **Questioning water demand projections.** Water use is changing and investors, credit rating agencies and policymakers should approach water systems' demand projections with a healthy dose of skepticism.
- ✔ **Boosting understanding of how water rate structures influence demand.** Investors and credit rating agencies should seek more information on the ways water rate structures influence demand and affect the stability of long-term revenue streams.
- ✔ **Building political support for sustainable water rates.** Environmental and consumer advocates should take a far more active role in building political support for sustainable water rates by making the case that it helps consumers ensure long-term future water security and affordability.

Ceres will continue to work closely with water utilities and bond market participants to elevate these issues. Our work will continue to evolve around three key pillars: 1) increasing market transparency and achieving better disclosure by water utilities about how they assess and manage these risks; 2) helping water utilities and investors better value and price water so that water supplies and required revenue streams are sustainable; and 3) leveraging the capital markets to finance water efficiency across municipal, industrial and agricultural sectors.



Introduction



Two years ago Ceres published *The Ripple Effect: Water Risk in the Municipal Bond Market*, a look at how water stress in the United States creates hidden financial risk for investors who buy the water utility bonds that finance much of the country's vast water infrastructure.

Public water utilities deliver more than 80 percent of the nation's water to residential and industrial consumers and issue billions of dollars worth of bonds each year to fund water infrastructure projects and ensure continued water delivery.

We found that few participants in the bond market—including investors, credit rating agencies, and the utilities themselves—were accounting for growing water scarcity, legal conflicts and other threats in their analyses. Some were even inadvertently encouraging risk by rewarding pricing and infrastructure plans that increased water use despite near-term supply constraints. In short, by overlooking these factors, market participants were allowing water risks to grow—and remain hidden—in the bond market.

The implications of water risk for water providers extend far beyond the bond market—water is one of the most fundamental inputs to our economy. And so it's no surprise that the report received significant attention from the water systems whose risks we evaluated, or by investors and policymakers concerned about the ways water stress could translate into investment and economic losses.

Not all of the attention *The Ripple Effect* received was positive, and there was a fair degree of skepticism from the utilities and credit rating agencies highlighted in the report. But behind closed doors, in conversations with bond issuers, underwriters, bond counsel, rating agencies and bond buyers, we heard that the questions we raised were on the minds of many people in the water sector, and that it was high time for everyone involved in financing water systems to answer them.

So what has happened since the report was released in fall 2010?



The market is changing the way it prices water risks

For years, investors financing public water systems viewed the sector as low risk an investment as you could find. Water is an “essential service” and water systems are nearly always monopolies. Short of the costs of regulatory compliance, investors assumed there was little risk. But the economic downturn left no asset untouched, including the water sector. Since the market crash, more water systems have had their credit ratings downgraded than ever before as industrial customers closed up shop, housing declines ate into lucrative connection fees and foreclosed homes went with lawns unwatered.

Water sales and connection funds declined, but the obligation to repay the investors who had financed infrastructure improvements did not. Investors took note. Over the last two years:

→ **Credit rating agencies have started building water conservation, pricing and supply risks into their sector analyses more transparently.**

Fitch Ratings and Standard & Poor’s in particular have released a number of special reports on the water sector over the past two years, highlighting supply trends, water conservation, and challenges to infrastructure financing. These special reports help investors gain a broader view of trends that are likely to shape credit health in the coming years. In contrast, the largest of the credit rating agencies, Moody’s, has neither updated its credit rating methodology for the water sector since 1999 nor issued special reports of relevance to the water sector.

S&P and Fitch have taken care to share their view on supply vulnerability, and are even commenting increasingly on the role of water conservation in drought planning. However, they do not yet help to differentiate systems that have invested meaningfully in managing water demand or that have designed rate structures that are more resilient to declines in water use. Yet demand management and revenue stability are two of the most important factors shaping credit health in the sector.

But in the end, a credit opinion is only meant to survey the landscape for the next few years—as the average holding period of a water-related bond for institutional investors is around eight years, the importance of freestanding credit analysis is evident.

→ **Investors have started to question whether *all* water is really essential.**

On average, nearly a third of the water used by American households goes to outdoor irrigation, otherwise known as watering lawns.¹ In some places, that percentage of total water use is as high as 50-80 percent.² As noted by both Fitch Ratings and Standard & Poor’s, water systems’ dependence on sales for discretionary purposes is a vulnerability when customers decide to cut back or are forced to by severe drought restrictions.

→ **Investors are supplementing credit opinions with their own analysis of water sufficiency.**

Fixed income investment managers like Breckinridge Capital Advisors are among the investors developing their own approaches to assessing the sustainability of water utility systems. Development of proprietary water risk frameworks can be expected to proliferate as products like Bloomberg New Energy

Demand management and revenue stability are two of the most important factors shaping credit health in the sector.

1 S&P Credit Research, “Dry As A Bone: The Drought Spurs Municipally-Owned Utilities To Rethink Their Long-Term Plans And Funding,” *Alcra Store*, August 29, 2012, http://www.alcrastore.com/research/s-and-p-credit-research-Dry_As_A_Bone_The_Drought_Spurs_Municipally_Owned_Utilities_To_Rethink_Their_Long_Term_Plans_And_Funding-1007197.

2 Fitch Research, “The Texas Drought: Quenching the Thirst,” *Alcra Store*, July 11, 2012, http://www.alcrastore.com/research/fitch-ratings-The_Texas_Drought_Quenching_the_Thirst-682609_report_frame.

Finance's Water Insight Service give investors access to data that will shape future sector performance, including water supply, pricing and regulation. Water providers cannot ignore this trend, as investor opinion can lead the cost of going to market to diverge significantly from the cost of capital that a credit rating may imply.

The ability of investors to shape their own view of water risks is an important factor in a market that efficiently communicates risk through pricing. But for systems seen as having outsized risk, the outcome can be sobering. Already, some investors predicate buy decisions on water availability, and in some cases simply do not buy in regions where the risk is viewed as being excessive or uncompensated. Recent regulatory filings by insurance companies—large investors in municipal bonds—describe such geographic screens:

“For municipal bond investments, the ability of the bond issuer (i.e. municipality) to repay debt is largely influenced by the health of its local economy and stability of its population (tax) base. Climate-change issues ranging from water scarcity in the Southwest to coastal migration in Florida are considered when evaluating potential investments.” —Nationwide Mutual Insurance Company³

“Since we assume catastrophe risks such as earthquake and windstorms in our capacity as an insurer, we also seek to manage our portfolio's credit risk to such events by assessing our investment exposures in impacted geographic areas. In addition, for municipal bond issuers in the Southwestern U.S and other areas of the country susceptible to drought, all investment analyses include an assessment of water supply adequacy.” —The Travelers Group⁴

In this environment, it is all the more important that risk assessments are designed to measure the metrics that matter, and reward sustainable water management no matter where the water is being used.



Water stress continues to intensify

THOUGH THE DROUGHTS OF 2011-2012 DEALT A HARSH BLOW TO THE U.S. ECONOMY, MOST WATER PROVIDERS ESCAPED UNSCATHED.

