WATER & WASTEWATER UTILITIES

DESIGNING THE RATE STRUCTURE OF THE FUTURE

Prepared for the:

HAMPTON ROADS PLANNING DISTRICT COMMISSION
DIRECTORS OF UTILITIES COMMITTEE

Prepared by the:

STAFF OF THE HAMPTON ROADS PLANNING DISTRICT COMMISSION

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HAMPTON ROADS PDC PLANNING DISTRICT COMMISSION

Preface

Municipal water and wastewater utilities are struggling with shrinking revenues and obsolete business models that are driving utilities toward risky financial positions in 2013 and beyond. Water and wastewater utilities currently rely on borrowed money and rate structures that are not designed to recover the true cost of service. Traditional rate structures are based on long-term debt financing that is paid off with revenues from growing sales projections.

The financial challenges facing water and wastewater utilities is a regional concern for Hampton Roads. Pricing of water and wastewater services must evolve to recover costs, incorporate declining demand trends, provide for long-term utility financial stability, encourage water conservation, respect locality-specific needs, and maintain customer affordability.

The Directors of Utilities Committee, an advisory committee to the Hampton Roads Planning District Commission, prepared this document to characterize the factors contributing to utility revenue gaps and strategies being explored by municipal water and wastewater utilities at the local and national levels.

Directors of Utilities Committee

The Directors of Utilities Committee is a formal advisory committee to the Hampton Roads Planning District Commission and is charged with addressing technical, policy and administrative issues associated with the planning and operation of the region's water supply and wastewater systems, as well as a broad range of other water resource management issues. The Committee includes the Director of Utilities or a senior representative from member jurisdictions as follows:

Daniel G. Clayton III, Williamsburg
W. Scott Dewhirst, Newport News
Bryan Foster, Portsmouth
Larry Foster, James City Service Authority
H. Reed Fowler II, Newport News
Tyrone Franklin, Surry
Edward G. Henifin, Hampton Roads Sanitation District
William Hopkins, Smithfield
John Hudgins, York
Julien Johnson, Southampton
Thomas M. Leahy III, Virginia Beach
Kristen M. Lentz, Norfolk
William J. Meyer, Chesapeake
Albert Moor II, Suffolk
Russell Pace, Franklin
Anthony Reyes, Hampton
Martin Schlesinger, Gloucester
Everett Skipper, Newport News
Robert Speechly, Poquoson
Michael Stallings, Windsor
Edwin P. Wrightson, Isle of Wight

Hampton Roads Planning District Commission

The Hampton Roads Planning District Commission (HRPDC) is a regional organization representing 16 member local governments. The purpose of Virginia's planning district commissions, as described in the Code of Virginia, Section 15.2-4207, is "to encourage and facilitate local government cooperation and state-local cooperation in addressing on a regional basis problems of greater than local significance'" Specifically, HRPDC's mission is to:

- Serve as a forum for local and elected officials and chief administrators to deliberate and decide issues of regional importance;
- Provide the local governments and citizens of Hampton Roads with credible and timely planning, research, and analysis on matters of mutual concern; and
- Provide leadership and offer strategies and support services to other public, private, local, and regional agencies in their efforts to improve the quality of life for the region's residents.

HRPDC provides a forum for the local governments to exchange information and to develop cooperative initiatives that address regional environmental and socio-economic issues, as well as state and federal regulatory requirements. HRPDC staff undertakes technical and policy studies and provides technical assistance to the member localities.

WATER & WASTEWATER UTILITIES

DESIGNING THE RATE STRUCTURE OF THE FUTURE

EXECUTIVE SUMMARY

Municipal water and wastewater utilities across the country are developing strategies to address the challenges of:

- Uncertain or declining revenues;
- Increasing costs; and
- Lack of public awareness of revenue gaps.[1]

Residential water use per customer in the U.S. has been gradually decreasing with changes in water use patterns over the last 30 years.[2] There is a growing gap between the revenues collected by water and wastewater utilities and the cost to provide those services.

Many utilities are experiencing financial hardship due to shrinking revenues. A 2012 national rate survey shows that water and wastewater utilities have already implemented rate increases since 1996 that outpace inflation.[3] Yet it is estimated that water system infrastructure needs will cost at least $1 trillion over the next 25 years[4] and wastewater capital needs will cost $298 billion over the next 20 years[5] because system maintenance, replacement, and upgrades have been underfunded.

How will water and wastewater utilities generate the funds to continue operations and build necessary capital projects while all indicators point to continued revenue declines? Simple increases to volume-based rates are not the solution. The rate structure itself needs to change.

Pricing must evolve to account for changing residential water use patterns. Rate structures should seek full cost recovery, and business planning should incorporate the declining demand trend to provide for long-term system viability and utility financial stability. Rate structures must also encourage water conservation and consider customer affordability.

In Hampton Roads, water and wastewater utilities are looking at rate design and pricing strategies to reduce revenue uncertainties and to provide for long-term infrastructure needs. This document summarizes factors contributing to the revenue gap and strategies being explored by municipal water and wastewater utilities at the local and national levels.

1. Lang, A. et al. (2011). "Water Utility Challenges in Meeting Revenue Gaps," Drinking Water Research, Advancing the Science of Water. July-September 2011. http://www.drinkingwaterresearch-digital.com/drinkingwaterresearch/20110709#pg18

2. Coomes P. et al. (2010). North America Residential Water Usage Trends Since 1992. Water Research Foundation. http://waterrf.org/PublicReportLibrary/4031.pdf

3. American Water Works Association and Raftelis Financial Consultants, Inc. (2013). 2012 Water and Wastewater Rate Survey Highlights. American Water Works Association. http://www.awwa.org/portals/0/files/publications/documents/samples/2012waterandwastewaterratesurvey.pdf

4. American Water Works Association. (2012). Buried No Longer: Confronting America's Water Infrastructure Challenge. http://www.awwa.org/Portals/0/files/legreg/documents/BuriedNoLonger.pdf

5. American Society of Civil Engineers. (2013). 2013 Report Card for America's Infrastructure. http://www.infrastructurereportcard.org/wastewater/

HAMPTON ROADS PDC PLANNING DISTRICT COMMISSION

This document was prepared by the staff of the Hampton Roads Planning District Commission (HRPDC) for the HRPDC Directors of Utilities Committee, September 2013.

Introduction

Current water and wastewater utility revenues are highly dependent on customer water use. The water bill, sewer collection bill, and sewer treatment bill for a given residence are all based on one monthly or bimonthly water meter reading.

In the past, metering and volumetric rates were implemented to promote efficiency and encourage water conservation, but the typical residential customer today uses less water than the customer of ten years ago primarily because of advances in water-saving technology and new regulatory requirements. Although water efficiency has made considerable gains since the 1970s, municipal water and wastewater utilities are struggling with obsolete business models that rely on volumetric water rates to cover the costs of providing services. The result: **Traditional rate structures are driving utilities toward risky financial positions in 2013 and beyond**.

As customers use less water, commodity-based pricing and volumetric rates are failing to provide utilities with sufficient revenue streams. **Progressive rate restructuring must occur** to enable water and wastewater utilities to safely and reliably serve communities for decades to come.

6. Noyes, C. (2013). "Effective Utility Management," Environmental Finance Center Blog. University of North Carolina, Environmental Finance Center, May 7, 2013. http://efc.web.unc.edu/2013/05/07/effective-utility-management/

In the U.S., many water and wastewater utilities rely on traditional rate structures that were not designed to recover the *true cost of service*. The traditional rate structure was developed in the 1970s while federal programs funded many system expansions. Rates were designed to recover the cost of *subsidized* water and wastewater operations. Therfore, only a portion of total costs were passed on to customers through utility bills.

Today, federal subsidies have largely disappeared and future subsidies are unlikely. Achieving financial viability is a serious priority for water and wastewater utilities seeking an effective balance between long-term debt, asset value, operational and maintenance expenses, and operating revenues.[6] The traditional rate structure and pricing model is now the biggest challenge to effective utility management.

Evolving Priorities for Municipal Water and Wastewater Utilities	
1960s	**Public Health** Technology was implemented to ensure safe and reliable water and wastewater services to growing populations.
1970s	**Public Health** and the **Environment** Clean water legislation came with large federal grants that funded system expansions.
Today	**Public Health**, the **Environment**, and **Financial Viability** Stricter regulations raise the level of protection of people and the environment. Federal grants have largely disappeared, and revenue gaps threaten the financial viability of municipal water and wastewater utilities.

Source: Noyes, C. (2013).

Summarized from the UNC Environmental Finance Center blog post, "Effective Utility Management," by Catherine Noyes (May 7, 2013).

The Challenge: Adapt to the "New Normal"

Water and wastewater utilities generally operate on a business model that relies heavily on volumetric water sales; this means that a large portion of the revenue generated by the rate structure is dependent upon customer water use. In general, water use prior to the mid-1990s was predictably increasing or relatively steady. Therefore, municipal water and wastewater utilities generally experienced revenue increases as populations grew and per capita water use increased or remained steady.

The commodity-based business model is no longer working for many water and wastewater utilities across the country. Utilities are experiencing declining water use and declining water- and sewer-related revenues in response to the combined influences of:

- Water-saving fixtures and high efficiency technology;
- Conservation measures and community education programs;
- Changes to codes and standards;
- Economic downturn, relocation of industries, and changes in population; and
- Changes in weather and precipitation patterns.

Water and wastewater utilities are facing the "**new normal**" where water consumption is declining despite increases in population.[7] Utilities are therefore exploring adaptation strategies to provide both short-term financial stability and long-term financial resiliency. Rate structure adjustments, innovative pricing, and new business models, among other strategies, are being assessed by small and large utilities alike. Most importantly, **water and wastewater utilities throughout the country are reaching out to customers, city and county councils, and other elected officials to prepare for the future**. This public dialogue encourages community participation in defining local goals and promotes a better understanding of:

- The importance of water and wastewater infrastructure for public health and the economy; and
- The financial needs for sustaining water and wastewater infrastructure.

Communities everywhere are recognizing that water and wastewater systems are in need of urgent attention. Water and sewer infrastructure provide the foundation for communities. All citizens benefit from the healthy environment and economic vitality enabled by well maintained and well managed water and wastewater systems.

7. Ursery, S. (2011). "Driving them to drink, Declining water demand causes new headaches for water managers," American City & County. October 1, 2011. http://americancityandcounty.com/water/ operations_mgmnt/declining-water-demand-201110

The "Conservation Conundrum"

In 2010, Dr. Janice Beecher, Director of the Institute of Public Utilities at Michigan State University, wrote about the "conservation conundrum" and how declining water demand "presents utilities with a significant but surmountable financial challenge: **Rising infrastructure costs must be recovered from a shrinking sales base**."[8] In discussing strategies for addressing declining revenues, she asserts that utilities should assess the consequences of alternative rate designs on revenue volatility, uncertainty, and social objectives.

The "conservation conundrum" was used to frame the discussion of declining water sales and utility revenues at the National Water Rates Summit in Racine, Wisconsin, August 29 – 31, 2012:

> *Partly due to successful water conservation programs, improved water-saving fixtures and technology, and a number of other factors, both water sales and water-related revenues are falling on a national level. With sales and revenues declining, how can water utilities cover costs of water treatment and delivery? How can they cover the rising costs of infrastructure repair and replacement? Most importantly, how can they meet these costs while still encouraging much-needed conservation efforts?*[9]

The New Normal for Newport News Waterworks

"The new normal is that water utilities are frequently faced with declining water demands even when service population increases…At my utility, Newport News Waterworks, we find that we now serve a population base that has grown by 15% over the last 20 years but uses considerably less water than the smaller population base did in 1990."[10]

- Brian Ramaley
Newport News Waterworks
Director, 1994-2013

Newport News Waterworks Demand, 1950-2012

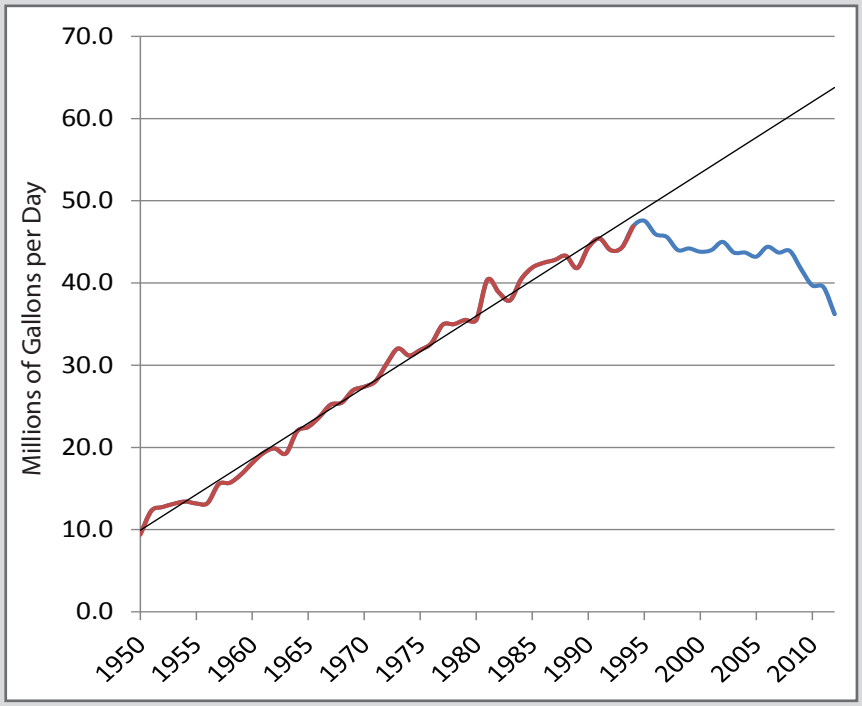


Figure 1. This chart characterizes the trend toward "new normal" water demands for Newport News Waterworks, showing the decline in water used by Waterworks customers from 1994 to 2012.

