Alternative Financing Mechanisms to Restore, Rebuild, and Adapt U.S. Water & Wastewater Infrastructure

Assessing the Potential for Public-Private Innovation to Reinvest in Municipal Infrastructure

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August 2014

EXECUTIVE SUMMARY

U.S. cities and their water and wastewater enterprises face the daunting challenge of upgrading failing infrastructure, complying with environmental regulations, and adapting to increasingly severe droughts and precipitation events, all within a constrained fiscal environment defined by low public appetite for rate adjustment. Just as changing conditions demand innovation in water and wastewater management, many utilities are seeing their expertise retire out and have limited funds, risk tolerance, and bench strength for these necessary adaptations.

Innovating upon the conventional public procurement, financing, and operating model to better match the fiscal and technological demands of the time is an achievable objective. Though the pure public approach has delivered high quality infrastructure and service in municipalities throughout the country historically, it now presents unique obstacles to the urgently needed restoration and adaptive upgrade of the nation’s water and wastewater infrastructure. With the adoption of globally-proven best practices in public-private delivery, the performance benefits of private financing, risk-transfer, and accountability and global expertise in infrastructure design can be incorporated under the public umbrella of municipal utilities without privatization.

The lifecycle cost advantages of a public-private approach can be significant, and as is common internationally, may be evaluated objectively in a side-by-side public-private comparator before implementation. Issues faced by utilities including retiring operator expertise, relatively slow uptake of innovative technologies and practices, and the siloing of design engineering and operations can all increase lifecycle costs of water and wastewater infrastructure under the purely public model. The widespread lack of a timely, decisive public process for implementing infrastructure upgrades combined with the reluctance to approve related rate increases results in underinvestment in infrastructure and the resulting accrual of deferred maintenance costs. In an era of increasingly constrained municipal resources and an urgent need to maximize the return on all investments, these shortcomings may present an unacceptable loss of economic value and undermine the ability of water utilities to adapt to changing climate conditions.

A public-private finance and expertise model has the potential to circumvent these challenges for certain public water and wastewater agencies and has particular relevance for utilities located in either drought-impacted regions with high dependence on imported water or in areas subject to severe weather events that may compromise stormwater and wastewater system integrity. Utilities that face conditions of water scarcity, either erratically or persistently, and are subject to rate increases from regional wholesalers over which they have little control, have a greater imperative to innovate, limit expenditures, build independence, and operate efficiently. Storm-susceptible utilities, on the other hand, are tasked with raising rates to support infrastructure improvements that may be of value infrequently and unpredictably, at a time when all municipal dollars are under strain. The ability of the public-private finance and expertise model to provide needed capital, achieve significant integrated construction and operational savings, limit overall rate increases and related political battles, and potentially stabilize broader municipal finances provides an attractive and long-lived solution to the persistent challenges facing these municipalities and their water, wastewater, and stormwater enterprises.

This opportunity is derived from the following convergence of otherwise disparate trends:

1. There is a severe municipal water and wastewater infrastructure investment deficit;
2. Strained general funds and risk of municipal insolvencies bring new openness to private partnerships;
3. The need for job creating infrastructure investment on the one hand and job preservation against further municipal layoffs on the other creates new opportunities for labor support, traditionally a primary barrier to public private partnership (P3) adoption;
4. The ancillary benefits of P3 concession (tangible local economic investment with upfront payment; stabilized credit ratings through reserve restoration; structural deficit remedies; pension solutions; cost-savings/efficiencies) all help get long-needed rate increases over the political threshold and unlock essential CIP investment at last;
5. The private sector's innovative technologies and practices in water and wastewater management were previously made available only in large-cap cities where commercially justified; These global best practice innovations can now be deployed in mid-cap cities on a commercially viable basis, through the long-term commitment and economics of a 30-50 year CIP and operations engagement for firms;
6. The convention by engineers of building redundancy into the system to account for uncertainty of expertise over time with a public operator can be eliminated with the certainty of a 30-50 year private O&M agreement. More sophisticated, adaptive systems are also made possible with the certainty of expertise under a long-term private O&M;
7. Essential water and wastewater infrastructure investment is notoriously subject to political shifts and election cycles. The P3 concession model locks into place a 30-50 year contractual commitment to invest in and maintain the health, efficiency, and overall performance of the systems that were financed. Infrastructure decision-making suits a buy-and-hold P3 investment timeframe, not an election cycle timeframe;
8. Adaptive, resilient infrastructure may have a longer "payback" period than conventional systems. A 30-50 year financial model, as opposed to a municipal analysis under political review, can accurately risk-assess and manage the value of the longer view infrastructure investment and plan for a wider range of risk factors such as climatological change;
9. The search by private capital for sturdy, fixed long-term yield in a time of historically low returns and bond volatility favors private investment in public infrastructure.