Over the past two years, drought hit the United States hard, causing tens of billions of dollars in economic damages in the form of failed crops, damaged infrastructure, crippled tax revenues and lost electric power and water sales. As of August 2012, much of California, all of Illinois and nearly all the land stretching from the Rocky Mountains to the Mississippi River Basin were in extreme drought condition.⁵ Few Americans have been left untouched by the country's water shortages, which elevated prices for both food and gasoline,⁶ into which half of the nation's corn crop now goes in the form of ethanol.⁷

Although images of parched and desiccated crops have blanketed the national media, drought has not devastated water providers, most of which entered the drought with

3 Nationwide Mutual Insurance Company. “Insurer Climate Risk Disclosure Survey Questions.” *Nationwide General Insurance Company*. 2011. California Dept. of Insurance, Climate Risk Survey Search Database (23760.NY.AN.2011.0204.pdf).

4 The Travelers Group. “Insurer Climate Risk Survey for Reporting Year 2011.” *The Travelers Institute*. February 2012. California Dept. of Insurance, Climate Risk Survey Search Database (36137.CA.AN.2011.0204.pdf).

5 S&P Credit Research, “Dry As A Bone: The Drought Spurs Municipally-Owned Utilities To Rethink Their Long-Term Plans And Funding,” *Alcra Store*, August 29, 2012, http://www.alacrastore.com/research/s-and-p-credit-research-Dry_As_A_Bone_The_Drought_Spurs_Municipally_Owned_Utilities_To_Rethink_Their_Long_Term_Plans_And_Funding-1007197.

6 Steven C. Johnson, “Ethanol Production Slows From Drought, Pushes Gas Prices Higher,” *Huffington Post*, August 13, 2012, http://www.huffingtonpost.com/2012/08/13/ethanol-production-slows-drought-pushes-gas-prices-higher_n_1772104.html.

7 John H. Cushman, Jr, “In Drought, a Debate Over Quota for Ethanol,” *New York Times*, August 16, 2012, <http://www.nytimes.com/2012/08/17/business/energy-environment/ethanol-quota-debated-by-corn-farmers-and-meat-industry.html>.

Demand management is a strategy robust to both short-term drought pressures and long-term supply shortages, as borne out by the 2011 drought. When the dust settled, it was the cities with the strongest conservation programs that emerged none the worse for wear.¹¹

enough water supplies to meet customer demand. The notable exception is Texas, where the 2011-2012 drought plunged more than 90 percent of the state into “extreme” or “exceptional” drought. Worst hit were small communities with limited water supplies—the *Texas Tribune* recently estimated that more than 20 communities were 180 days or less from running out of water⁸—though larger cities in the Panhandle and far West Texas were far from spared. Though the worst days of the drought have passed, the city of Lubbock’s vulnerability is still starkly apparent. Two of the lakes feeding Lubbock are below 30 percent capacity and its historic primary reservoir is now at zero percent capacity.⁹

But while most systems in the state had to curtail water deliveries to customers to protect critical water supplies, few saw their sales reductions translate into credit deterioration.¹⁰ The reasons why vary: for systems that began the drought with excess supply, emergency conservation rationing was limited enough to prevent significant revenue shortfalls, while in areas with groundwater supplies, increased pumping of those resources were enough to meet customer demand. In the long-term these strategies are not adaptive to more persistent droughts or supply shortages. Demand management, on the other hand, is a strategy robust to both short-term drought pressures and long-term supply shortages, as borne out by the 2011 drought. When the dust settled, it was the cities with the strongest conservation programs that emerged none the worse for wear.¹¹ As noted by Standard & Poor’s, the credit impact of drought depends a good deal on how central demand management is to a water system before the drought ever starts.

In its report *Dry as a Bone*, S&P offers in counterpoint two Texas cities: Midland and San Antonio. San Antonio Water System has been investing in water efficiency programs for years and has cut water use citywide by a billion gallons a year. During the recent drought, San Antonio’s supplies and revenue remained relatively stable. In contrast, Midland, which had virtually no conservation programs in place, saw two of its three reservoirs decline to below one percent capacity. Its third is on track to reach that level by early 2013. Midland will soon begin construction of a treatment plant that will turn wastewater into drinking water supplies, a project that will be costlier for city residents now that Moody’s has downgraded the city’s water enterprise to Aa2, citing reduced revenue from water sales and uncertain supply recovery.¹²

DROUGHT ASIDE, SUPPLY SECURITY REMAINS A MAJOR SOURCE OF RISK FOR SYSTEMS SERVING SOME OF THE MOST POPULOUS AREAS OF THE UNITED STATES.

While the reasons depend on the place, the bottom line is that some of the most important water supplies in the country are:

→ **Over-allocated:** The most notable example is the Colorado River, which supplies water to more than 35 million Americans. Recent studies indicate the typical amount of water available in the basin may be nearly 20 percent less than when water rights

8 Ryan Murphy and Kate Galbraith, “Interactive Map: Public Water System Shortages,” *Texas Tribune*, September 6, 2012, <http://www.texastribune.org/library/data/public-water-system-shortages/>.

9 Adam D. Young, “Drought taxing area lakes, Water Advisory Commission to discuss strategic supply plan,” *Lubbock Avalanche Journal*, August 15, 2012, http://lubbockonline.com/local-news/2012-08-15/drought-taxing-area-lakes-water-advisory-commission-discuss-strategic-supply#.UGzJk_k-uvU.

10 Fitch Research, “The Texas Drought: Quenching the Thirst,” *Alcra Store*, July 11, 2012, http://www.alcrastore.com/research/fitch-ratings-The_Texas_Drought_Quenching_the_Thirst-682609_report_frame.

11 S&P Credit Research, “Dry As A Bone: The Drought Spurs Municipally-Owned Utilities To Rethink Their Long-Term Plans And Funding,” *Alcra Store*, August 29, 2012, http://www.alcrastore.com/research/s-and-p-credit-research-Dry_As_A_Bone_The_Drought_Spurs_Municipally_Owned_Utilities_To_Rethink_Their_Long_Term_Plans_And_Funding-1007197.

12 Global Credit Research, “Downgrade to Aa3 and assignment of negative outlook affects \$10.9 million in outstanding revenue bond debt,” *Moody’s Investors Service*, August 31, 2012, http://www.moody.com/research/Moodys-downgrades-to-Aa3-from-Aa2-the-revenue-rating-on—PR_254380.