8. Beecher, J.A. (2010). "The conservation conundrum: How declining demand affects water utilities," Journal AWWA. February 2010.

9. Alliance for Water Efficiency. (2012). Declining Water Sales and Utility Revenues: A Framework for Understanding and Adapting. http://www.a4we.org/uploadedFiles/Resource_Center/Library/rates/Summit-Summary-and-Declining-Water-Sales-and-Utility-Revenues-2012-12-16.pdf

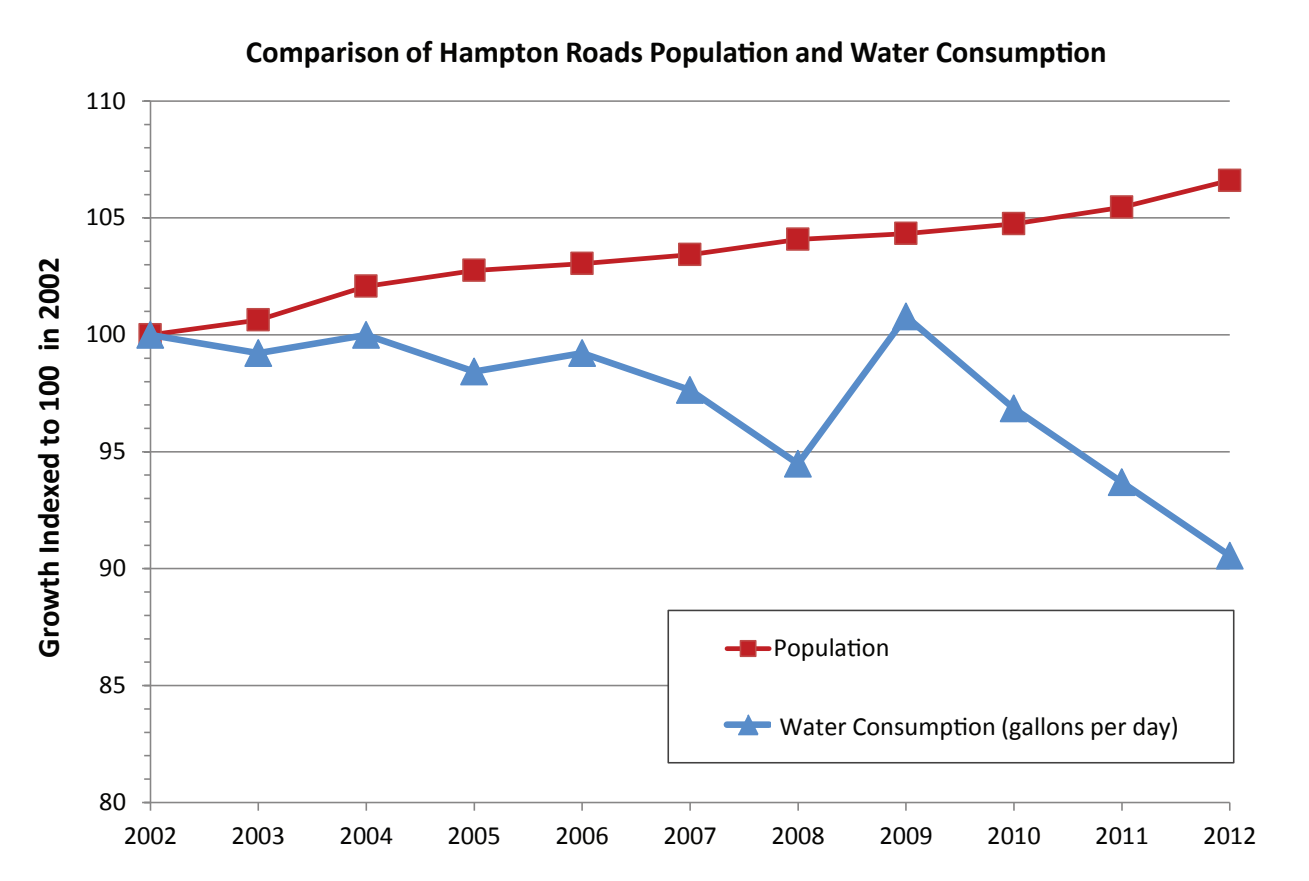
10. Ramaley, B. (2011). "The New Normal," Tap Into Virginia. Virginia Section of the American Water Works Association. Winter 2011. www.vaawwa.org/magazine/4/

Declining Water Use in Hampton Roads

Per-capita use decreases while population grows

Declining water use in Hampton Roads is evident over the past ten years. Since 2002, regional water consumption dropped from 127 million gallons per day (mgd) to 115 mgd. This 10% decrease in consumption occurred while the region's population grew by more than 105,000 people.

Based on this data, water use in Hampton Roads fell from 79.7 gallons per person per day in 2002 to 67.7 gallons per person per day in 2012, a 15% decrease in per-capita water use.



Source: 2002-2011 population data from HRPDC 2012 Data Book; 2012 population estimate from the University of Virginia, Weldon Cooper Center for Public Service, July 1, 2012 Estimates for Virginia and its Counties and Cities; billed water consumption data from HRSD FY2012 Comprehensive Annual Financial Report.

Figure 2. Water use in Hampton Roads decreased by 10% from 2002 to 2012.

Uncertain Revenues

Under the typical rate structure, water and wastewater utility revenues are heavily dependent on the amount of water used by customers. This means that revenue is vulnerable to variability. When people use less water, less revenue is generated to support both water and wastewater utilities.

Decreasing Water Use. The Energy Policy Act of 1992 (effective 1994) and resultant plumbing standards are considered to be the primary causes of declining water use. Subsequent federal legislation (Energy Policy Act of 2005, effective 2006, and the Energy Independence and Security Act of 2007, effective 2010) has led to additional requirements and mandates for more efficient fixtures and appliances.

How have these policies impacted water demand? A 2010 Water Research Foundation study that examined North American household water use over a 30-year period concludes that "the decline in the number of individuals per household and the increased use of low-flow appliances are the primary contributors to the observed decline in water use among single-family households."[11] It is estimated that, all other factors being equal, **indoor water use in a home built in 2011 is 35% less than indoor water use in a home built prior to 1994**.[12]

Other factors are also influencing water demands and contributing to the gradual decline in water use, or "**demand decay**." Cultural changes and social attitudes are shifting water demands, which causes revenue uncertainty, and in some areas, revenue decline. Some shifts in water use are attributable to stricter building codes and standards, installation of native landscap-

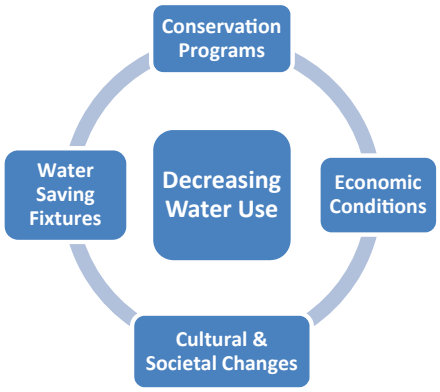


Figure 3. Factors contributing to demand decay.

11. Rockaway, T. et al. (2011). "Residential water use trends in North America," Journal AWWA. February 2011.

12. Hunter, M. et al. (2011). "Declining Residential Water Use Presents Challenges, Opportunities," American Water Works Association Opflow. May 2011.

13. Alliance for Water Efficiency. (2012).

Multiple Factors in "Shifting Proportions" Contribute to Demand Decay

As the Seattle area experienced a drop in water usage, a suburban water agency did not interpret the available data quickly enough and did not adjust rates accordingly. As a result, it entered into unnecessary contractual agreements with water suppliers and is now buying unneeded water at a premium price. Part of the dilemma grew from unreliable demand forecasting.

While utilities must make decisions based on forecasts, those forecasts often miss the mark. In practical terms, per capita water use in the region dropped by 20% to 50% because of a combination of code changes, more efficient use, active conservation programs, price, community education, and weather and rain patterns…[E]ven as the population increases, water sales are declining, not for one reason, but for all of these reasons in shifting proportions.[13]

Excerpted from the discussion summary of the National Water Rates Summit on declining water sales and utility revenues, Racine Wisconsin, August 29-31, 2012.

ing instead of turf lawns, and the general adoption of a conservation ethic.

Trends in non-residential water use are also influencing demand. The economic downturn has resulted in decreased demand, as well as less revenue from development and connection fees. It is difficult to generalize the national impacts of the recession, relocation of industry, and implementation of water-efficient industrial practices; these influences are better characterized at the utility scale.

Utility-supported water conservation programs that promote education, fixture retrofits, and water audits have been widely implemented. Such programs have been extremely effective in many areas of the country. This raises another question: *Do water utilities and the conservation community have a messaging problem?*[14] Research by the Environmental Finance Center at the University of North Carolina (UNC) indicates that traditional consumption-based rate structures create a paradoxical relationship between water conservation efforts and the financial health of water utilities; this paradox emphasizes the need for innovative financial strategies and resilient business models.[15]

14. Alliance for Water Efficiency. (2012).

15. Berahzer, S.I. (2012). "The State of Water Utility Financial Innovation at the Dawn of the 21st Century," 2012 Water and Health Conference: Science, Policy and Innovation. University of North Carolina, Chapel Hill, NC. October 31, 2012. http://www.efc.unc.edu/training/2012/StateofWaterUtilityFinancialInnovation.pdf

Flow Rates for Typical Household Fixtures and Appliances*

Type of Use	Pre-Regulatory Flow[1]	Regulatory Standards and Flows			Current WaterSense/ ENERGY STAR Specification[2]
		Federal Law	Year Effective	Regulatory Standard (maximum)	
Toilets	3.5 gpf	US Energy Policy Act	1994	1.6 gpf	1.28 gpf
Showers	2.75 gpm	US Energy Policy Act	1994	2.5 gpm (at 80 psi)	2.00 gpm
Faucets[3]	2.75 gpm	US Energy Policy Act	1994	2.5 gpm or 1.5 gpm (at 80 psi)	1.50 gpm (at 60 psi)
Dishwashers	14 gpc	Energy Independence and Security Act of 2007	2010	6.5 gpc (standard) 4.5 gpc (compact)	4.25 gpc (standard) 3.50 gpc (compact)
Clothes Washers[4]	41 gpl (14.6 WF)	Energy Independence and Security Act of 2007	2011	26.6 gpl (estimate) 9.5 WF	16.8 gpl (estimate) 6.0 WF

Abbreviations: gpc – gallons per cycle; gpf – gallons per flush; gpl – gallons per load; gpm – gallons per minute; psi – pounds per square inch; W.F. – Water factor or gallons per cycle per cubic feet capacity of the washer

*Table adapted from Hunter, M. et al. (2011).

1. Source: *Handbook of Water Use and Conservation*, Amy Vickers, May 2001
2. Source: http://www.epa.gov/watersense/ and http://www.energystar.gov websites
3. Regulation maximum of 2.5 gpm at 80 psi, but lavatory faucets available at 1.5 gpm maximum
4. Average estimated gallons per load and water factor

Figure 4. Implementation of federal standards and high-efficiency water and energy specifications have significantly impacted flow rates of typical household fixtures and appliances, reducing household water use.

Uncertain Revenues. Will this trend of "demand decay" continue, or will water use stabilize at current levels? When will a clearer picture emerge? Water and wastewater utilities are still experiencing the impacts of the 1992 Energy Policy Act. Standards for clothes washers and dishwashers per the 2007 Energy Independence and Security Act became effective in 2010 and 2011. Utilities will likely observe additional demand changes over the 10 to 13 year lifetimes of these water-saving appliances. Regardless of when water use stabilizes, utilities must examine demand patterns, revisit projections, and **take steps to reduce financial risks**.