This paper focuses on how the public-private finance model is positioned to address the country's inventory of water, wastewater, and stormwater infrastructure needs, advance resilient infrastructure solutions, and bring financial stability and flexibility to municipal finances.

CHALLENGES FACING THE U.S. WATER & WASTEWATER SECTOR

Infrastructure Investment Deficit

There is a severe investment deficit in municipal water and wastewater infrastructure across the U.S. On average, the country's municipal water infrastructure is more than 50 years old, and pipes and water mains in parts of the country have been in place for more than a century.[1] As a result, many systems are crumbling with age and inadequate upkeep, leading to costly emergency repairs and service outages. There are 240,000 water main breaks in the U.S. every year and up to 75,000 leaks of untreated waste from sanitary sewer lines.[2,3] In addition, approximately forty-six million Americans are served by combined sewer systems, which carry untreated sewage and stormwater in the same pipe and routinely overflow during storm events. The EPA estimates that 850 billion gallons of untreated sewage and stormwater are released from these systems annually.[4]

Deferring capital expenditures and maintenance reduces near-term expenditures but can increase overall infrastructure costs in the long-term. Aging pipes that are not properly maintained or replaced on schedule fail with greater frequency and require costly emergency repairs. They can also threaten public health and safety, disrupt the local economy, and cause costly damages where flooding occurs or sinkholes form.[5] Deferred maintenance only adds to the financial challenges utilities face in the long-term.

Climate Change Impacts

A second major challenge is the interconnected suite of changes to the water cycle brought about by climate change. In recent decades rising temperatures have been consistently linked to a number of observed changes in the hydrological cycle across the U.S. ranging from shifts in the temporal and spatial distribution of precipitation to more severe and frequent storms and droughts and shrinking snowpack and glaciers.[6] Climate models project a continuation of these trends as temperatures rise further, and particularly vulnerable regions such as the Southwest U.S. may transition to a new normal defined by perpetual drought.[7] Models also predict a

[1] American Society of Civil Engineers. 2013 Report Card for America's Infrastructure. 2013.
[2] Ibid.
[3] U.S. EPA, *Report to Congress: Impacts and Control of CSOs and SSOs*, Office of Water EPA 833-R-04-001, 2004 at 4-13 and 4-18.
[4] Ibid.
[5] American Water Works Association. Buried No Longer: Confronting America's Water Infrastructure Challenge. 2012.
[6] T.R. Karl, J.M. Melillo, and T.C. Peterson, Eds., *Global Climate Change in the United States.* U.S. Global Change Research Program, New York, 2009.
[7] R. Seager et al. Model Projections of an Imminent Transition to a More Arid Climate in Southwestern North America. *Science.* 316, 2007.

continued rise in precipitation intensity, leading to an increase in the frequency and severity of storms and droughts.[8]

These shifts in the hydrological cycle will have dramatic impacts on water and wastewater utilities. Reduced snowpack, increased evaporation, and more frequent droughts are expected to threaten water supply in many parts of the country and increase competition among water users.[9] Increasingly powerful storms will trigger more frequent and severe floods,[10] lead to rising levels of polluted stormwater and sewer overflows,[11] and make water and wastewater treatment more difficult and more costly.[12] Water supply, wastewater treatment, and flood control infrastructure require significant investment not only to repair years of neglect but also to adapt to shifting precipitation patterns and increasingly extreme weather events.

Water agencies that are located in arid areas and are highly dependent on regional water wholesalers face a particularly difficult set of challenges as they may be subject to considerable cost increases over which they have little control, especially as costly adaptation projects are required. Regional water wholesalers such as the San Francisco Public Utilities Commission (SFPUC) and the Metropolitan Water District maintain extensive water supply systems and pass costs onto neighboring water utilities based on the expenses they incur to deliver that water. When a wholesaler makes significant investments in the water supply system, rates for end customers rise in response. For example, SFPUC projects that wholesale water rates will increase 55% between 2013 and 2018.[13] This presents a challenge for utilities as they must pass on costs over which they have little control while often still needing to invest significant resources in local distribution and collection systems.