Recent studies indicate the typical amount of water available in the basin may be nearly 20 percent less than when water rights were allocated in 1922 among the seven states entitled to Colorado River water.

were allocated in 1922 among the seven states entitled to Colorado River water. To make matters more complicated, the most senior water rights in the system tend to be held by agricultural users, leaving fast-growing cities reaching for extraordinarily expensive supplies. While pressure on the river from fast-growing populations may have eased somewhat during the housing downturn, the long-term divergence between reliable supply and demand remains a critical economic challenge for the region. And the escalating cost of tapping new supplies brings its own economic repercussions: Colorado Springs' water provider was placed on watch for a possible downgrade by Moody's in March 2012 in light of slow economic recovery and a nearly \$1.5 billion capital program to build the Southern Delivery System, which will pipe water from the Arkansas River, a tributary of the Mississippi River, when it is completed in 2016.¹³ Similarly, the Las Vegas Valley Water District saw nearly \$2 billion of debt downgraded as declining water sales followed on the heels of emergency supply expenditures to construct a new water intake pipe from Lake Mead.¹⁴

→ **Contested:** Many water systems have not been formally adjudicated, meaning that although users may depend on them they have ill-defined legal standing to protect their use. One such system is the Apalachicola-Chattahoochee-Flint (ACF) River Basin, over which Alabama, Florida and Georgia have been locked in legal battle for two decades. At the center of the dispute is Lake Lanier, the city of Atlanta's primary drinking water supply. Until a federal ruling last spring, the city was at risk of losing up to 40 percent of its supply to downstream users.¹⁵ Metropolitan Atlanta has secured its water for the time being, but as populations grow downstream in Florida, and as oyster growers seek to shore up their supply at the river's mouth, the threat of losing Lake Lanier looms.

→ **Over-abstracted:** Groundwater accounts for 20 percent of water used in the U.S. Unlike surface water, some groundwater resources can take hundreds to thousands of years to recharge through natural rainfall. When water removed from the system exceeds the water that filters into the system, groundwater supplies can decline precipitously. Because groundwater is often the cheapest source of supply and its use is virtually unregulated, some of the places that rely most on groundwater are on a path to exhausting their supplies. A 2012 study by the University of Texas showed that at present rates of withdrawal, some of the country's most important water sources for food production are likely to be exhausted within decades (**see Figure 1**). California's Central Valley and the High Plains, which in 2007 produced a combined \$56 billion of crops, are the areas most at risk of losing agricultural economies and groundwater drinking supplies. Because water users with the choice often increase groundwater withdrawals when rainfall drops below average or alternative supplies become more expensive, choices that seem financially prudent in the short-term may come at the expense of long-term supply security. The city of Lubbock is one example, where emergency drought reinforcements came in the form of a well field drilled into the Ogallala Aquifer¹⁶—the Panhandle groundwater source on track to be depleted within a generation.¹⁷

13 Global Credit Research, "Long-term rating under review for possible downgrade," *Moody's Investors Service*, March 8, 2012, http://www.moody.com/research/MOODY-ASSIGNS-Aa2-RATING-TO-COLORADO-SPRINGS-UTILITIES-VARIABLE-RATE-PR_239967.

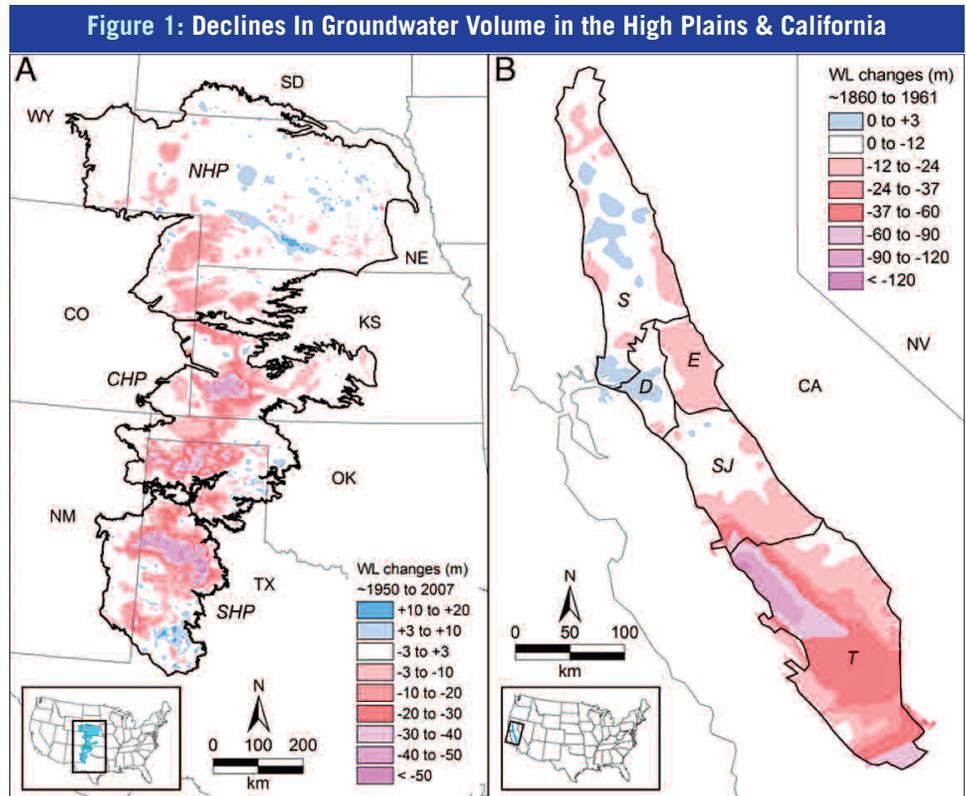
14 Global Credit Research, "\$1.8 billion of double-barreled limited tax general obligation debt affected, post refunding," *Moody's Investors Service*, May 9, 2011, http://www.moody.com/research/MOODY-DOWNGRADES-LAS-VEGAS-VALLEY-WATER-DISTRICT-NEVADAS-GENERAL-OBLIGATION-New-Issue-NIR_16928797.

15 Christopher Henthaler and Julie Seebach, "Tristate Water Wars: Metropolitan Atlanta's Fight for Water Supply," *Public Finance, Fitch Ratings*, June 2, 2011.

16 Adam D. Young, "Drought taxing area lakes, Water Advisory Commission to discuss strategic supply plan," *Lubbock Avalanche Journal*, August 15, 2012, http://lubbockonline.com/local-news/2012-08-15/drought-taxing-area-lakes-water-advisory-commission-discuss-strategic-supply#-UGzJk_k-uvU.

17 University of Texas at Austin, "Groundwater Depletion in Semiarid Regions of Texas and California Threatens U.S. Food Security," *Newswise*, May 24, 2012, <http://www.newswise.com/articles/groundwater-depletion-in-semiarid-regions-of-texas-and-california-threatens-u-s-food-security>.

California's Central Valley and the High Plains, which in 2007 produced a combined \$56 billion of crops, are the areas most at risk of losing agricultural economies and groundwater drinking supplies.