Revenue uncertainty or decline is not likely to be resolved through the traditional rate structure and simple price increases. Why? Often water or wastewater utility rates are increased, but the impact on total revenue is not as predicted. Recent analysis of a 2010 national rate survey examined the relationship between pricing (rate increases) and revenues from 2004 to 2010.[16] Given price elasticity, a one-to-one relationship between the rate increase and the revenue increase was not expected, however, the analysis demonstrated significant diversity in the impact of rate increases. The majority of utilities (64%) saw a smaller revenue increase compared to the related rate increase. Some utility rate increases were even associated with net revenue declines.

Most water and sewer rates have not been restructured to address the lack of alternative funding sources such as federal subsidies and municipal financing mechanisms, nor have they been restructured to acknowledge decreasing revenue as a result of reductions in per capita water use. Federal subsidies for municipal water or wastewater projects are scarce. Cuts to the state revolving loan fund program continue, and additional grant funding is unlikely. Meanwhile, the "conservation conundrum" persists, as water-efficient appliances gain market penetration and conservation practices are widely implemented. In adapting to the "new normal," municipal water utilities are interested in employing rate structures that provide predictable cash flow and reduce risks to revenues.

Residents of the City of Virginia Beach, approximately one third of the region's population, pay a flat charge for sewer service. This provides wastewater utility operations with predictable revenue to support fiscally and environmentally responsible management of the sanitary sewer collection system and long-term system viability.

Pricing and Revenues: A Challenging Relationship

A 2012 analysis by the University of North Carolina's Environmental Finance Center illustrates "the radically different operating environments" of water utilities.[16] Consider this example:

> *Utility A experienced only a 30% increase in revenues during a period when the bill for 10 hundred cubic feet (ccf) of water was increased by 150%. In contrast, Utility B's 30% rate increase was associated with an 85% increase in revenues (it is likely that growth in customers and sales also contributed to this increase).*

The analysis emphasizes why diverse revenue strategies should be explored to meet the needs of specific circumstances. Read more here: http://efc.web.unc.edu/2012/08/23/pricing-and-revenues-a-challenging-relationship/

Summarized from the UNC Environmental Finance Center blog post, "Pricing and Revenues: A Challenging Relationship" by Jeff Hughes (August 23, 2012).

16. Hughes, J. (2012). "Pricing and Revenues: A Challenging Relationship," Environmental Finance Center Blog. University of North Carolina, Environmental Finance Center, August 23, 2012. http://efc.web.unc.edu/2012/08/23/pricing-and-revenues-a-challenging-relationship/

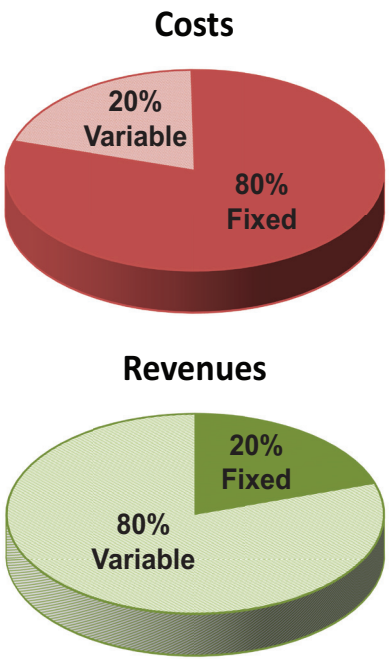


Figure 5. Most water and wastewater utility costs are fixed, while most revenues generated by the traditional rate structure are variable. The misalignment of costs and revenues makes it difficult for utilities to recover the costs of providing water services.

Increasing Costs

On one side of the revenue gap, revenues are uncertain or are decreasing. On the other side of the revenue gap, costs are increasing. The traditional water and wastewater utility rate structure is flawed from this standpoint as well. As demand decreases, the traditional rate structure makes it increasingly difficult for utilities to recover the cost of providing water and wastewater services.

Misalignment of Costs and Revenues. In general, utility costs and revenues are poorly aligned. **Costs are largely fixed, while revenues generated by the traditional rate structure are mostly variable**. It is common for a water or wastewater utility's costs to be at least 80% fixed. Revenues, however, are typically 80% variable. The majority of a utility's revenue is generated by consumption-based usage rates, while a small portion comes from fixed meter fees or "ready to serve" fees. A 10% reduction in demand will result in approximately a 10% reduction in revenue, but the overall utility costs remain about the same. The water utility incurs approximately the same amount of total expenses regardless of the change in consumption.

Water and wastewater utilities are obligated to ensure services are always available to customers. There are costs associated with providing on-demand water and wastewater services 24-hours a day. **Utilities incur certain fixed costs regardless of the volume of service supplied to customers**. Examples of fixed costs include debt

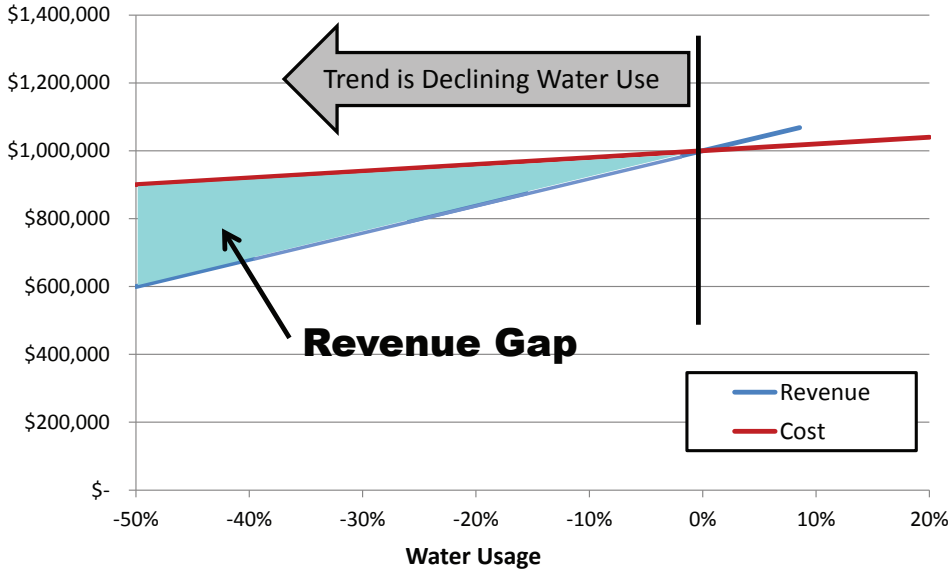


Figure 6. Water and wastewater utility costs are relatively stable, regardless of how much water is used by customers. As water use decreases, the traditional consumption-based rate structure creates a revenue gap, and utilities become unable to recover the cost of services. In the example shown here, the impact of a 10% drop in water use on a balanced budget of $1 million results in a $60,000 funding gap. Revenues (20% fixed, 80% variable) decrease to $920,000, while costs (80% fixed, 20% variable) total $980,000.

service, regularly scheduled maintenance, and administration.

Variable costs are dependent upon the volume of service supplied to customers. Variable costs primarily include electrical power and chemical supply costs that fluctuate with the volume of water or wastewater pumped and treated, but may also include some portion of a utility's labor costs and system repair and maintenance costs.

As an industry, water and wastewater utilities have applied cost control strategies and have captured efficiencies to continue to provide clean, safe water and wastewater services despite the increasing cost of service. The American Water Works Association notes that "Utilities have been able to continue to provide high quality service by:

1. Delaying needed capital improvements (primarily rehabilitation and replacement of buried infrastructure);
2. Reducing certain levels of service; and/or
3. Using reserves.

However, these options are not sustainable."[17]

Water and wastewater utilities also recognize the consequences of credit ratings, which affect a utility's ability to borrow money and the cost of borrowing money. Highly rated utilities benefit from lower borrowing costs; poorly rated utilities must pay more to access capital. Over the long-term, the additional debt service cost in-

Water Utilities are Capital Intensive

"Water utilities (and wastewater utilities) are distinctly capital intensive, even compared with other utilities or other large industries. Water utilities invest significant financial capital in fixed assets relative to their annual operating revenues (a ratio of about 5 to 1). Fixed assets include all of the utility's supply, treatment, transmission, and distribution facilities, much of which are long-lived and serve generations of water customers. Aging infrastructure and the relative high cost of replacement are significant cost drivers for the water industry today. The combined requirements of water, wastewater, and storm-water management are considerable." [18]

- Dr. Janice A. Beecher, Director of the Institute of Public Utilities at Michigan State University

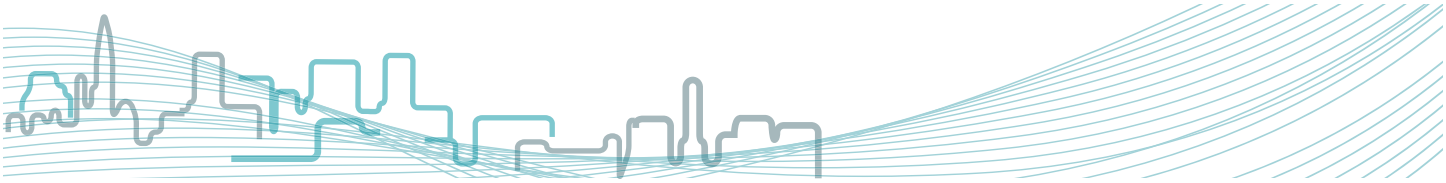
Fixed vs. Variable Costs

Fixed Costs Costs incurred regardless of the volume of service supplied to customers	Capital Expenditures	Future Expansion (annualized costs) Debt Service Reserve Contributions
	Operation and Maintenance	Administration, Billing, & Support Services Salaries, Wages, & Benefits Taxes, Insurance, & Rent Planned Maintenance & Replacement
Variable Costs Costs vary depending on the volume of service supplied to customers	Operation and Maintenance	Electrical Power Chemicals & Treatment Materials & Equipment Labor (temporary or intermittent)

Figure 7. Water and Wastewater utility expenses generally consist of capital costs and operation and maintenances costs, most of which are fixed costs.

17. American Water Works Association and Raftelis Financial Consultants, Inc. (2011). 2010 Water and Wastewater Rate Survey. American Water Works Association.

18. Beecher, J.A. (2011). Primer on Water Pricing. Michigan State University, Institute of Public Utilities, November 1, 2011. http://ipu.msu.edu/research/pdfs/Primer-Water-Pricing-2011.pdf



Ratings Service	Rating System	
Fitch Ratings	AAA AA A BBB	+ / -
Moody's Investors Service	AAA AA A BBB	+ / -
Standard & Poor's Ratings Services	Aaa Aa A Bb	1, 2, 3

Risks to Credit Ratings

Water and wastewater infrastructure is largely financed through the sale of municipal bonds. Water and wastewater utility revenues have been declining, but the obligation to repay bond investors has remained unchanged. Since the 2007-08 financial crisis, more water sector utility credit ratings have been downgraded than ever before, as ratings agencies examine how declining revenues and increasing costs aggravate utility credit risks. Since 2010, the most common cause of water sector credit downgrades is failure to sufficiently increase rates to keep pace with maintenance expenditures or debt service coverage. The gap between utility borrowing costs and required revenue is widening, and rating agencies are becoming more transparent about how these risks influence their analyses. Fitch Ratings and Standard & Poor's have issued reports on trends and challenges to the water sector; Moody's has not issued water sector reports and has not updated their 1999 water sector rating methodology. [19]

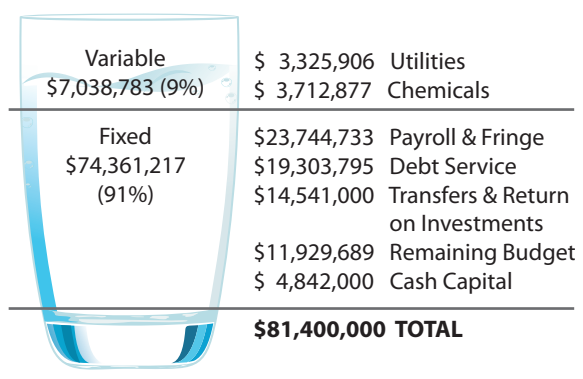
Summarized from "Water Ripples: Expanding Risks for U.S. Water Providers" (2012).