One high-profile example of this dynamic can be found in the Las Vegas metro area. The Southern Nevada Water Authority, the regional agency that serves Las Vegas and nearby cities, derives nearly all of its water from Lake Mead. As water levels in the reservoir have decreased in recent years, there has been an increased risk that the city's water intakes will be exposed, which would limit the agency's ability to supply the region's residents with water. As a result, SNWA is undertaking an $800 million project to create a third, lower intake to reduce this risk. Local

[8] T.R. Karl et al. Eds., *Observed Changes in Weather and Climate Extremes in Weather and Climate Extremes in a Changing Climate. Regions of Focus: North America, Hawaii, Caribbean, and U.S. Pacific Islands*. U.S. Climate Change Science Program, Washington, DC, 2008.

[9] T.R. Karl, J.M. Melillo, and T.C. Peterson, Eds., *Global Climate Change in the United States.* U.S. Global Change Research Program, New York, 2009.

[10] P.C.D. Milly, R.T. Wetherald, K.A. Dunne, and T.L. Delworth. Increasing Risk of Great Floods in a Changing Climate. *Nature*. 415, 2002.

[11] U.S. E.P.A. *A Screening Assessment of the Potential Impacts of Climate Change on Combined Sewer Overflow Mitigation in the Great Lakes and new England Regions.* EPA, Washington, D.C., 2008.

[12] NACWA. *Confronting Climate Change: An Early Analysis of Water and Wastewater Adaptation Costs.* NACWA, Washington, D.C., 2009.

[13] Romanow, Kerrie. Municipal Water System Water Rate Increase for 2013-2014. City of San Jose. May 15, 2013. http://sanjoseca.gov/DocumentCenter/View/17707

water agencies are bearing the cost of this and other infrastructure upgrades which will cost nearly $3 billion over 15 years. SNWA has increased wholesale rates on a number of occasions in the past decade including a 14% increase for the average household by 2017.[14] This creates a greater imperative to innovate, limit expenditures, build independence, and operate efficiently.

Funding Challenges

Adding to this challenge, many municipalities struggle to make the significant capital investments needed to maintain and upgrade systems while maintaining affordable rates. While federal appropriations enabled initial construction of much of the nation's water and wastewater infrastructure, current levels of federal funding are clearly inadequate to maintain and upgrade infrastructure systems. Over the next 20 years, the estimated need for investment in water infrastructure in the U.S. totals $384 billion.[15] Other estimates place the need for drinking water infrastructure investment at over $1 trillion through 2035.[16] Wastewater systems will require $298 billion of investment.[17] In 2012, the Clean Water and Drinking Water State Revolving Funds – low interest loan programs that are the primary source of federal water and wastewater infrastructure financing – received a combined appropriation of $2.5 billion. This infrastructure funding shortfall is compounded by across-the-board cuts in federal and state aid to local governments which places additional strain on broader municipal finances and makes it less likely that local funds will be available for infrastructure upgrades. From 2008 to 2012, 32 states cut aid to municipalities.[18] For local governments, the "new normal" is defined by reduced state and federal assistance and tighter municipal budgets.[19]

The infrastructure investment deficit is also driven in part by unfavorable economic trends at the local level. Falling real estate values and rising unemployment throughout the financial crisis led to lower property tax, income tax, and sales tax revenues while the demand for services grew in response to economic distress. This placed strain on general funds and depleted fiscal reserves across the country. While national economic statistics continue to trend upward, challenges remain for many municipalities. Local general fund revenues declined 0.9% in 2012, which marked the sixth straight year of declines.[20] Much of this is driven by stagnant property tax assessments, which typically lag behind the housing market. Local property tax revenues declined again in 2013 for the fourth straight year.[21] Local and state governments as a whole face

[14] Shine, Conor. "Water Authority Oks Rate Hike, Raising Residents' Water Bills." *Las Vegas Sun.* September, 26, 2013.
[15] US EPA. Drinking Water Infrastructure Needs Survey and Assessment: Fifth Report to Congress. April 2013.
[16] American Water Works Association. Buried No Longer: Confronting America's Water Infrastructure Challenge. 2012.
[17] US EPA Clean Watersheds Needs Survey 2008: Report to Congress.
[18] National Association of State Budget Offices. http://www.governing.com/columns/mgmt-insights/col-managing-state-local-government-fiscal-uncertainty.html
[19] Joyce, Philip. Managing through Endless Fiscal Uncertainty. Governing. April 17, 2013. http://www.governing.com/columns/mgmt-insights/col-managing-state-local-government-fiscal-uncertainty.html
[20] Pagano, Michael and Christiana McFarland. City Fiscal Conditions in 2013. League of Cities. October 2013.
[21] Ibid.

an operating deficit that is expected to increase steadily over the next 50 years.[22] While most water and wastewater agencies are operated as enterprise funds, infrastructure investments can be crowded out by other priorities and reluctance to raise needed revenues in the face of uncertain economic trends.