Source: Bob Morris. "Groundwater Depletion: The End of Agriculture as we know it." *IVN*. June 14, 2012. <http://ivn.us/2012/06/14/groundwater-depletion-the-end-agriculture-know-it/>

→ **Imperiled:** Groundwater supplies can also be imperiled from manmade pollutants or intrusion of natural contaminants that make water unfit for human consumption. In low-lying coastal areas like Florida and Cape Cod, rising sea levels are tainting freshwater aquifers with saline ocean water—in Miami Dade County alone, an estimated \$2 billion will be needed to manage this intrusion over the next fifteen years.¹⁸ In the shale basins of the U.S. Northeast and West, water demand for hydraulic fracturing can remove large volumes of freshwater from use¹⁹ and potentially contaminate drinking water supplies. Without proper management, energy policies that favor unconventional oil and gas supplies may exacerbate groundwater scarcities.

For many reasons, the cost of securing additional water supplies has increased dramatically from the heydays of water projects in the mid- to late-twentieth century. Gaining access to new water supplies once cost systems little more than the costs of transmission, thanks to generous federal grants and loans that financed a generation of reservoirs, pipelines and treatment plants. But today's fiscal realities mean that new water projects more likely than not must be built within ratepayers' budgets, a tricky proposition when the cost of new water supplies is several orders of magnitude more expensive than in the boom years.

18 Michael Miller, "Good and bad news ahead 'On the Waterfront,'" *Miami's Community Newspapers*, December 22, 2008.

19 Jack Healy, "For Farms in the West, Oil Wells are Thirsty Rivals," *New York Times*, September 5, 2012, http://www.nytimes.com/2012/09/06/us/struggle-for-water-in-colorado-with-rise-in-fracking.html?pagewanted=all&_r=0.



Declining revenue and rising costs exacerbate supply challenges

ALTHOUGH SUPPLY CONSTRAINTS ARE CHANGING THE ECONOMICS OF PROVIDING WATER, THERE ARE THREE OTHER TRENDS INFLUENCING CREDIT RISK FOR DRINKING WATER PROVIDERS:

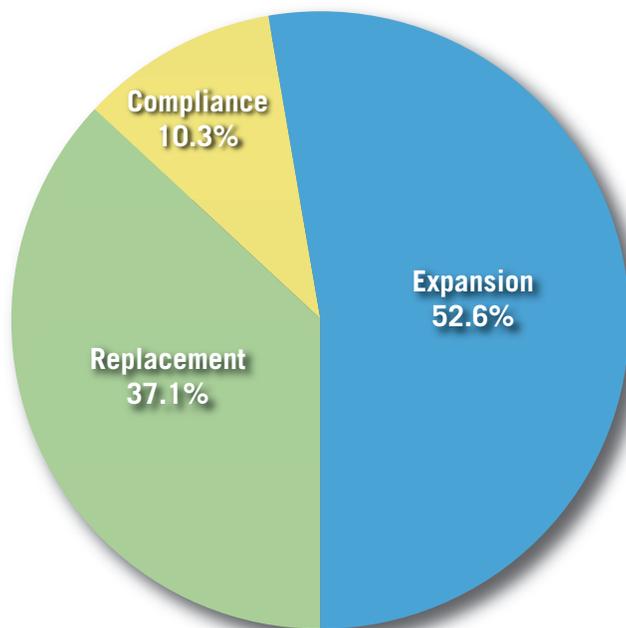
- Growing infrastructure investment needs
- Curtailment of growth
- Declining water demand

Altogether, these trends have conspired with rising supply costs to create a precarious imbalance between borrowing and revenues needed to pay for that borrowing.

GROWING INFRASTRUCTURE INVESTMENT NEEDS

For many systems, rising expenses have outpaced increases in revenues for decades. In many places, what revenue came in went toward system expansion or compliance with regulatory mandates, with not enough money left over to replace aging transmission lines or to update connections with more accurate meters. And in recent years, whether it was the drought or stuttering economic growth, most water systems have made few gains against these decades of underinvestment (*see Figure 2*).

Figure 2: Water Industry Capital Expenditures



In recent years, use of capital has primarily gone to water system expansion.

Source: U.S. Environmental Protection Agency, "2006 Community Water System Survey Report, Vol. 1 Overview," *Office of Water*, February 2009, <http://water.epa.gov/infrastructure/drinkingwater/pws/upload/cwssreportvol1umel2006.pdf>.

Since 2010, by far the most common cause of credit downgrades in the water sector has been failure to increase rates sufficiently to keep pace with expenditures on system maintenance or debt service coverage.

Since 2010, by far the most common cause of credit downgrades in the water sector has been failure to increase rates sufficiently to keep pace with expenditures on system maintenance or debt service coverage. Left unaddressed too long, the lack of cost recovery can lead to system decay, as is the case for cities like Altoona, Pennsylvania²⁰ and Bowling Green, Kentucky,²¹ where years of deferred maintenance have led to massive water loss rates, triggering negative ratings actions. Across the U.S., an estimated 18 billion gallons of treated water are lost each day in leaky pipes and unmetered accounts, an annual cost to customers of nearly \$3 billion.²²

The mismatch between spending and income is partly responsible for the staggering spending estimates projected for maintaining and upgrading water infrastructure—a need estimated at more than \$300 billion dollars by the Environmental Protection Agency²³ and a whopping \$1 trillion by the American Water Works Association.²⁴

CURTAILMENT OF GROWTH

With water rates failing to keep pace with the cost of delivering water, many water systems developed an unfortunate dependence on connection fees from new housing development during the economic boom. In Las Vegas, at the peak of new housing starts, connection fees accounted for \$188 million in revenue for the Southern Nevada Water Authority—by 2010 they accounted for little more than \$3 million.²⁵ For such systems, the housing downturn led to a sudden reduction in revenue, and subsequent credit degradation.

Dependence on connection fees has propagated across the country, and is responsible for negative ratings actions in South Valley Sewer District in Utah, Port St. Lucie, Florida,²⁶ Hernando County, Florida,²⁷ Erie, Colorado,²⁸ Clovis, California,²⁹ Contra Costa, California³⁰ and Yuma, Arizona.³¹ And for Colorado Springs, which had just financed the massive Southern Delivery System, the downturn in housing development came at just the wrong time.

Even during boom times, investors and ratepayers should be wary of how much water systems rely on fees from new connection to generate revenue—the boom times will only last so long and rate adjustments needed to offset revenue loss are sure to cause water customers sticker shock.

20 Global Credit Research, "Rating no longer on review for downgrade," *Moody's Investors Service*, June 21, 2012, http://www.moodys.com/research/Moodys-confirms-A1-rating-on-Altoona-Water-Authoritys-PA-364-PR_249184.

21 Global Credit Research, "Aa3 rating and negative outlook affects \$18.1 million in outstanding senior lien debt, inclusive of current sales," *Moody's Investors Service*, Dec. 12, 2011, http://www.moodys.com/research/MOODYS-DOWNGRADES-TO-Aa3-FROM-Aa2-THE-CITY-OF-BOWLING-PR_233322.

22 U.S. Environmental Protection Agency, "Addressing the Challenge through Innovation," *Aging Water Infrastructure, Research Program*, 2007, <http://nepis.epa.gov/EPA/html/DLwait.htm?url=/Exe/ZyPDF.cgi?Dockey=6000012A.PDF>.