19. Leurig, S. (2012). Water Ripples: Expanding Risks for U.S. Water Providers. A Ceres Report, December 2012. http://www.ceres.org/resources/reports/water-ripples-expanding-risks-for-u.s.-water-providers/view

20. Tiger, M. and C. Boyle. (2012). "The Role of Rates in Ratings," Environmental Finance Center Blog. UNC Environmental Finance Center, November 8, 2012. http://efc.web.unc.edu/2012/11/08/the-role-of-rates-in-ratings/

curred by an "AA" rated utility may be considerably more than if the utility was "AAA" rated. The UNC Environmental Finance Center describes the role of rates in credit ratings, noting that "given the amount of capital needed to bring U.S. utilities' aging infrastructure up to modern standards, the long-term availability of reasonably-priced credit remains a pressing issue, especially as federal and state subsidies decrease."[20] Utilities are considering how to create stable revenue streams to ensure that their financial indicators satisfy or exceed the requirements of credit agencies.

Newport News Waterworks FY2013 Expenditures



Newport News Waterworks serves over 400,000 people in Hampton, Newport News, Poquoson, and portions of York County and James City County. In fiscal year 2013, Waterworks' total expenditures were over $81 million.

In the past, approximately 90% of Waterworks' expenses were fixed while more than 80% of revenues were generated from volumetric charges. In May 2013, the City of Newport News approved rate structure revisions that enable Waterworks to recover more costs through fixed charges. The bimonthly service fee (meter fee) for a residential rate payer was increased from $8.70 to $22.00.

Increasing Costs. Several factors are pushing costs upward for water and wastewater utilities:

- Aging infrastructure and replacement needs;
- Increasing regulatory requirements and more expensive environmental compliance requirements;
- Increasing costs of energy, chemicals, and supplies; and
- Limited water resources.

In Hampton Roads, the cost of wastewater service will be particularly impacted by increasing regulatory requirements and expensive environmental compliance mandates. The Virginia Department of Environmental Quality and the U.S. Environmental Protection Agency have ordered Hampton Roads' localities and the Hampton Roads Sanitation District (HRSD) to improve wastewater systems to reduce or eliminate overflows of untreated sewage into waterways. Locality and HRSD wastewater systems are interconnected and overflows occasionally occur during major rain or storm events.

The improvements required throughout the region are very expensive, with an estimated cost of over $2.5 billion dollars

21. Black & Veatch. (2013). *2013 Strategic Directions in the U.S. Water Utility Industry*. http://bv.com/reports/2013-water-utility-report

22. Mantz, B.A. (2011). "Utility transfers to the general fund: What is reasonable, fair, and legal?" Journal AWWA. October 2011.

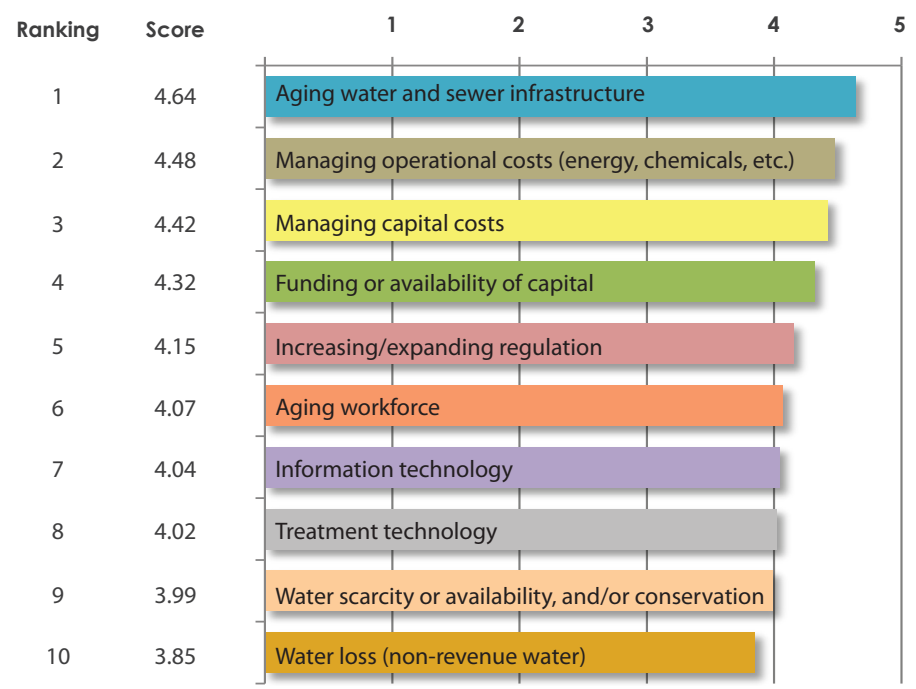


Figure 8. "Aging water and sewer infrastructure" is the number one issue for water and wastewater utilities, according to a 2013 industry-wide survey by Black & Veatch.[21] Participants were asked to rate the importance of each issue using a scale of 1 to 5, where 1 indicates "Very Unimportant" and 5 indicates "Very Important."

Business Principles of Water and Wastewater Utilities

Most municipal water and wastewater utilities in Hampton Roads are enterprise funds. An ***enterprise fund*** is established to provide separate accounting for municipal goods or services provided to the public for a fee.

Like a commercial business, utility enterprise funds follow general accounting principles and are self-supporting. Utility enterprise funds that follow good business practices can effectively provide services at the lowest price. Revenues generated by enterprise services should be protected from transfer or diversion to non-utility programs. Local governments should recognize that funding nonutility-related operating or capital costs with water or wastewater utility revenues is not considered a best management practice by credit rating agencies.[22]

to the local utilities and HRSD. These improvements are in addition to the capital improvements currently being undertaken by HRSD to ensure that treated wastewater discharges comply with the new limitations per Virginia's implementation plan for the Chesapeake Bay Total Maximum Daily Load.

As costs continue to rise, municipal water and wastewater utilities are interested in recovering a larger portion of fixed costs through rate structures that provide more predictable revenue. "Full-cost pricing" or "cost-based rates" are structured to recover the cost of operating and providing services over the long-term. Most municipal water and wastewater utilities in Hampton Roads are **enterprise funds** and must operate like businesses. Full-cost recovery supports the self-sufficient operation of utilities and eliminates resource subsidies and transfers.[23] While current rate structures incorporate some principles of full-cost pricing, more costs could be recovered through adjustments in rate and pricing mechanisms.

23. Beecher, J.A. (2011).

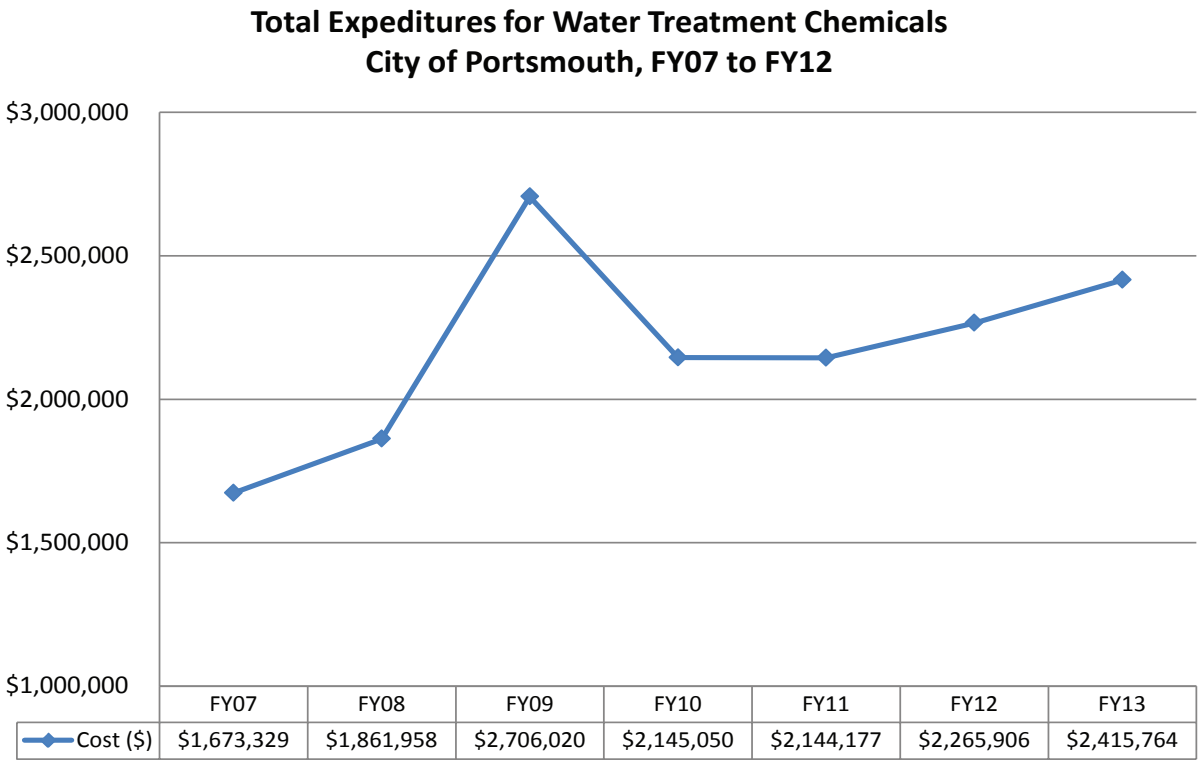


Figure 9. Chemical costs, incurred by utilities to support treatment processes, are rising. From fiscal year (FY) 2007 to 2013, the City of Portsmouth's chemical costs increased by about 44% while the volume of water treated only increased by about 4%. In FY2013, it cost the City's Public Utilities Department over $2.4 million to treat approximately 6.3 billion gallons of water.

Lack of Public Awareness

Water and wastewater utilities have a critical mission to reliably serve customers. Customers expect, and typically receive, uninterrupted service twenty-four hours a day, seven days a week. According to a 2012 nationwide survey, 90% of Americans consider water an important service on par with electricity and heat.[24] However, the same survey revealed that "Americans are largely unaware of the factors impacting water costs, their water footprint or the extent to which water infrastructure problems would impact them personally."[25] Although people know that water plays a role in their day-to-day lives, the survey results show a lack of awareness of personal water dependency. For the most part, **the value of having continuous, on-demand water and wastewater services is unrecognized** by the public.

Customer confusion. The 2012 survey also revealed that "Americans attribute water costs to many factors, but these may not align with the true cost factors determined by utilities financial structures."[26] Customer confusion over how utilities are financed and what happens to the money collected through rates has also been documented at the municipality level. A 2008 focus group study by the UNC Environmental Finance Center[27] showed that customers of Charlotte-Mecklenburg Utilities (CMU) in North Carolina had questions such as:

- Where do utilities get their money?
- Whose pockets am I lining with my rates?
- What do you mean the utility is not run for profit?
- How do I know that they are doing the right things with my money?
- What are they doing with the money they already have?

The Value of Service

"Raw water may be an inexpensive input, but potable or "finished" water is a value-added commodity that is provided "on demand" for a variety of daily uses, from drinking water to fire protection...Water utilities add value to water through treatment, storage, and transportation, delivering as much as a ton of product every day directly to the consumer's home and ready to use. The capacity to provide water is maintained regardless of whether a drop is used on any given day. Water is also the only utility product that consumers physically ingest, making public-health considerations paramount."[28]

- Dr. Janice A. Beecher, Director of the Institute of Public Utilities at Michigan State University

24. Xylem, Inc. (2012). 2012 Value of Water Index (Highlights). http://www.xyleminc.com/valueofwater/media/2012_Value_of_Water_Index_Highlights.pdf

25. Xylem, Inc. (2012). The Value of Water (Infographic). 2012. http://www.xyleminc.com/valueofwater/media/Value%20of%20Water_Infographic_8.5x11.pdf

26. Xylem, Inc. (2012). The Value of Water (Infographic). 2012. http://www.xyleminc.com/valueofwater/media/Value%20of%20Water_Infographic_8.5x11.pdf

27. Tiger, M. (2009). "Utility Financing Confusion," North Carolina American Water Works Association and the North Carolina Water Environment Association NC Currents, Summer 2009. Available at http://www.efc.unc.edu/publications/2009/NC_Currents_financing.pdf

28. Beecher, J.A. (2011).

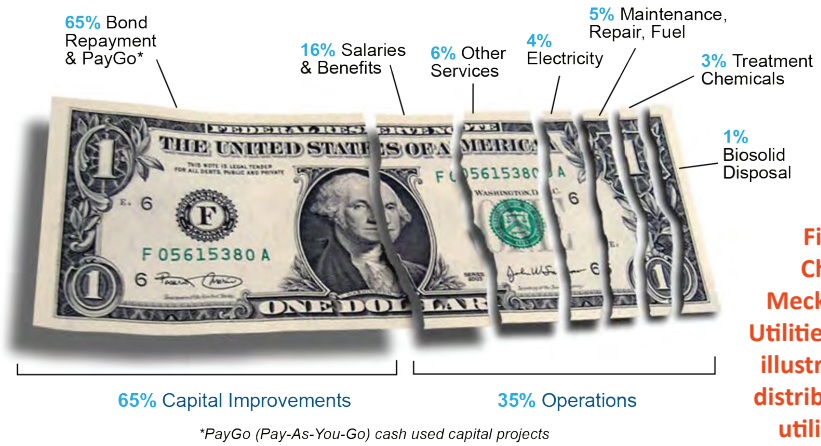
29. Charlotte-Mecklenburg Utilities. (2013). The Value of Your Water. http://charmeck.org/city/charlotte/Utilities/CustomerService/guidetorates/Documents/UnderstandingWaterRatesF.pdf

30. Xylem, Inc. (2012). 2012 Value of Water Index (Highlights). http://www.xyleminc.com/valueofwater/media/2012_Value_of_Water_Index_Highlights.pdf

31. Walton, B. (2012). "The Price of Water 2012: 18 Percent Rise Since 2010, 7 Percent Over Last Year in 30 Major U.S. Cities," Circle of Blue. May 10, 2012. http://www.circleofblue.org/waternews/2012/world/the-price-of-water-2012-18-percent-rise-since-2010-7-percent-over-last-year-in-30-major-u-s-cities/

COSTS OF IMPROVEMENTS AND INVESTMENTS

Paying for capital and infrastructure projects accounts for 65 cents of every dollar spent by CMUD, and is in many ways like a mortgage that has to be paid back over time. Other key cost drivers are chemicals, power, people and fuel.