CHALLENGES FOR THE PUBLIC OWNERSHIP AND OPERATIONS MODEL

The majority of water and wastewater systems in the U.S. are publicly owned and operated, and many provide exceptional service and are staffed with highly trained and dedicated employees. However, there are certain dynamics inherent in the public ownership and operations model that produce suboptimal outcomes, hinder timely investment in needed infrastructure upgrades, and may present an obstacle to building resilience to the impacts of climate change. These challenges unique to the traditional public procurement model are outlined below.

Operational & Design Challenges

One major challenge for publicly owned and operated water and wastewater agencies is driven by the split between public operation and private design and construction of water and wastewater infrastructure. In the traditional public own and operate water utility model, a private partner is hired to design and build treatment plants and collection or distribution systems. The public entity is responsible for operating the system upon completion, and future operators' level of expertise over the life of the project is unknown. As a result, the design of municipal systems is often more conservative with multiple redundancies built in to account for the need to reduce risk, the uncertain availability of funding for regular repair and replacement over the long term, and operator retention issues. As a result, the capital investment required can be significantly higher and operating efficiencies might be lower than they otherwise would be under an integrated approach to design and operations.

These challenges are exacerbated in water and wastewater agencies located outside of major cities. Nationwide there is a shortage of highly-trained system operators.[23] The population of operators and engineers is aging and many have been retiring in recent years. Not surprisingly, the key determinants of job selection are salary and benefits, which in most cases attracts the best operators to larger utilities with greater financial resources. As a result, operator shortages are felt most acutely outside of the major water agencies where there are fewer resources with which to compensate talented employees. Furthermore, it is common for water agencies in urban areas to source new staff from surrounding utilities, which perpetuates the concentration of expertise in

[22] GAO. State and Local Governments' Fiscal Outlook: April 2013 Update.
[23] Manning et al. Workforce Planning for Water Utilities – Successful Recruiting, Training, and Retaining of Operators and Engineers. Water Research Foundation, 2009.

larger systems.[24] This in turn can influence the design and associated costs of water and wastewater system in areas with more limited operator expertise.

An added challenge for these utilities is the questionable commercial viability of smaller design-and-build projects for engineering firms. Many smaller upgrades may not prove sufficiently attractive given the resources needed to pursue a request for proposal (RFP). For this reason, leading engineering firms with the greatest expertise in infrastructure best management practices (BMPs) may not pursue smaller contracts. The result of these dynamics is a multi-tiered system wherein innovative technology and BMPs are available to larger systems but not to small and medium-sized utilities. This can inhibit the latter group's ability to operate efficiently and adapt to changing conditions, which in turn leads to higher rates and worse public health outcomes.

Political Challenges

Political challenges can be a significant obstacle to the costly upgrades that are needed to maintain and upgrade water and wastewater systems in many communities. There are numerous examples of public opposition to rate increases despite the fact the public generally expects water and wastewater services to continue with very little tolerance for interruption. Water rate increases have played prominent roles in mayoral and city council races. The 2013 mayoral race in Annapolis, MD, for example, revolved in large part around the challenger's pledge to reverse water rate increases implemented by the incumbent, who ultimately lost the race. A number of California cities have recalled council members due to water and wastewater rate increases.

Political challenges associated with water infrastructure upgrades are caused in part by the widely divergent lifespan of political careers and infrastructure systems. Virtually all municipalities limit mayoral terms to four years or fewer.[25] Nearly two-thirds of city council members receive four year terms.[26] Water and wastewater infrastructure, on the other hand, has a lifespan lasting decades. The appropriate timeframe for infrastructure planning is 30-50 years. Future upkeep and replacement costs over that time period should be taken into account, not simply upfront costs, in order minimize lifecycle costs. This creates a disconnect between the length of the political cycle and infrastructure systems, whereby policymakers do not have an incentive to make the right decision for infrastructure systems that will almost certainly outlast their political career. It instead creates an incentive to oppose upgrades or support the alternative with the lowest upfront costs to minimize near-term rate increases. The lack of an independent mechanism to address infrastructure needs as they arise forces utilities to operate less efficiently and incur costs from deferred maintenance.