23 U.S. Environmental Protection Agency, "Drinking Water Infrastructure needs Survey and Assessment: Fourth Report to Congress," *Office of Water*, 2007, <http://water.epa.gov/infrastructure/drinkingwater/dwns/index.cfm>.

24 American Water Works Association Public Affairs, "AWWA Report finds infrastructure bill to top \$1 trillion," *AWWA News/Announcements*, February 27, 2012, <http://www.awwa.org/publications/breakingnewsdetail.cfm?itemnumber=58522>.

25 Southern Nevada Water Authority Board of Directors, "SNWA Board revisits infrastructure charge," *Southern Nevada Water Authority*, http://www.snwa.com/about/regional_charges_surcharge.html.

26 Global Credit Research, "Assigns A1 rating to Port St. Lucie's (FL) \$30 million of Utility System Refunding Revenue Bonds, series 2012; outlook is stable," *Moody's Investors Service*, June 4, 2012, http://www.moodys.com/research/Moodys-downgrades-the-rating-on-Port-St-Lucies-FL-4416-PR_247641.

27 Global Credit Research, "Downgrade approximately affects \$35.2 million in rated debt," *Moody's Investors Service*, May 24, 2012, http://www.moodys.com/research/Moodys-downgrades-to-Aa3-from-Aa2-Hernando-Countys-FL-Water-PR_246797.

28 Global Credit Research, "\$24.1 million in outstanding debt affected," *Moody's Investors Service*, December 13, 2011, http://www.moodys.com/research/MOODYS-ASSIGNS-A1-RATING-AND-A-NEGATIVE-OUTLOOK-TO-THE-PR_233431.

29 Global Credit Research, "Baa2 rating applies to \$94.2 million of debt outstanding," *Moody's Investors Service*, Aug. 9, 2011, http://www.moodys.com/research/CORRECTION-TO-SUB-HEADLINE-AND-TEXT-AUGUST-9-2011-RELEASE-Rating-Update-RU_16967288.

30 Fitch Research, "Fitch Rates Contra Costa Water District (CA) & Water Authority Revs 'AA+'," *Fitch Ratings*, June 19, 2012, http://www.fitchratings.com/creditrates/press_releases/detail.cfm?pr_id=752983.

31 Fitch Research, "Fitch Affirms Yuma Municipal Property Corp., AZ's Water & Sewer Revs at 'AA-'; Outlook Negative," *Fitch Ratings*, May 29, 2012, http://www.fitchratings.com/creditrates/press_releases/detail.cfm?pr_id=751084.

DECLINING WATER DEMAND

As surprising as it might seem, water providers have been more damaged in recent years by declines in water demand than by a lack of water.

During a drought, the reason is easy enough to understand: when drought eats deeply enough into supplies and emergency measures are taken to limit discretionary use like outdoor watering, the result can be a precipitous decline in revenue.

But drought aside, demand management and revenue stabilization are two of the most fundamental credit factors shaping the sector. There are two reasons for this.

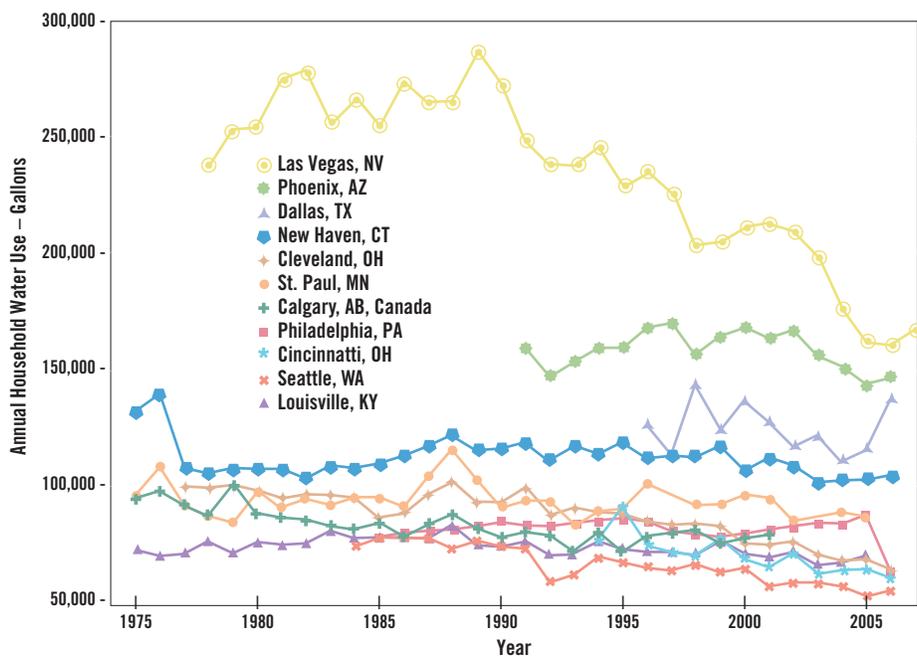
First, the vast majority of utilities still get the preponderance of their revenue from volumetric sales.³² Depending on the place, as much as 80 percent of a system's revenue can be volume dependent.

Second, across the country, demand is declining. All over the U.S., the story is the same—people are using less water. Between the 1970s and the late 2000s, the amount of water used by households fell everywhere: by tens of thousands of gallons each year in Louisville, Kentucky to nearly 100,000 gallons a year per household in Las Vegas (see Figure 3).³³ That is a remarkable decline, and an unsung success story. It is the outcome of many factors, most significantly smaller household sizes and the infusion of high-efficiency indoor fixtures like low-flow toilets, dishwashers and washing machines. In some places, it was the result of conservation outreach by water systems. And in other places it was the product of pricing to communicate to customers the real cost of delivering that extra thousand gallons of water.

When drought eats deeply enough into supplies and emergency measures are taken to limit discretionary use like outdoor watering, the result can be a precipitous decline in revenue.

Across the U.S., water use per household has declined on average 13 percent since 1975—by far more in some places.

Figure 3: North American Water Use Per Household – 1975-2007



Source: P. Comes, T. Rockaway, J. Rivard, and B. Kornstein, "North American Water Usage Trends Since 1992," *Water Research Foundation*, 2010. Reprinted with permission.

³² Jeff Hughes, "Pricing and Revenues: A Challenging Relationship," *University of North Carolina Environmental Finance*, August 23rd, 2012, <http://efc.web.unc.edu/2012/08/23/pricing-and-revenues-a-challenging-relationship/>.

³³ Paul A. Comes, Thomas D. Rockaway, Joshua Rivard, and Barry Kornstein, "Residential water use trends in North America," *Journal American Water Works Association*, 103 (2):76-89. 2011.

But whatever the reason, the short-term financial outcome can be perilous for water systems. In recent years, the North Branch Water and Light Commission in Minnesota,³⁴ the San Francisco Public Utility Commission,³⁵ Charlotte, North Carolina³⁶ and the West Slope Water District in Oregon³⁷ have all experienced negative ratings actions related in part to declining customer usage.