*PayGo (Pay-As-You-Go) cash used capital projects

Source: Charlotte-Mecklenburg Utilities, "The Value of Your Water" (April 11, 2013).[29]

Figure 10. Charlotte-Mecklenburg Utilities (CMU) illustrates the distribution of utility costs.

Atlanta's Water & Sewer Tax

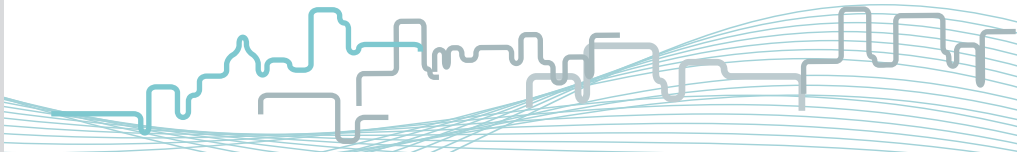
"In 2004, three-quarters of Atlanta residents voted to tax themselves, as well as visitors spending money within the city limits, through retail sales. This motivation came from a $4 billion bill, negotiated in 1998 with the federal government, to clean up the city's sewer overflows. Just last year [2011], revenue from the one percent retail sales tax totaled $120 million, which made up roughly one-quarter of the water department's budget and relieved some of the pressure on the city's ratepayers, who have some of the highest water bills in the nation. In March [2012], Atlanta residents voted 85 percent in favor of extending the tax for another four years." [31]

- Brett Walton, reporting for Circle of Blue

These questions characterize a **misunderstanding of utility financing**. Given the questions about revenue sources and spending, it is not surprising that customers lack awareness of the growing gap between utility revenues and costs. To help educate customers, CMU developed a brochure, "The Value of Your Water," which includes a graphic showing the key cost drivers for the utility (see Figure 10).[29]

Personal Responsibility. Despite some confusion over utility financing, according to a 2012 nationwide survey, Americans are aware of the expanding needs for water and wastewater infrastructure repair and reinvestment. "Nearly all Americans (88 percent) believe that government should be accountable for fixing and maintaining our nation's water infrastructure. They want government to invest more time (79 percent) and money (85 percent) in upgrading our water pipes and systems. And Americans trust local and municipal governments to address these problems more than other entities."[30]

The survey also found that six in ten Americans were willing to pay $7.70 more per month on average in 2012 to underwrite infrastructure improvements. This willingness to pay more demonstrates the public's recognition of personal responsibility, as well as the public's trust in local and municipal governments to tackle the problem of aging water and wastewater infrastructure and provision of critical water and sewer services.



Rate Setting. Public officials make key decisions that affect water and wastewater utility financing and rate setting. It is important that utilities communicate with officials and regulators to explain the revenue gap and describe the particular financial challenges facing the utility. Financing and rate setting discussions can be complicated by the political process; rate structures can be controversial, especially when some aspects of a utility cost-recovery strategy conflict with considerations for economic development, water conservation incentives, and customer affordability.

Water and wastewater utilities are always concerned with how rates and potential rate changes will affect customers that are financially struggling. Utilities are considering alternative approaches to keep water services affordable for low-income customers. Some utilities are creating programs where direct assistance for utility bills is administered by a social services department. This type of program may not work everywhere, but the approach is representative of a suite of strategies that minimize hardship on low-income customers while providing the utility with necessary revenue.

In evaluating strategies to address the revenue gap, water and wastewater utilities are looking at ways to enhance communication with public officials and customers to encourage stakeholder understanding of the utility's financial requirements. Informed customers and city council members are more likely to consider strategies that provide both short-term financial stability and long-term financial resiliency. Public outreach and education programs can facilitate transparent communication with customers and help city and county councils and boards make tough financial decisions.

The Painful Art of Setting Water and Sewer Rates

"Maintaining safe drinking water and environmentally sound sewer services is one of the most important responsibilities of a local government. As providing water and sewer services becomes more expensive, local governments face the constant challenge of balancing their interest in offering customers a fundamental public health service at an affordable price, against the necessity of managing their programs in a financially sustainable manner." [32]

- Jeff Hughes, Director of the Environmental Finance Center at the University of North Carolina

Progressive Rate Making: Strategies for Promoting Stakeholder Understanding

- **Educate elected officials** and utility board members on the factors necessary for successful rate setting to help them make the right decision.
- **Undertake a comprehensive rate analysis** together with consumers and elected officials to **educate the community** and to seek buy-in of the outcome results.
- **Communicate regularly** with customers, elected officials, and the media to properly set the stage for rate evaluation and redesign.
- **Design rates that work in a recessionary economy**, rather than just a growth economy.
- **Emphasize the need for revenue stability** to support regular maintenance and provision of safe and reliable service at a reasonable price.
- **Maintain customer equity** based on a cost of service approach.
- Eliminate the "% increase" sound bite and pro-actively **educate the media to foster better reporting** of the absolute value of proposed rate increases.

Adapted from the recommendations of the 2010 workshops held by the Great Lakes Commission for the Value of Great Lakes Water Initiative.[33]

Assessing Affordability

As federal requirements to meet specific environmental standards drive U.S. household water bills higher, a joint issue brief from the U.S. Conference of Mayors, the American Water Works Association, and the Water Environment Federation proposes that the Environmental Protection Agency (EPA) reassess its definition of affordability.

According to the three organizations, EPA's affordability criteria rely too heavily on median household income and underestimate the effect of rising water bills on low-income, fixed-income, and renter-occupied households.

The May 2013 joint issue brief offers several alternative metrics for better gauging the affordability of water mandates.[34]

Download the brief from: www.usmayors.org, www.awwa.org, and www.wef.org.

Summarized from the American Water Works Association, Affordability Assessment website: http://www.awwa.org/resources-tools/water-utility-management/affordability-assessment.aspx.

Affordability. Utilities must also consider **customer affordability** in evaluating different strategies to address revenue shortfalls. There are several types of customer assistance or affordability programs in place across the country. The Water Research Foundation identified the following utility practices through a 2004 survey:[35]

- Payment plan to allow customer to pay over time;
- Customer referral to private, non-utility agency for assistance;
- Customer referral to a local government agency for assistance;
- Education;
- In-home conservation assistance;
- Special billing arrangements;
- Change in the rate charged to customer;
- One-time bill credit from utility funds.

The Water Research Foundation incorporated the survey results into a 2010 report, *Best Practices in Customer Payment Assistance Programs*, which is intended as a guide to develop and improve affordability programs. It recommends that customer assistance programs be rigorous in payment management and comprehensively integrated into the utility business process, rather than simply ad hoc practices.

Finding consistent funding sources for customer assistance programs can be challenging. Utilities must also consider legal constraints and customer equity with respect to affordability programs. State and local finance laws may limit rate setting practices and methods for generating funds and distributing assistance. Some utilities have turned to non-rate revenue sources, such as leasing property or selling advertising space, to generate direct funding. In developing a sustainable program, utilities and municipalities will have to wrestle with the question of who pays for affordability programs.

32. Hughes, J. (2005). "The Painful Art of Setting Water and Sewer Rates," Popular Government. Spring-Summer 2005

33. Alliance for Water Efficiency. (2011). Great Lakes Commission, Value of Great Lakes Water Initiative, Final Report on the Workshops Held: Findings and Recommendations. http://www.glc.org/wateruse/watervalue/pdf/Water-Rate-Workshop-Final-Report-v2.pdf.

34. Cromwell, J.E. et al. (2010). Best Practices in Customer Payment Assistance Programs. Water Research Foundation. http://waterrf.org/PublicReportLibrary/4004.pdf

35. American Water Works Association, Affordability Assessment website: http://www.awwa.org/resources-tools/water-utility-management/affordability-assessment.aspx

Strategies for the "New Normal"

To adapt to the "new normal," water and wastewater utilities are exploring strategies to provide financial stability and resiliency. Rate structure adjustments, innovative pricing, and new business models are being assessed by small and large utilities alike.

Hampton Roads water and wastewater utilities are interested in addressing the "new normal" with strategies to:

- Increase revenue stability by moving to a model of selling a service, rather than a commodity.
- Provide affordable, high quality water service to all customers while ensuring that the utility first-and-foremost meets its financial goals.
- Build more cost recovery into the base charge while promoting customer conservation, efficient water use, awareness of water infrastructure, and stewardship of water resources.

In many parts of the country, municipal water and wastewater utilities are using finance strategies to address similar objectives.

Some strategies are more effective when a utility has already completed efforts to analyze water use and improve demand forecasts. To assess the financial implications of "new-normal" water demands and to provide timely development of new water supplies, long-term capital planning should incorporate local trends in decreased water use as well as population growth. Adjusted demand forecasts can provide operational and environmental advantages, opportunities to optimize water supply sources and management of pump stations and treatment facilities, and opportunities for efficient pumping and treatment.[36]

A forthcoming 2013 report funded by the Water Research Foundation is anticipated to assist water and wastewater utilities in their consideration of financial practices. A team of researchers from the UNC Environmental Finance Center and Raftelis Financial Consultants is examining revenue and pricing trends to develop strategies to address growing costs. The goal of the research project is to outline more resilient business models for water and wastewater utilities founded on integrated financial and management practices, systems, and processes adapted for the "new normal."[37]

The report will evaluate how different finance strategies, like the ones listed below, can address the revenue gap and improve the financial health of water utilities:

- Finance policies and benchmarking (metric-driven policies with specific targets for debt service coverage, debt ratios, and reserve balances)
- Customer assistance programs
- Pricing and business models

36. Hunter, M. et al. (2011).

37. Adapted from the project fact sheet, "Defining a Resilient Business Model for Water Utilities: Addressing Revenue Vulnerability and Variability, Water Research Foundation Project #4366," available at http://efc.unc.edu/publications/2012/RevenueGapsSummaryFinal.pdf