[24] Isbell et al. Recruit and Train Great Employees: Proven Approaches You Can Implement Now to Address the Workforce Gap. AWWA, 2008.

[25] Moulder, Evelina. "Municipal Form of Government: Trends in Structure, Responsibility, and Composition." In *The Municipal Year Book, 2008*. Washington, DC: International City/County Management Association, 2008.

[26] Ibid.

Financing Challenges

While many water and wastewater systems can access financing to make needed infrastructure investments, smaller publicly owned and operated municipalities may face additional challenges in financing capital improvements. Large jurisdictions are better able to finance projects through ratepayer revenues, have better credit ratings, and borrow larger amounts, all of which help them access capital markets.[27] Small jurisdictions present a greater credit risk and may issue debt too infrequently and in amounts too small to attract significant interest from institutional buyers. Given the shortage of federal capital for infrastructure investments, the lack of access to bond markets leaves smaller jurisdictions with few financing options for capital improvement projects.[28] At the least, it can increase the cost of capital. Tax exempt bonds level this playing field to some extent and allow smaller municipalities greater access to affordable capital than would otherwise be the case,[29] but accessing sufficient resources remains a significant challenge for many smaller jurisdictions.

This is compounded by the higher per capita infrastructure costs and greater fiscal challenges in smaller municipalities. In rural areas, there are not only fewer ratepayers but also lower population density, which requires more per capita miles of pipe for distribution and collection. Small water utilities also have the highest operating expenses and are less able to fully recover costs through service rates than medium and large water agencies.[30] These dynamics will cause rates to rise fastest in smaller municipalities. Households in these areas will see annual water rates increases of $550 by the 2030s compared to a cost increase of $75-$100 per household in larger systems.[31] Furthermore, smaller communities have greater existing fiscal challenges, on average. These dynamics all combined to undermine utilities' credit worthiness and raise the cost of capital, where it is available.

PUBLIC-PRIVATE FINANCE & EXPERTISE MODEL

For qualifying systems that meet basic credit parameters, public-private financing and expertise can offer a compelling resolution to the challenges that publicly owned and operated water and wastewater utilities face. It allows them to integrate advanced technology and operational expertise into the system, lower overall operational and capital improvement costs, and consolidate difficult political challenges into a single decision point with a commitment to

[27] Pearson, Mark. U.S. Infrastructure Finance Needs for Water and Wastewater. Rural Community Assistance Partnership. http://www.rcap.org/sites/default/files/rcap-files/Infrastructure%20Finance.pdf

[28] Gomez, J. Alfredo. Approaches and Issues for Financing Drinking Water and Wastewater Infrastructure. Government Accountability Office. Testimony before the Subcommittee on Interior, Environment, and Related Agencies. March 13, 2013.

[29] Breckenridge Capital Advisers. The Risks and Opportunities to Reforming the Tax-Exemption. March 2013. http://www.breckinridge.com/insights/whitepapers.html?id=1369

[30] Rahill-Marier, Bianca and Upmanu Lall. America's Water: An Exploratory Analysis of Municipal Water Survey Data. 2013. http://growingblue.com/wp-content/uploads/2013/10/Aquanauts_Study_Data.pdf