Depending on population dynamics, declining household demand can mean different things for overall water demand. In areas with stable or declining population, the result is likely overall decline in sales. But even in areas with growing population, the effect can be a much more modest increase in water sales than would be projected based on historical water use.

Because the majority of systems' costs are fixed, declines in customer use typically require systems to increase the rates they charge. Yet as systems increase the price they charge per unit of water, their customers use less. To make up for lost revenue, the water system has to increase the cost of service. But the amount a water system increases its rates is not at all proportionate to the revenue increase it experiences.³⁸ This can create a great deal of discomfort for water managers: they fight the political battle to raise rates, only to see revenue increase by less than that needed to cover costs. And in the meantime, customers are irked that they have to pay more for using less water.

In an era when water providers are considering investments in some of the most expensive water projects ratepayers have ever seen—among them the Flaming Gorge Pipeline to feed the Front Range of Colorado, the Sacramento-San Joaquin River Delta tunnel system for southern California, the Southern Nevada Water Authority's groundwater importation pipeline, the St. George, Utah Lake Powell pipeline—these trends should not be ignored.



Known unknowns

Knowing this, how are most water systems projecting future demand? According to a survey by the Pacific Institute, approximately 15 percent of water systems in California don't forecast demand at all (**see Figure 4**). Of those that do, more than 40 percent use their customers' current or past water use. And only slightly more than a quarter incorporate potential changes in demand.³⁹ It is likely this survey of California water systems mirrors practices across the country, which begs two questions: do we really know how much water customers will use in the future? And does the trillion-dollar shortfall really exist?

34 Global Credit Research, "Baa1 rating applies to \$11.8 million of outstanding revenue debt," *Moody's Investors Service*, May 3, 2012, http://www.moodys.com/research/MOODYS-DOWNGRADES-TO-Baa1-FROM-A2-THE-RATING-ON-NORTH-PR_244997.

35 Global Credit Research, "Approximately \$3.7 billion in debt affected including the current issue," *Moody's Investors Service*, July 18, 2011, http://www.moodys.com/research/MOODYS-DOWNGRADES-TO-Aa3-THE-RATING-ON-SAN-FRANCISCO-PUBLIC-New-Issue-NIR_16962963.

36 Global Credit Research, "Aaa rating and negative outlook applies to \$1.52 billion in senior lien revenue debt, including current issue," *Moody's Investors Service*, July 7, 2011, http://www.moodys.com/research/MOODYS-ASSIGNS-Aaa-RATING-TO-CITY-OF-CHARLOTTE-NC-913-New-Issue-NIR_16962433.

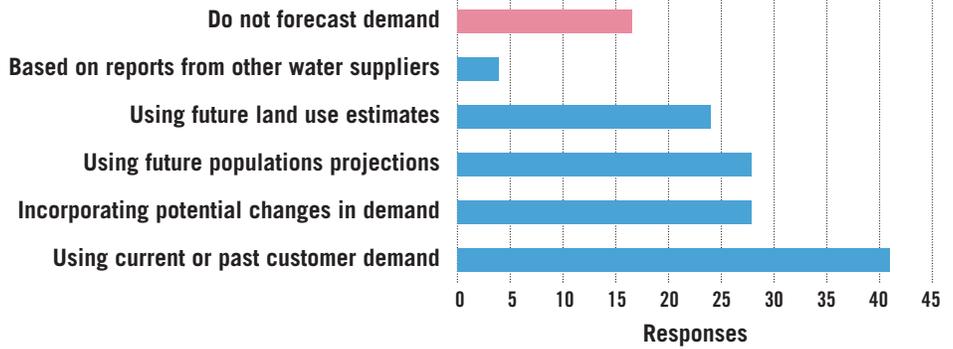
37 Global Credit Research, "\$4.5 million of debt affected," *Moody's Investors Service*, Jan. 21, 2011, http://www.moodys.com/research/MOODYS-DOWNGRADES-WEST-SLOPE-WATER-DISTRICT-OR-WATER-REVENUE-BOND-Rating-Update-RU_16805296.

38 Jeff Hughes, "Pricing and Revenues, a Challenging Relationship," *UNC Environmental Finance Center*, August 23, 2012, <http://efc.web.unc.edu/2012/08/23/pricing-and-revenues-a-challenging-relationship/>.

39 Juliet Christan-Smith, "Tools for Success: Forecasting Water Demand," Presentation, *Water Rates Workshop*, September 13, 2012, http://www.pacinst.org/reports/water_rates/tools_for_success.pdf.

To estimate future demand many water systems simply look to the past, a risky proposition if per capita water use continues to decline.

Figure 4: How are California Water Systems Forecasting Demand?

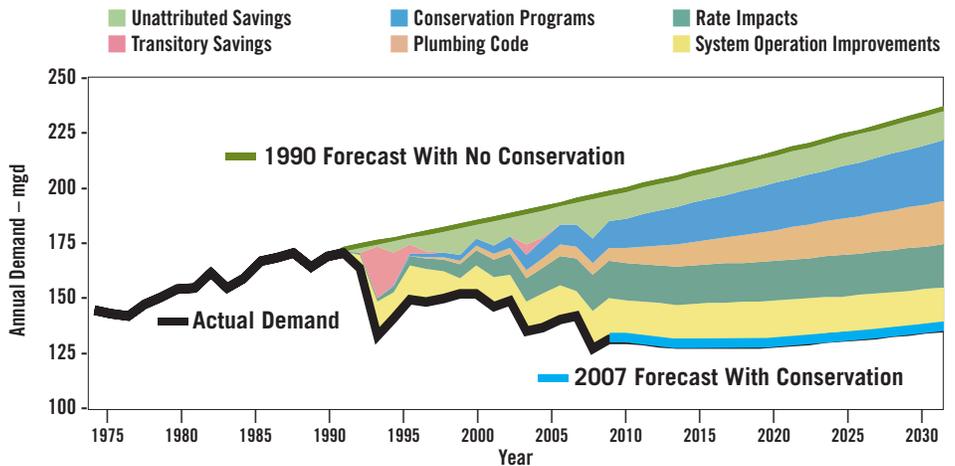


Source: Juliet Christian-Smith. "Tools for Success: Forecasting Water Demand." Presentation, *Water Rates Workshop*. September 13, 2012. http://www.pacinst.org/reports/water_rates/tools_for_success.pdf.

The difference between the future demand projected by water systems and the demand that actually develops can be significant, and the deferred capital expenditures enormous. Seattle Public Utilities has been vocal in communicating how wrong they were in projecting future water demand, as demonstrated by the 100 million gallon a day difference between the demand projected for 2030 in planning exercises done in 1990 and 2007 (see Figure 5).

Figure 5: Seattle Public Utilities' Demand Forecasts With and Without Conservation

Forecasted demand can overshoot actual demand substantially.