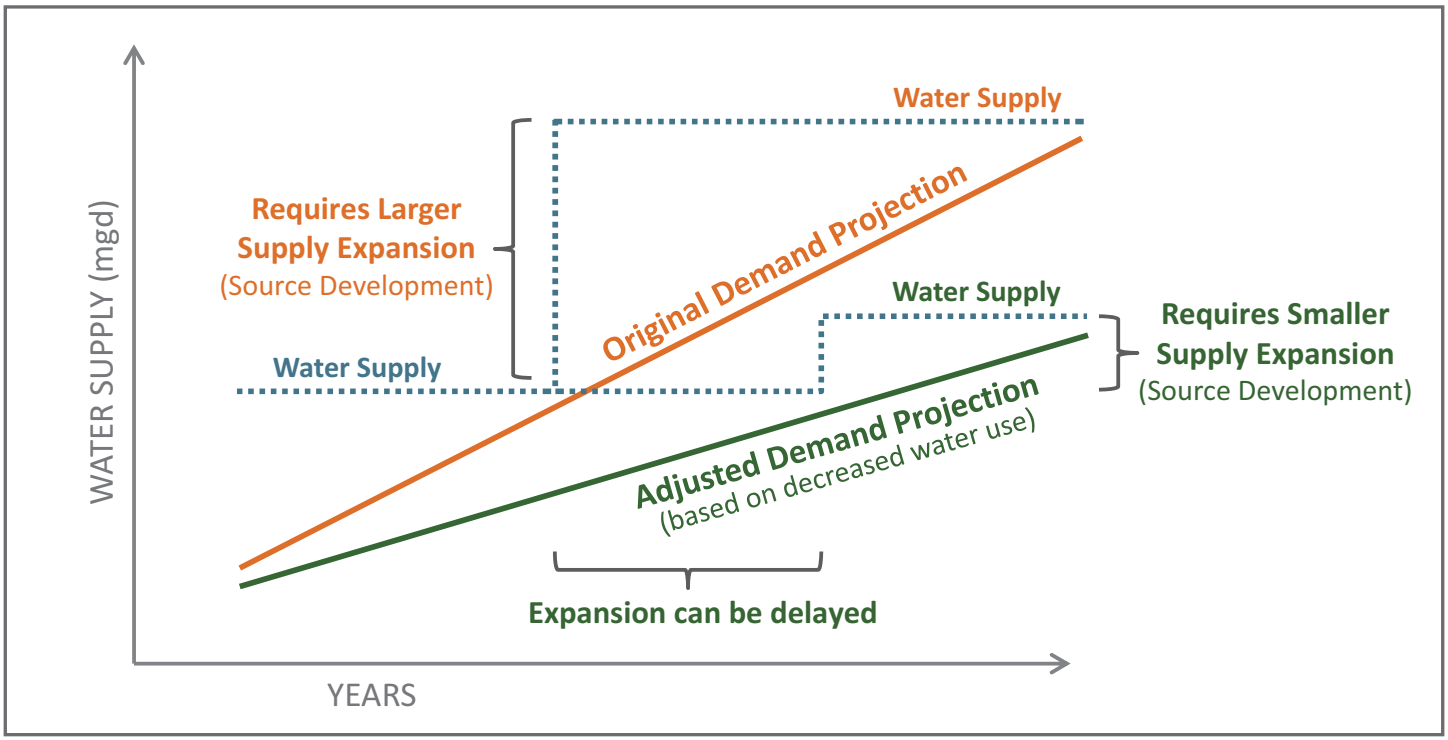


Figure 11. Adjusting demand projections to incorporate decreasing water use trends can impact long-term capital planning. Figure adapted from Hunter, M. et al. (2011).

The UNC Environmental Finance Center is also working with water and wastewater utilities throughout the southeastern U.S. to explore new business models and rate mechanisms, such as the CustomerSelect Rate Plan based on mobile phone service provider plans and the Peak*set* Base Pricing Model with individualized base charges based on a customer's maximum period of consumption (see the Environmental Finance Center's website[38] for more information).

While current research is examining the effectiveness of finance strategies and vetting more innovative rate structures, Hampton Roads water and wastewater utilities may consider the advantages and disadvantages of other methods to encourage revenue stability, such as those listed below and described further in Appendix A:

- Rate and pricing mechanisms;
- Special funds, charges, or adjustments; and
- Forecast- and demand-based adjustments.

38. UNC Environmental Finance Center website URL: http://efc.unc.edu/

Hampton Roads Planning District Commission
723 Woodlake Drive, Chesapeake, VA 23320
P: 757-420-8300 | F: 757-523-4881
www.hrpdcva.gov

Appendix A
Methods to Encourage Revenue Stability

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Appendix A: Methods to Encourage Stable Revenues*

Method	Description	Advantages	Disadvantages
Rate and Pricing Mechanisms			
Rate adjustments	Rate reviews and adjustments that keep pace with changing conditions	- Reduces rate adjustment lag	- Increases ratemaking expense - May be politically unwelcome
Cost indexed rates	Rate adjustments based on a predetermined inflation index	- Simplifies and expedites rate adjustments	- May mis-estimate real costs
Full-cost pricing	Water prices based on system budgeting cost of service studies	- Supports fiscal autonomy of system - Enhances price efficiency	- May cause significant rate increases for subsidized systems
Straight fixed-variable pricing	Alignment of fixed and variable charges with fixed and variable prices	- Stabilizes revenues by effectively decoupling revenues from sales - Neutralizes the incentive to sell	- High fixed charges - Raises affordability concerns - Weakens variable price signals, particularly with regard to future capacity costs
Revenue-stable rate design	Use of uniform rates, uniform by class, or large first blocks that stabilize revenues	- Simplification and customer understanding	- May not be perceived as sufficiently conservation-oriented
Replacement value ratemaking	Base rates on anticipated cost of asset replacement	- Account for inflationary effects	- Requires utility basis of accounting - May be arbitrary and inflate rates unnecessarily
Three-part tariff	Design rates with three components: customer, capacity, and commodity charges	- Stabilizes revenues by establishing a charge related to capacity costs	- High fixed charges - Raises affordability concerns - May weaken variable price signals, particularly with regard to future capacity costs
Water-budget rates	Rate design that considers property size, household size, and other variables in designing rate blocks based on a determination of "need"	- Enhances revenue stability - Promotes conservation awareness - Politically acceptable to large-volume customers	- Difficult to reconcile with cost-of-service and related equity and efficient principles - Administratively complex - May reinforce legacy choices - Regressive in customer impact
Lost-revenue adjustment	A rate mechanism or revenue recoupling method used to recover revenues lost due specifically to mandates designed to reduce usage	- Neutralizes the incentive to sell	- Difficult to segregate sales lost due to mandates - Overstates incentive to sell
Revenue assurance or decoupling	A rate mechanism or revenue cap designed to decouple sales from revenues and profits	- Neutralizes the incentive to sell - Case is easier for publicly owned utilities (risk and profit issues)	- Overstates incentives to sell - Discourages economic sales - Undermines price efficiency and variable pricing incentives - Perpetuates legacy investment - Shields utilities from elasticity effects

Appendix A: Methods to Encourage Stable Revenues* (continued)

Method	Description	Advantages	Disadvantages
Special Funds, Charges, or Adjustments			
Reserve-account funding	Use a special charge or equity return mechanism to build a reserve account	- Builds a reserve account for infrastructure replacement needs	- May be arbitrary and inflate rates unnecessarily - May cause intergenerational equity concerns - Funds may be diverted
Rate stabilization fund	A designated fund for managing revenue deficits and surpluses	- Provides fiscal protection for utility	- May cause intergenerational inequity
Depreciation expense	Include in rates an expense for the depreciating the value of utility assets	- Provides cash flow to system	- Requires utility basis of accounting and ratemaking - May cause significant rate increases
Fire-protection charges	Design of fixed charge based on the value and cost of fire protection	- Stabilizes revenues by establishing a fixed charge	- Weakens variable price signals - More affordable if based on property values
Public-benefit surcharge	A customer surcharge used to fund efficiency or other programs considered beneficial to the public	- Educates customers about programs and costs	- May invite political resistance
Cost-adjustment mechanisms	Pass through to customers of certain substantial and volatile costs (e.g., purchased water or power)	- Simplifies and expedites rate adjustments - Keeps rates in line with actual costs	- May provide a disincentive for cost control
Forecast- and Demand-Based Adjustments			
Improved cost forecasting	Pro forma adjustments for known and measureable cost changes or use of future test year	- Reduces rate lag	- Requires analytical skill
Improved sales forecasting	Enhanced econometric modeling v. simple moving averages (e.g., statistically adjusted end-use modeling)	- Reduces rate lag - Weather-adjusted water usage is relatively predictable	- Requires analytical skill
Weather normalization	Adjustment to forecast sales based on expectation of normal weather and precipitation	- Reduces weather impact on revenues	- Requires analytical skill
Demand-repression adjustment	Adjusts sales forecast to account for price elasticity on usage	- Reduces rate lag by incorporating elasticity effects	- Requires analytical skill

*Adapted from "Exhibit 6. Methods for Addressing Revenue Shortfalls" (Janice A. Beecher, Institute of Public Utilities, Michigan State University) as published in the source document.

Source: Alliance for Water Efficiency. (2012). Declining Water Sales and Utility Revenues: A Framework for Understanding and Adapting. http://www.a4we.org/uploadedFiles/Resource_Center/Library/rates/Summit-Summary-and-Declining-Water-Sales-and-Utility-Revenues-2012-12-16.pdf

Appendix B
Publicly Accessible Resources by Subject

Subject	Page
Declining Water Use and Adapting the Utility Business Model	B - 3
Pricing and Rate Structures	B - 5
Affordability	B - 8
Rates Dashboards	B-11
Infrastructure Needs	B-12
Public Outreach Tools	B-14
Credit and Finance	B-15

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Declining Water Use and Adapting the Utility Business Model

Beecher, J.A. and T. Chesnutt. (2012). *Declining Water Sales and Utility Revenues, A Framework for Understanding and Adapting*. Alliance for Water Efficiency, December 2012. http://ipu.msu.edu/research/pdfs/Summit-Summary-and-Declining-Water-Sales-and-Utility-Revenues-2012-12-16.pdf

> *From the conclusion:* "New normals in water usage are forming and the industry must find ways to navigate a path toward more efficient usage patterns. The water industry needs to own the issues of declining sales and revenues and update its message of conservation and efficiency to one of service and sustainability."
>
> This document also contains a list of selected readings and resources.

Black & Veatch. 2012. *2012 Strategic Directions in the U.S. Water Utility Industry*. http://brstage.bv.com/docs/management-consulting-brochures/2012-water-utility-report.pdf

> *From the introduction*: "Welcome to the inaugural Black & Veatch Strategic Directions in the U.S. Water Utility Industry Report. This report serves to provide insights on the common challenges and opportunities facing the water and wastewater industry based on the analysis of survey responses from water utility leaders. As we reviewed survey results and conducted subsequent analysis, common themes emerged that centered on financial issues, sustainability and optimized asset management practices. What is unique is that these are not stand-alone themes. Rather, each is intertwined with the others in terms of alleviating challenges or hindering future opportunity."

Black & Veatch. 2013. *2013 Strategic Directions in the U.S. Water Utility Industry*. http://bv.com/reports/2013-water-utility-report

> *From the introduction*: "Welcome to the 2013 Strategic Directions in the U.S. Water Industry Report. For the second consecutive year, Black & Veatch has worked to capture the industry's viewpoint concerning ongoing issues through our industry-wide survey. In addition to graphical interpretation of survey results, our full report provides expert analysis, recommendations and actionable intelligence for overcoming the growing challenges of limited finances, rising costs and the need to ensure the long-term viability of the provision of water and wastewater services. Primary findings from this year's report validate, at a macro level, what the industry has been saying for years. Aging infrastructure is threatening the financial viability of water and wastewater utilities, and traditional operating models are no longer sustainable. At the micro level, we see a commitment to improvement. However, the industry is just now developing real maturity in regard to formal asset management programs. As a result, ongoing efforts to fix aging infrastructure and gain efficiencies may not be addressing the root causes of some of the challenges impacting utilities."

Declining Water Use and Adapting the Utility Business Model (continued)

Donnelly, K. and J. Christian-Smith. (2013). *An Overview of the "New Normal" and Water Rate Basics*. Pacific Institute, June 2013. http://www.pacinst.org/wp-content/uploads/2013/06/pacinst-new-normal-and-water-rate-basics.pdf

> *From the Pacific Institute website:* **"**The most common water rate structures – flat fees, uniform rates, block rates, and water budget rates – require varying levels of financial, institutional, and human capacity to implement, and so choosing between them means evaluating whether the potential benefits are greater than the cost to provide the necessary capacity. The white paper An Overview of the "New Normal" and Water Rate Basics examines the rate structures and the characteristics of the new normal, which includes more uncertain water supply; new legislation, codes, and standards; and overall increasing costs to provide a safe drinking water supply."
>
> This white paper is related to the "Need To Know: Water Rates" series briefs, released in partnership with the Alliance for Water Efficiency and the Community Water Center, present strategies to help water service providers cope with the "new normal" or an era of decreased water demand due to a variety of factors from weather to the economy to increased conservation and efficiency.
>
> - Conservation and Revenue Stability: http://www.pacinst.org/wp-content/uploads/2013/01/water-rates-conservation_and_revenue_stability.pdf
> - Demand Forecasting: http://www.pacinst.org/wp-content/uploads/2013/01/water_rates_water_demand_forecasting.pdf
> - Affordability: http://www.pacinst.org/wp-content/uploads/2013/01/water-rates-affordability.pdf
> - Communication and education: http://www.pacinst.org/wp-content/uploads/2013/01/water-rates-communication_and_education.pdf

Effective Utility Management Resources: http://www.watereum.org/resources/

> *From the website*: On May 8th, 2007, six associations representing the U.S. water and wastewater sector, including the American Public Works Association, the American Water Works Association, the Association of Metropolitan Water Agencies, the National Association of Clean Water Agencies, the National Association of Water Companies, and the Water Environment Federation, in collaboration with the U.S. Environmental Protection Agency (EPA), signed a historic agreement pledging to support effective utility management collectively and individually throughout the water sector and to develop a joint strategy to identify, encourage, and recognize excellence in water and wastewater utility management.Mehan, T. G. III. (2011). "The Business of Water: It Is Time to Embrace a New Model for Water Services," *Daily Environment Report*. The Bureau of National Affairs, October 19, 2011. http://www.thehorinkogroup.org/pubs/BNAWater.pdf
>
> *From the introduction*: "Water utilities in America are facing the sobering truth that there is nowhere else to turn other than to a model of business self-sufficiency for the financial and technical resources necessary to carry out their mission, according to G. Tracy Mehan III, the author of this article. He says that in a strange twist of fate, water utilities must become more business-like in how they value their water, wastewater, and more critically, their very sophisticated and capital-intensive services. They will have to manage water demand as much as water supply, and price the resources effectively while accounting for the poor and needy within their service areas.