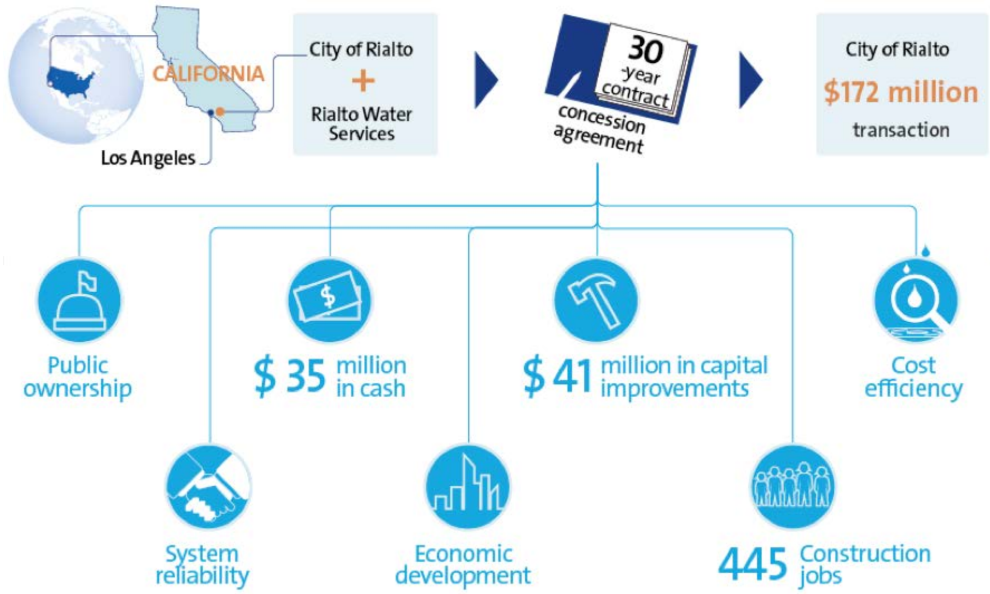
[31] American Water Works Association. Buried No Longer: Confronting America's Water Infrastructure Challenge. 2012.

maintain infrastructure systems for the life of the partnership. In the process, utilities can move forward with upgrades and adaptations that might otherwise be financially or politically inaccessible and thereby make investments needed to weather a changing climate. It can also provide compelling benefits to a city's general finances through payments to the general fund enabled by the operational and construction savings at the utility. Both the utility and the general fund gain financial stability unavailable under public financing alternatives.

Public-private partnership (P3) is a broad term that describes a diversity of contractual agreements between governmental and private sector partners. In the context of infrastructure investment, private sector involvement can range from designing and building an infrastructure system to designing, building, financing, operating, and maintaining the asset. At the furthest end of the spectrum, a private entity can build, own, and operate a facility with or without an option to transfer it to a public entity in the future. The concession model discussed here involves designing and building upgrades to the system, financing, and operating and maintaining the system over the long term. It notably does not involve transferring ownership of the assets to a private partner.

While various P3 structures have been used to build and operate transportation, energy, water, and social infrastructure (e.g., schools and hospitals) around the world, the model has been employed on a far more limited basis in the U.S. Within the U.S. water and wastewater industry there have seven public private partnerships since 1992, mostly initiated in the mid-to-late 1990s.[32] One of the most recent examples was formed in Rialto, California, in 2012 with a partnership between the city, Table Rock Capital, Veolia Water North America, and ULLICO, a union insurance and investment company. Under the concession agreement, the city retains ownership of all infrastructure assets and water rights and maintains control over the rate-setting process. The private partners involved in the deal are investing $41 million in the city's water and wastewater systems, providing $30 million in upfront capital to the city for priority projects, and making annual payments of $2 million to the city. Veolia Water is managing the city's water and wastewater assets for the 30 year term of the deal.

[32] Gomez, J. Alfredo. Approaches and Issues for Financing Drinking Water and Wastewater Infrastructure. Government Accountability Office. Testimony before the Subcommittee on Interior, Environment, and Related Agencies. March 13, 2013.



While the P3 concession model is not suited to every municipality, it can be a powerful solution to cities facing infrastructure deficits and broader financial challenges. It may be especially relevant for small to medium-sized utilities facing operational, financial, and political obstacles discussed in the first section of this paper.