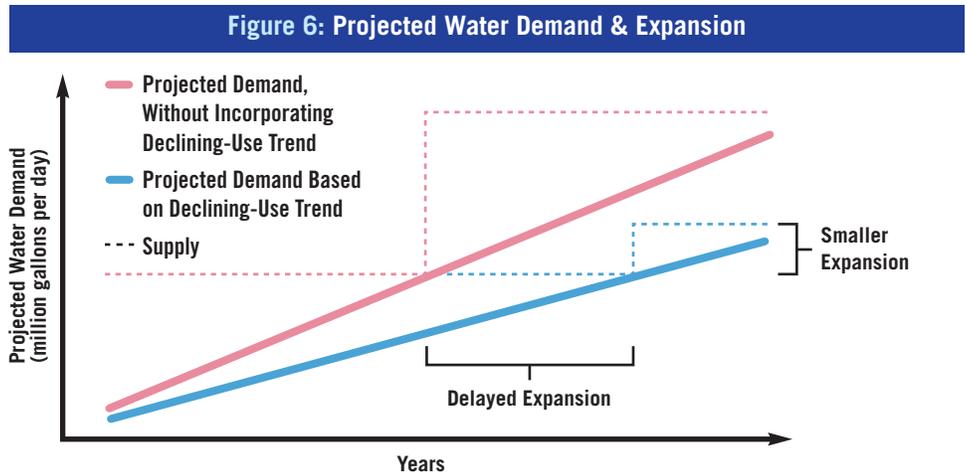


Source: The Johnson Foundation at Wingspread, "Charting New Waters: Financing Sustainable Water Infrastructure," *Convening Meeting by American Rivers, Ceres, and The Johnson Foundation at Wingspread*, January 2012. http://www.johnsonfdn.org/sites/default/files/reports_publications/WaterInfrastructure.pdf.

Building for a high demand future commits ratepayer funds to capital expenditures built for peak capacity, compromising the ability of systems to make gains against the decades of underinvestment for basic maintenance and quality upgrades. Whatever the actual size of the funding gap, it is an uncontested truth that degraded infrastructure will be a key driver of increasing costs for customers, and a credit risk for systems struggling to increase revenue to the levels necessary to overcome their decades long spending deficit.

In contrast, money spent on efficiency stabilizes the long-term rates customers pay by limiting capital expenditures for new treatment facilities, water storage and transmission capacity (see Figure 6). But to pay for needed infrastructure improvements and to effectively use pricing as a tool for driving efficient water use, in most places the short-term result will be water bills that are higher than customers have ever paid.

Effective demand management shifts the demand curve, defers capital expenditures and in the long-term saves ratepayers money. The challenge is getting ratepayers and policymakers to see the long-term cost savings in the face of short-term rate increases.



Source: Hunter, et al, "Declining Residential Water Use Presents Challenges, Opportunities," *Oplow, American Water Works Association*, May 2011, http://www.austintexas.gov/sites/default/files/files/Water/JointSubcommittee/article_decliningresidentialwaterusepresentschallengesopportunities.pdf.

For taxpayers and ratepayers, investment in water efficiency translates to less money that will have to be spent on water systems over the long-term.

Lest that last statement be misinterpreted, let's be clear: Americans will pay more for water services than they have in recent generations. That is the inevitable result of decades of underfunding, and that story is no different from any other underfunded obligation—Medicare, Social Security or flood insurance, for example. But designing water systems to reflect declining water demand will ultimately save consumers hundreds of billions of dollars that would otherwise be spent on unnecessary water diversion projects, reservoirs, treatment plants and pipelines built for a peak demand that is very unlikely to ever manifest.



Politics, rates and affordability

Decisions made today on spending ratepayer funds for demand management or supply expansion could not be more important to Americans' quality of life, now and in future generations. While water in the United States is dirt-cheap (and maybe even cheaper than dirt), for the first time ever, it has surpassed even cable television as the most rapidly escalating basic service paid for by American households (*see Figures 7 & 8*). In part this reflects the insufficient rates that water systems have charged in the past. But regardless of the historic causes, the reality is that securing the investment needed for water infrastructure is a political endeavor. And in politics, perception is everything.

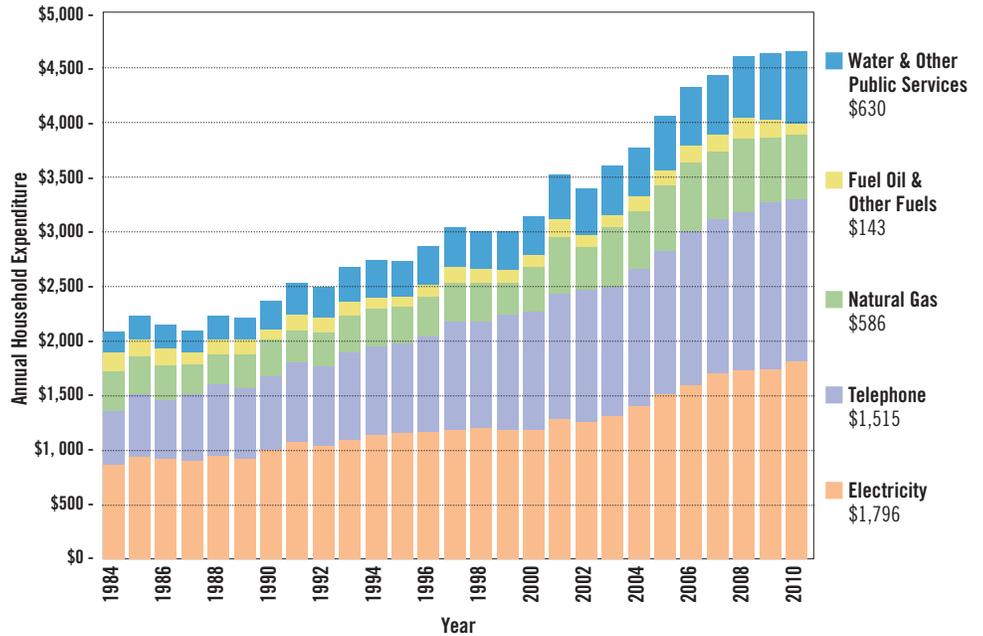
Unlike electricity prices, which typically are set by state-level public utility commissions, most water systems depend on city councils or local water boards to set prices. The process of water rate setting is highly politicized. For water systems, this reality requires cooperation with political actors and investment in communications with the American public to communicate the value of water services. For a highly decentralized market with tens of thousands of operators, such coordination will be an unprecedented and extraordinary challenge.

Maintaining affordability of water services in an era of escalating costs and historic disinvestment should be of primary importance to ratepayers, investors and

policymakers. Lack of affordability is already hitting communities and the investors who finance their water systems, especially in California, where a spate of recent credit actions have been linked to the lack of affordability of water. For such water systems, the challenge is that credit degradation driven by affordability makes borrowing more expensive, further raising costs of service for customers.