Declining Water Use and Adapting the Utility Business Model (continued)

Tiger, M. and S. Berahzer. (2010). Factsheet: Working Water Efficiency into the Utility Business Model. University of North Carolina, Environmental Finance Center, June 2010. http://www.efc.unc.edu/publications/2010/EfficiencyBusinessModel_factsheet.pdf

> This factsheet is subtitled "Striking a balance between revenue stability and water efficiency goals," and the target audience is identified as elected officials, City and County Managers, and Utility Managers. It discusses the conservation conundrum and the difficulties of decoupling rates and revenues, incentivizing customer efficiency, and maintaining affordability. It also explains water sector price elasticity of demand and the factors that determine customer responses to increased rates.

Pricing and Rate Structures

American Water Works Association. (2012). *Principles of Water Rates, Fees, and Charges*. Manual 1. Sixth Edition. http://books.google.com

> *From the AWWA website:* "This manual provides financial managers, water policymakers, and rate analysts with all relevant information needed to evaluate and select water rate structures, fees, charges, and pricing policies. The manual contains seven sections: 1. Overview of cost-based water utility rate making; 2. Revenue requirements; 3. Cost allocation; 4. Rate design; 5. Other rate issues; 6. Capacity and development charges; and 7. Implementation issues."

Beecher, J.A. (2010). *Glossary of Terms Used in Water Utility Regulation*. Michigan State University, Institute of Public Utilities, January 2010. http://www.ipu.msu.edu/research/pdfs/IPU%20Glossary%20of%20Terms%20in%20Water%20Regulation%20(2010).pdf

> This glossary was originally published as part of the Sourcebook of Regulatory Techniques for Water Utilities, prepared by Janice A. Beecher (NAWC, 2006).

Beecher, J.A. (2011). *Primer on Water Pricing*. Michigan State University, Institute of Public Utilities, November 1, 2011. http://ipu.msu.edu/research/pdfs/Primer-Water-Pricing-2011.pdf

> *Introduction:* "Sound pricing is essential to the sustainability of public utility services. Although many ratemaking guides are available, this Primer is intended to outline basic principles related specifically to water utilities. It is hoped that the principles outlined here will spark further inquiry and investigation by regulators, their staff and other professionals involved in providing water service and regulating this vital public utility."

Pricing and Rate Structures (continued)

Beecher, J.A. (2012). "The Ironic Economics and Equity of Water Budget Rates" *Journal AWWA.* February 2012. http://editiondigital.net/display_article.php?id=964244

> *From the introduction:* "Water budget rates are gaining attention in the water sector. Although clearly well-intended, the water budget approach to rates raises serious theoretical and practical issues familiar to applied regulatory economics. In essence, water budget rates exemplify "social ratemaking," that is, a system of pricing that departs from traditional economic standards in the interest of serving social goals—in this case water conservation. The inherent problem with this particular rate structure, however, is not its good intentions but its disconcerting implications. The troubling irony of water budget rates appears to be lost in the deliberation."

Berahzer, S. et al. (2012). Water and Sewer Rates and Rate Structures in Georgia. University of North Carolina, Environmental Finance Center, September 2012. http://www.efc.unc.edu/publications/2012/GA2012WaterSewerRatesReport.pdf

> Abstract: "This document details the results of a survey of water and sewer rates and rate structures conducted by the Georgia Environmental Finance Authority and the Environmental Finance Center in 2012. Rates and rate structures are analyzed for public water and sewer utilities throughout the State. For more information or to download a listing of water and sewer rate tables, to use interactive Rates Dashboards designed to allow the user to compare rates among groups of utilities and analyze the affordability of services and the extent to which rates are financially sustainable, or to view rate sheets of individual utilities, please visit www.gefa.org and www.efc.unc.edu."

Brandt, P. (2013). "Cost-Indexed Rate Increases," *Environmental Finance Center Blog*. University of North Carolina, Environmental Finance Center, March 14, 2013. http://efc.web.unc.edu/2013/03/14/cost-indexed-rate-increases/?doing_wp_cron=1369772123.9357590675354003906250

> *From the introduction:* "In today's political climate, it can be a challenge for a utility to gain approval from its governing body for a rate increase. Rate increases aren't especially popular, and approving rate increases, though necessary for a sustainable utility, is not generally good political practice. Regardless of whether the rate increases are approved, however, utility costs are increasing due to inflation, additional regulatory requirements, and the need to repair or replace aging infrastructure. Some utilities have begun to rely on indexed rate increases set in place to help increase the revenue stream without requiring annual approval by the governing body. With indexed rates, a utility's governing body approves annual rate increases based on a specified cost index (such as the Consumer Price Index) for a certain period of time. In theory, this approach allows the utility's revenue to increase without requiring the governing body to approve increases each year."

Pricing and Rate Structures (continued)

Eskaf, S. et al. (2013). Water and Wastewater Rates and Rate Structures in North Carolina. University of North Carolina, Environmental Finance Center, January 2013.
http://www.efc.unc.edu/publications/2013/NCLM_EFC_AnnualW&WWRatesReport-2013.pdf

> Abstract: "This report details the results of a survey of FY 12-13 water, irrigation and wastewater rates and rate structures conducted by the North Carolina League of Municipalities and the Environmental Finance Center at the UNC School of Government1. Rates and rate structures are analyzed for 507 local government, not-for-profit and multi-system for-profit utilities throughout the State. For more information, or to download tables of every rate structure and its computed bills, use interactive Rates Dashboards designed to allow you to compare rates using multiple selection criteria, and to view rate sheets of individual utilities, please visit www.nclm.org or www.efc.unc.edu/projects/NCWaterRates.htm."

Hughes, J. (2005). "The Painful Art of Setting Water and Sewer Rates," *Popular Government*. Spring-Summer 2005.
http://www.efc.unc.edu/publications/2005/PainfulArtOfSettingRates.pdf

> *Conclusion:* "Maintaining safe drinking water and environmentally sound sewer services is one of the most important responsibilities of a local government. As providing water and sewer services becomes more expensive, local governments face the constant challenge of balancing their interest in offering customers a fundamental public health service at an affordable price, against the necessity of managing their programs in a financially sustainable manner. Local leaders have an array of options allowing for local finance and revenue strategies that take into consideration local conditions and objectives. Despite these choices, managing water and sewer services inevitably involves asking customers to pay more for the services. As difficult as it is to do so, leaders should never lose sight of the inevitable health and environmental costs of failing to ensure that their water and sewer operations have sufficient financial resources to serve the public."

Tiger, M. and S. Eskaf. (2012). An Exploration of Alternative Business Models for the Beaufort-Jasper Water and Sewer Authority. University of North Carolina, Environmental Finance Center, July 2012.
http://www.efc.unc.edu/publications/2012/AlternativeModels.pdf

> Abstract: "This report explores the legal, financial and practical implementation of unique pricing models that better align revenue stability and customer water conservation for the Beaufort-Jasper Water and Sewer Authority in South Carolina. It defines the structure and potential challenges of five pricing models. Appendix A provides great detail on the alternative selected by BJWSA staff for deeper analysis: the PeakSet Base Model."

Affordability

Beecher, J.A. (2013). *Consumer Expenditures on Utilities in 2011*. Michigan State University, Institute of Public Utilities, March 2013. http://www.ipu.msu.edu/research/pdfs/IPU%20Consumer%20Expenditures%20on%20Utilities%202011%20(2013).pdf

> *From the introduction*: "The Bureau of Labor Statistics (BLS) of the U.S. Department of Labor publishes annual data on household expenditures. This research note summarizes 2010 and time series data on utility expenditures extracted from the BLS website (www.bls.gov). Expenditures are reported here in absolute terms and relative to total household expenditures. The data are also reported along several demographic dimensions. Utility expenditures are divided by total household expenditures instead of income because total household expenditures may exceed income before taxes for lower income households."

Beecher, J.A. (2013). *Trends in Consumer Prices (CPI) for Utilities Through 2012*. Michigan State University, Institute of Public Utilities, February 2013. http://ipu.msu.edu/research/pdfs/IPU%20Consumer%20Price%20Index%20for%20Utilities%202012%20(2013).pdf

> *From the introduction:* "The Consumer Price Index (CPI) is used to measure the average change over time in prices paid by urban consumers in the United States for a market basket of consumer goods and services.1 This research note summarizes the annual CPI data focusing on public utility services and how they compare over time with each other and with other major household expenditures. Inflation can be a significant issue for utility services, which are highly essential, relatively price inelastic, and generally regressive in terms of cost impact on households."

Eskaf, S. et al. (2013). ""Percent MHI" Indicator of Affordability of Residential Rates: Using the U.S. Census Bureau's Median Household Income Data," *Environmental Finance Center Blog*. University of North Carolina, Environmental Finance Center, January 9, 2013. http://efc.web.unc.edu/2013/01/09/percent-mhi-indicator-of-affordability-of-residential-rates-using-the-u-s-census-bureaus-median-household-income-data/

> *From the introduction:* ""Percent MHI" has become a popular indicator for utilities, agencies and organizations across the country…Although different groups have their own unique interpretation of the resulting value, the calculation is relatively standard. One of the two variables needed to calculate this indicator – the Median Household Income (MHI) – is usually obtained from the U.S. Census Bureau and taken on face value. Digging deeper into this variable, however, reveals that it is not as simple as most people consider it to be. Using the Census Bureau's MHI as-is automatically builds in important qualifications into the Percent MHI indicator that could significantly affect the interpretation of its value."

Hughes, J. et al. (2013). "Water Services are Cheap, Right? Maybe Not for Everyone…," Environmental Finance Center Blog. University of North Carolina, Environmental Finance Center, May 29, 2013. http://efc.web.unc.edu/2013/05/29/water-services-are-cheap-right-maybe-not-for-everyone/

> The author uses data from the 2004 and 2012 AWWA-RFC rate survey to illustrate how "[c]ommunity wide MHI has several shortcomings as a water affordability indicator — it masks income distribution within a community and discounts the low-income part of a community curve…The analysis highlights the evolution of spending pressure for low income families over the last 8 years with many families that had been paying less than 2% of their income in 2004, now paying 3% or higher."

Affordability (continued)

Environmental Protection Agency (EPA) Documents, Correspondence, and Resources:

- Memorandum from Office of Water to regional offices, "Assessing Financial Capability for Municipal Clean Water Act Requirements," January 13, 2013. http://www.epa.gov/npdes/pubs/sw_regionalmemo.pdf
- "Final Integrated Municipal Stormwater and Wastewater Planning Approach Framework," June 5, 2012. http://cfpub.epa.gov/npdes/integratedplans.cfm
- "Combined Sewer Overflows: Guidance for Financial Capability Assessment and Schedule Development," March 1997. http://www.epa.gov/npdes/pubs/csofc.pdf
- "Affordability Criteria for Small Drinking Water Systems: An EPA Science Advisory Board Report," December 2002. http://water.epa.gov/infrastructure/drinkingwater/pws/upload/Affordability-Criteria-for-SDWS.pdf

National Association of Clean Water Agencies (NACWA) Affordability-Financial Capability: http://www.nacwa.org/index.php?option=com_content&view=article&id=791&Itemid=103

- "The Evolving Landscape for Financial Capability Assessment, Clean Water Act Negotiations and the Opportunities of Integrated Planning," May 2013. http://www.nacwa.org/images/stories/public/2013-05-31fcalandsapesipdesign.pdf

United States Conference of Mayors, Mayors Water Council Publications and Newsletters: http://usmayors.org/urbanwater/publications.asp

- "Trends in Local Government Expenditures on Public Water and Wastewater Services and Infrastructure: Past, Present, and Future," February 2010. http://www.usmayors.org/publications/201002-mwc-trends.pdf

United States Conference of Mayors, American Water Works Association, and Water Environment Federation:

- "U.S. Conference of Mayors, American Water Works Association and Water Environment Federation Champion Affordability for Low-Income Water Customers (Press Release), " May 29, 2013.