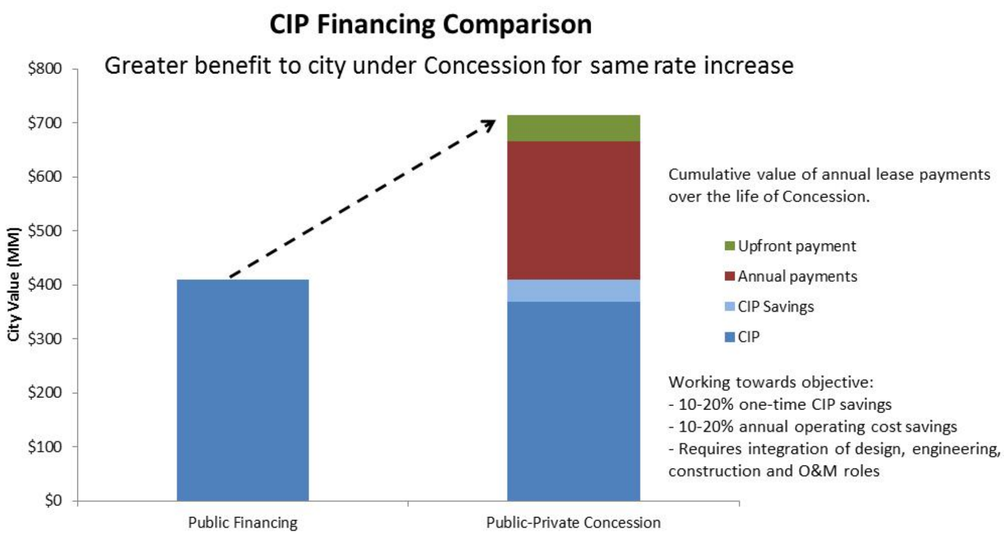
Financial Benefits

The P3 model can provide meaningful cost savings to utilities and financial stability to the enterprise and general fund. Concessions have a demonstrated ability to achieve significant cost savings and deliver projects in a timely manner. A recent review of infrastructure projects found 10-30% cost savings for P3 projects over traditional public procurement approaches.[33] P3 projects were completed 3.4% ahead of schedule, while traditional projects were 23.5% behind schedule on average. Furthermore, as discussed further below, outside expertise can help lower the long-term cost of operating a water or wastewater system. While the potential for operational and CIP savings vary based on a number of factors, there is frequently significant potential for gains in efficiency in the range of 10-20%.

These cost savings can provide powerful benefits to the utility and city finances. While private capital has historically been more expensive than public capital, recent volatility in municipal bond markets has decreased the spread between public and private financing. With a smaller premium for the cost of private capital and the demonstrated cost savings of the P3 model, partnerships can significantly reduce overall lifecycle costs of providing essential water and wastewater services.

[33] Infrastructure Partnerships Australia. Performance of PPPs and Traditional Procurement in Australia. 2012.

As a result, cities can receive significantly greater value from pursuing a public-private partnership rather than traditional public financing (see exhibit below). Operational and CIP savings allow cities to receive upfront and/or annual payments in addition to infrastructure improvements – the sole benefit under the public scenario. For cities that have made extensive budget cuts since the start of the recession and continue to face persistent structural deficits, upfront and annual lease payments can provide much-needed stability and help avoid further erosion in essential city services. In financially distressed municipalities, these payments can also stabilize city finances, boost credit ratings, and avoid the path to bankruptcy. A city could choose to rehire employees, rebuild reserves, or invest in deferred capital projects such as road repair with the newly available resources. Alternatively, a city can implement lower rate increases or choose some combination of rate relief and general fund stabilization. Most fundamentally, the P3 model provides flexibility and the ability to make investments that have been lacking for many municipalities since the onset of the financial crisis.



These financial benefits are especially important for small and medium-sized water and wastewater utilities. First and foremost, the P3 concession model can provide access to capital that might not otherwise be available to finance urgent infrastructure upgrades. As with the Rialto concession, the capital provided by private partners can circumvent those challenges and allow municipalities to make needed capital investments in water and wastewater systems. In addition, the cost savings are particularly powerful for smaller communities with lower rate-payer revenues and more urgent general fund challenges.

Operational and Capital Improvement Benefits

The cost savings described above are enabled by a number of efficiencies in operations and capital improvements. First, the concession model provides guaranteed funding to make upgrades that optimize performance of water and wastewater systems. Costs associated with deferred maintenance are removed, and the systems are able to operate more efficiently with necessary upgrades and repairs in place. However, there is no incentive to over-invest in infrastructure as there can be in pure privatization where revenue growth is driven by securing capital improvement-related rate increases. In a concession with a fixed capital charge, any upside in revenue growth accrues to the municipality rather than the concessionaire.

Second, the involvement of expert engineering firms in the construction and operations of water and wastewater systems brings with it the potential to integrate new technology and best management practices. Global engineering and operations firms have access to some of the most highly skilled operators and can access expertise from the operation of numerous infrastructure assets across the world. This is especially valuable where the population of operators is aging and operator expertise in the field is declining as a whole. In addition, operators with global experience and resources can overcome the understandable risk aversion that is one of the leading barriers to innovation in the water and wastewater sector.[34] The types of technologies and associated benefits are varied. Energy conservation and new treatment technologies can significantly reduce the energy consumption at water filtration and wastewater treatment plants. Collectively, these facilities account for 4% of the nation's electricity consumption which represents $4 billion in costs per year.[35] Water reuse technologies can allow utilities to access new, cheaper sources of water supply. New operational controls can improve the reliability of water systems.[36]

Finally, water and wastewater systems can be optimized under a 30-50 year operating agreement without uncertainty surrounding the capabilities of future operators. The practice of conservatively designing systems with multiple redundancies can be eliminated, lowering the near-term capital investment. The combination of a design-build contract with a long-term operations and maintenance contract furthermore aligns incentives for the third party to design the system in a way that responds to foreseeable risks such as those associated with climate change and to operate it as efficiently as possible.