Figure 7: Annual Consumer Expenditures on Utilities for a Four-Person Household

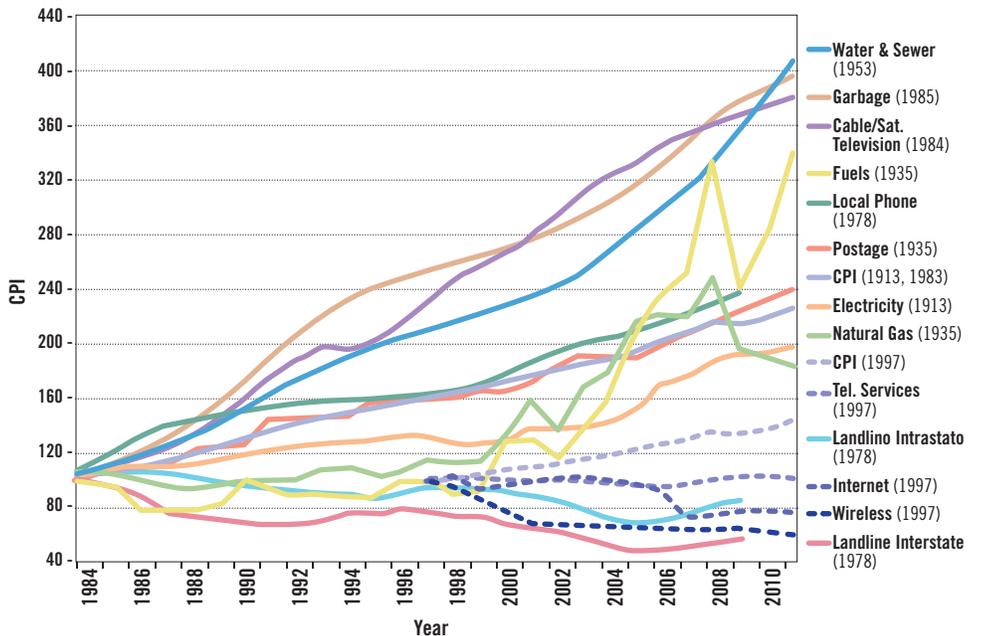
Water services have been increasing as a proportion of total household utility spending, creating challenges to affordability in some areas and political opposition to rate increases even in areas without affordability challenges.



Source: Janice A. Beecher, Ph.D., "Consumer Expenditures on Utilities in 2010," *Institute of Public Utilities Regulatory Research and Education*, Michigan State University, March 2012, <http://ipu.msu.edu/research/pdfs/IPU-Consumer-Expenditures-on-Utilities-2010-2012.pdf>

Figure 8: Trends in Consumer Price Index (CPI) for Utilities

Water and sewer utilities have seized the unenviable title of most rapidly escalating cost of service, even in comparison to cable television.



Source: Janice A. Beecher, Ph.D., "Trends in Consumer Prices (CPI) for Utilities Through 2011," *Institute of Public Utilities Regulatory Research and Education*, Michigan State University, March 2012, <http://ipu.msu.edu/research/pdfs/IPU-Consumer-Price-Index-for-Utilities-2011-2012.pdf>



So where do we go from here?

Solving this challenge does not require huge infusions of federal or state dollars. It does necessitate getting smarter about the water investments we make by prioritizing water efficiency, the lowest-cost solution for customers over the long-term. It means asking better questions about demand estimates that neglect the real trends of declining water use. It necessitates educating customers about the true costs of delivering water services, and understanding what customers value. And it requires policies that protect affordability of water for *essential* use to ensure that we honor the human right to water.

Since releasing *The Ripple Effect*, Ceres has met with credit rating agencies, institutional investors, water systems and advocates to talk about what these trends mean for them. And within that time we've seen the beginnings of meaningful change. Yet more remains to be done:

- ✔ **Managing demand is not something to be saved for a dry spell.** Emergency conservation measures during droughts or legally-induced water shortages may be necessary, but it is the demand management through conservation outreach, efficiency investments and pricing that protects a system's financials during times of shortage and that enables systems to deliver the lowest-cost water to customers over the long-term.
- ✔ **Investors, credit rating agencies and policymakers should not take water systems' demand projections as a given.** Water use is changing, but that change is not reflected in how most systems project demand. As the costs of supplies increases, building for phantom demand can put ratepayers and investors in big financial trouble.
- ✔ **Investors and credit rating agencies should seek out better information on how water rate structures influence demand, and in turn shape the stability of water systems' revenues.** Not all rate structures are built alike, yet research on the relationship between these factors is not making its way from academics and rate consultants to credit rating agencies and investors, for whom this should be an absolutely central part of credit analysis.
- ✔ **As investor water risk awareness grows, water systems that provide the best information to the market will benefit.** Investor opinion determines the cost systems pay to finance critical infrastructure, whether the opinion is based on bias or hard data. Transparent and accurate disclosure should be valued positively by the market.
- ✔ **Environmental advocates and consumer advocates should assume a far more active role in building political support for sustainable water rates.** Educating customers and elevating water security and long-term affordability within political constituencies is in the interest of those advocating on behalf of the environment and the low-income.

Over the next two years, Ceres will be working hand-in-hand with water utilities and the bond market to put sustainability at the center of financing decisions in the water sector. Our work rests on three pillars: **Transparency, Valuing Water** and **Market Formation**.

Ceres' Three Pillars

TRANSPARENCY

In early 2013, Ceres will release a disclosure guidance framework for the water sector crafted in cooperation with water systems and investors. The framework will help investors and credit rating agencies to access better information on how water systems assess and manage risk. Over the next year, we will work with leadership water systems to build their financial reporting around this framework, and with investors and rating agencies to translate this framework into credit analysis that will allow the markets to more effectively price.

VALUING WATER

Water providers must be able to secure sustainable revenues to ensure safe, reliable drinking water while also more effectively communicating the costs of water services to customers. Working with water systems, rate consultants and academics, Ceres will help water managers, investors and credit rating agencies to identify the rate structures that optimize revenue stability and water efficiency, protecting the long-term affordability of water while delivering reasonable returns to investors.

Transitioning to sustainable revenue models is as much a political challenge as a technical one. In the next two years, Ceres will work with water conservation advocates to build the political will to transition to sustainable revenue models for water systems.

MARKET FORMATION

Over the next two years, Ceres will help to educate policymakers, investors, advocates and water systems on the approaches to leverage the capital markets to finance water efficiency—the least expensive source of supply—among municipal water users and agricultural water rights holders. We believe the markets can be an effective force for protecting food security, industrial productivity, safe drinking water and environmental flows.

The once-sleepy U.S. water sector is being transformed into one of the most dynamic fields of innovation—in technology, environmental management and pricing. And yet the challenges, both technical and economic, are so vast, the sector must look beyond its own walls for solutions. This need for cross-sector partnerships is not only critical for water service providers themselves, but for all aspects of the value chain, from water technology providers to bond underwriters to investors. Working together, we can ensure that access to water is no obstacle to sustainable prosperity, now or for future generations.



Ceres
99 Chauncy Street
Boston, MA 02111
T: 617-247-0700
F: 617-267-5400

www.ceres.org

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