  USCM: http://usmayors.org/pressreleases/uploads/2013/0529-release-WaterAffordability.pdf

  AWWA: http://www.awwa.org/resources-tools/public-affairs/press-room/press-release/articleid/1302/u-s-conference-of-mayors-american-water-works-association-and-water-environment-federation-champion-affordability-for-low-income-water-customers.aspx

  WEF: http://www.wef.org/about/page.aspx?id=12884903243

- "Assessing the Affordability of Federal Water Mandates," May 2013.

  USCM web page: http://usmayors.org/urbanwater/

  AWWA web page: http://www.awwa.org/resources-tools/water-utility-management/affordability-assessment.aspx

  Joint Issue Brief, "Assessing the Affordability of Federal Water Mandates" http://www.awwa.org/Portals/0/files/resources/water%20utility%20management/affordability/Affordability-IssueBrief.pdf

Affordability (continued)

Full Report, "Affordability Assessment Tool for Federal Water Mandates"
http://www.awwa.org/Portals/0/files/resources/water%20utility%20management/affordability/AffordabilityAssessmentTool.pdf

Workbook 1:
http://www.awwa.org/Portals/0/files/resources/AffordabilityWorkbook1.xlsx

Workbook 2:
http://www.awwa.org/Portals/0/files/resources/water%20utility%20management/affordability/Affordability-Workbook2.pdf

Workbook 3:
http://www.awwa.org/Portals/0/files/resources/AffordabilityWorkbook3.xlsx

Workbook 4:
http://www.awwa.org/Portals/0/files/resources/AffordabilityWorkbook4.xlsx

Workbook 5:
http://www.awwa.org/Portals/0/files/resources/AffordabilityWorkbook5.xlsx

WEF web page: http://www.wef.org/AffordabilityTools/

Affordability Issue Brief:
http://www.wef.org/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=12884903235&libID=12884903208

Affordability Assessment Tool:
http://www.wef.org/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=12884903236&libID=12884903209

Workbook 1, Cost per Household:
http://www.wef.org/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=12884903237&libID=12884903210

Workbook 2, Accessing American Community Survey Data at the Community, National, and Census-Tract Levels:
http://www.wef.org/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=12884903241&libID=12884903214

Workbook 3, Socioeconomic Indicators:
http://www.wef.org/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=12884903240&libID=12884903213

Workbook 4, Developing Alternative Metrics:
http://www.wef.org/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=12884903238&libID=12884903211

Workbook 5, EPA's Secondary Screening Analysis:
http://www.wef.org/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=12884903239&libID=12884903212

Rates Dashboards

Environmental Finance Center, University of North Carolina rates dashboards:
http://efc.unc.edu/RatesDashboards/

> *From the website*: These free, interactive Rates Dashboards are designed to assist utility managers and local officials to analyze residential water and wastewater rates against multiple characteristics, including: utility finances; system characteristics; customer base socioeconomic conditions; geography, and history. The Rates Dashboards are tools designed and produced by the Environmental Finance Center as part of projects to annually survey and analyze rates data from different states. Rates data are collected from approximately 85-90% of all local governments and non-profit utilities in half of these states. Other products from the rates analyses include annual reports and tables of rates across the state, and copies of the hundreds of rate sheets analyzed. All of this information is provided free of charge on our website. The rates surveys are conducted in partnership with state agencies in different states.
>
> Georgia (2012 Rates): http://efc.unc.edu/RatesDashboards/ga.htm
>
> North Carolina (2013 Rates): http://efc.unc.edu/RatesDashboards/nc.html
>
> South Carolina (2008 Rates): http://efc.unc.edu/RatesDashboards/sc.html
>
> Texas (2012 Rates): http://efc.unc.edu/RatesDashboards/tx.html
>
> Virginia (2012 Rates): http://efc.unc.edu/RatesDashboards/va.html
>
> Canada (2013 Rates): http://efc.unc.edu/RatesDashboards/Canada_NWWBI.html

Infrastructure Needs

American Society of Civil Engineers: http://www.asce.org/

- 2013 Report Card for America's Infrastructure: http://www.infrastructurereportcard.org/
- 2009 Virginia Infrastructure Report Card: http://www.infrastructurereportcard.org/a/#p/state-facts/virginia
- American Society of Civil Engineers. (2013). Failure to Act. http://www.asce.org/failuretoact/

  From the website: ASCE's Failure to Act economic report series shows the economic consequences of continued underinvestment in our nation's infrastructure, and the economic gains that could be made by 2020 in terms of GDP, personal disposable income, exports, and jobs if we choose as a country to invest in our communities.

  Full Report: http://www.asce.org/uploadedFiles/Infrastructure/Failure_to_Act/Failure_to_Act_Report.pdf

  Water and Wastewater Technical Appendix: http://www.asce.org/Infrastructure/Failure-to-Act/Water-and-Wastewater/
- American Society of Civil Engineers. (2009). Guiding Principles for the Nation's Critical Infrastructure. http://www.asce.org/Infrastructure/Guiding-Principles-for-the-Nation-s-Critical-Infrastructure/?terms=guiding+principles

  Full Report: http://www.asce.org/uploadedFiles/Infrastructure_-_New/GuidingPrinciplesFinalReport.pdf

American Water Works Association (AWWA): http://www.awwa.org/

- American Water Works Association. (2012). Buried No Longer: Confronting America's Water Infrastructure Challenge. http://www.awwa.org/legislation-regulation/issues/infrastructure-financing/buried-no-longer-campaign.aspx

  From the website: AWWA's 2012 report, "Buried No Longer: Confronting America's Water Infrastructure Challenge" shows the cost of repairing and expanding U.S. drinking water infrastructure will top $1 trillion in the next 25 years. The report is an excellent tool for bringing national perspective to your local water infrastructure situation. Buried No Longer analyzes many factors, including timing of water main installation and life expectancy, materials used, replacement costs and shifting demographics.

  Full Report: http://www.awwa.org/Portals/0/files/legreg/documents/BuriedNoLonger.pdf

  Briefing Matrix (adapt for use with legislators, editorial boards or other audiences): http://www.awwa.org/Portals/0/files/resources/public%20affairs/docs/BNLBriefingMatrix.docx

  PowerPoint Template: http://www.awwa.org/Portals/0/files/resources/public%20affairs/docs/BNLPowerPointOutline.pptx

  Op-ed Piece: http://www.awwa.org/Portals/0/files/resources/public%20affairs/docs/BNLOpEdPiece.docx

Infrastructure Needs (continued)

Green For All: http://greenforall.org/

From the website: Green For All is dedicated to improving the lives of all Americans through a clean energy economy. We work in collaboration with the business, government, labor, and grassroots communities to increase quality jobs and opportunities in the green industry – all while holding the most vulnerable people at the center of our agenda.

- Green For All, 2011. "WATER WORKS: Rebuilding Infrastructure, Creating Jobs, Greening the Environment." http://greenforall.org/focus/water/water-works-rebuilding-infrastructure-creating-jobs-greening-the-environment/
  From the website: Want to create 1.9 million American jobs and add $265 billion to the economy? Upgrade our water infrastructure. That's the message of Water Works: Rebuilding Infrastructure, Creating Jobs, Greening the Environment, a report by Green For All, in partnership with American Rivers, Pacific Institute, and the Economic Policy Institute.

Public Outreach Tools

American Water Works Association, "Only Tap Water Delivers" Campaign: http://www.awwa.org/resources-tools/public-affairs/communications-tools/only-tap-water-delivers.aspx

Penn State Public Broadcasting, "Liquid Assets" Documentary Film and Public Media Outreach Initiative: http://liquidassets.psu.edu/index.html

- 90-minute Documentary: http://liquidassets.psu.edu/the_film/index.html
- Community Toolkit and Outreach Guide: http://liquidassets.psu.edu/outreach/community_toolkit.html

Water Environment Federation, "Water's Worth It" Campaign: http://www.waters-worth-it.org/

From the website: WATER'S WORTH IT® is a broad-based messaging campaign that helps to answer the question about how our actions, attitudes, and the things we most value are so closely connected with water. The campaign aims to inform a range of audiences, including the general public, media, opinion leaders, decision-makers, and elected officials.

- ToolKit: http://www.waters-worth-it.org/get-started/
- Brochure
- Fact Sheets format 1
- Fact Sheets format 2

Xylem, "2012 Value of Water" Index and Reports: http://www.xyleminc.com/valueofwater/index.html

- Highlights: http://www.xyleminc.com/valueofwater/media/2012_Value_of_Water_Index_Highlights.pdf
- Interactive Report: http://www.xyleminc.com/valueofwater/report/index.html
- Infographic: http://www.xyleminc.com/valueofwater/media/Value%20of%20Water_Infographic_8.5x11.pdf

Credit and Finance

Summary of Credit Rating Agencies			
Ratings Service	**Rating Criteria**	**Rating System**	
Fitch Ratings	US Water and Sewer Revenue Bond Criteria (August 2011)	AAA AA A BBB	+ / -
Standard & Poor's Ratings Services	Standard and Poor's Public Finance Criteria (2007)	AAA AA A BBB	+ / -
Moody's Investors Service	Rating Methodology, Analytical Framework For Water and Sewer System Ratings (August 1999)	Aaa Aa A Bb	1, 2, 3
Adapted from Hughes, J. (2013). "Proactive Steps to Improving Financial Resiliency." Presentation to Water and Sewer Infrastructure Funding Strategies Course, School of Government, University of North Carolina, March 5, 2013. http://efc.unc.edu/training/2013/waterfinance/hughesfinancialresilience.pdf			

Ernst & Young Global Limited. (2013). "The US water sector on the verge of transformation." Global Cleantech Center white paper. 2013. http://www.ey.com/GL/en/Industries/Cleantech/The-US-water-sector-on-the-verge-of-transformation

> *From the introduction*: "The US faces several major water challenges, the impacts of which are beginning to be felt across industries: increasing water scarcity, aging infrastructure, climate volatility, water quality issues and rising water-related energy risks. To address these immense challenges effectively, the water and wastewater sectors must address underlying structural and financial impediments that hamper the adoption of system innovation and efficiency-focused strategies.

Hughes, J. et al. (2012). "Rate and Revenue Trends You Should Care About." Presentation to 2012 Council of Infrastructure Financing Authorities (CIFA), State Revolving Fund (SRF) National Workshop, November 12, 2012. http://cifanet.org/documents/12Work/JeffHughes.pdf

Leurig, S. (2010). *The Ripple Effect: Water Risk in the Municipal Bond Market*. A Ceres Report, October 2010. http://www.ceres.org/resources/reports/water-bonds/view

> *From the website*: "Growing water scarcity in many parts of the United States is a hidden financial risk for investors who buy the water and electric utility bonds that finance much of the country's vast water and power infrastructure, according to this first-ever report by Ceres and Water Asset Management. The report evaluates and ranks water scarcity risks for public water and power utilities in some of the country's most water-stressed regions, including Los Angeles, Phoenix, Dallas and Atlanta."

Credit and Finance (continued)

Leurig, S. (2012). *Water Ripples: Expanding Risks for U.S. Water Providers*. A Ceres Report, December 2012. http://www.ceres.org/resources/reports/water-ripples-expanding-risks-for-u.s.-water-providers/view

> *From the website*: "As numerous western states are considering massive new water supply projects, a new Ceres report is suggesting caution. Citing shrinking federal funds, uncertain water demand and declining revenues to pay for the projects, the report recommends that utilities move carefully before embarking on major pipelines, reservoirs and other new infrastructure that will create financial risks for investors and utility customers alike."

Standard & Poor's Ratings Service. (2012). "Water: The Most Valuable Liquid Asset?" *CreditWeek*, *CreditMatters Multimedia Edition*. March 2012. http://www.standardandpoors.com/spf/swf/water/data/document.pdf

> This edition of *CreditWeek* includes a feature articles, including "Is the U.S. Water Sector Approaching a Tipping Point?," "From Droughts to Conservation, Water Can Have Big Effects on U.S. Municipal Utility Credit Quality," and U.S. Municipal Water and Sewer Utilities: Funding Long-Term Needs Remains Their Biggest Risk."

The Johnson Foundation at Wingspread. (2012). *Financing Sustainable Water Infrastructure*. Charting New Waters Convening Report. January 2012. http://www.johnsonfdn.org/sites/default/files/reports_publications/WaterInfrastructure.pdf

> *From the website*: "As part of our work with Charting New Waters, we have focused on discovering different approaches to financing structures that incorporate new perspectives and input. The *Financing Sustainable Water Infrastructure* report is the product of a meeting convened by The Johnson Foundation, in collaboration with American Rivers and Ceres, that brought together a group of experts to discuss ways to drive funding toward the infrastructure needed for the 21st century. The report has led to testimony before Congress, amid other important work."

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