These changes enable the long-term operational and capital improvement savings described above that can reduce life-cycle infrastructure costs particularly for smaller utilities that otherwise would not have access to global best management practices. Leading infrastructure engineering firms may not be attracted by smaller system upgrades alone, but the inclusion of a 30-50 year O&M contract can significantly improve the NPV of a project. The ability to couple

[34] "Survey Identifies Obstacles and Opportunities to Advance Innovation in the Water Sector." Water efficiency, March 5, 2013.
http://www.waterefficiency.net/WE/Articles/Survey_Identifies_Obstacles_and_Opportunities_to_A_20777.aspx.
[35] U.S. EPA. Blueprint for Integrating Technology Innovation into the National Water Program. March 27, 2013.
http://water.epa.gov/upload/blueprint.pdf.
[36] Ibid.

smaller infrastructure upgrades with long-term contracts has the potential to rebalance the risk-reward calculus for pursuing work with smaller water utilities.

Political Benefits

Finally, the P3 model can simplify difficult political decisions and allow for infrastructure planning and investment on a time frame that fits the lifespan of the asset rather than a short-term political cycle. Difficult political decisions about rate increases which are frequently made (or deferred) one year at a time can be condensed into a single decision point. The municipality enters into a long-term contract that outlines infrastructure investment schedules, rate increases, and many other details. With that long-term agreement the city commits to a 5-year program to rebuild and reinvest in key infrastructure along with a contractual commitment to continue making investments and necessary rate adjustments for the life of the contract. Funding for ongoing repair and replacement is built into the deal structure for 30 years. While unforeseen expenditures may still arise, a concession model shifts much of the risk onto the third party which assumes responsibility for delivering infrastructure upgrades and high quality service. These dynamics minimize future rate increases and the political risk associated with them.

In addition, the upfront capital infusion and annual payments to the general fund provide a range of ancillary benefits including stabilized credit ratings, elimination of structural deficits, and the opportunity to make other needed community investments such as road improvements. This can be packaged as a comprehensive solution for the community's infrastructure and economic development needs. It can make the needed investments significantly more politically palatable and avoid the alternative of piecemeal investments and rate increases year after year.

THE ROLE OF PRIVATE CAPITAL

The opportunity for the P3 concession model in water and wastewater is strengthened by recent trends in financial markets and the rising market demand for stable, long-term returns. Several dynamics favor a growing role for private equity in this market. First, U.S. interest rates remain near their lowest level in decades, and low bond yields are expected to continue for at least several years. This low-yield environment has pushed investors to seek more attractive, higher-yield investment opportunities in a range of asset classes. Second, in recent years equities have demonstrated significant volatility. The combination of these trends results in a shortage of options for attractive, risk-adjusted returns. There is a growing trend toward real assets that offer lower volatility, steady income, and the potential for equity-like upside. These assets include commodities, real estate, and infrastructure. The water and wastewater sector has been overlooked as a target for private capital but also provides the potential for attractive, stable, long-term returns. In short, there is ample capital available for deployment in a water and wastewater sector that is urgently in need of investment.

CONCLUSION

There is no single panacea for the varied challenges facing municipalities and their water, wastewater, and stormwater enterprises. Utilities, especially those that face the greatest costs of adapting to climate change, are in need of innovative solutions to improve efficiency of operations and capital improvements, build adaptive infrastructure systems, and circumvent intractable political disputes. A public-private partnership model will not solve all of these problems but it can provide needed capital, infuse innovation and long-term planning into infrastructure systems, and condense a series of painful political decisions into a single choice for the community. It can also provide a municipality with the financial flexibility to reverse years of service declines and reinvest in critical community needs. A meaningful comparison of public and public-private procurement options is an essential part of ensuring that municipalities are selecting the most cost effective approach to building the next generation of water, wastewater, and stormwater infrastructure.