water 20/20

Bringing Smart Water Networks Into Focus

EXECUTIVE SUMMARY

Water is both challenging to manage and increasingly precious. Within the next decade, approximately 1.8 billion people worldwide will be living in areas of absolute water scarcity[1].

As a finite resource, access is at risk from a growing population and an increase in need that will continue to put pressure on infrastructure requirements, particularly in cities.

The water industry is aware of the issues it faces including environmental impacts, an aging infrastructure and increases in energy prices. Globally, utilities are spending nearly $184 billion each year related to the supply of clean water—$14 billion of which is spent on energy costs just to pump water around the current networks.

Water not only feeds bodies, it also feeds countries. Given the link between gross domestic product (GDP) and the availability of drinking water, this vital resource is both a source of life and livelihood.

The human, environmental and financial stakes couldn't be higher.

Smart water networks provide the right opportunity right now.

Smart technologies can be leveraged to help address these water challenges. Advancements in technology that deliver enhanced data make that possible today. To understand the business case for smart water networks, we conducted in-depth interviews and comprehensive surveys with 182 global water utilities and analyzed utility operations and budgets. Our analysis found **up to $12.5 billion in annual savings** from a combination of the following:

- *Improved leakage and pressure management:* One-third of utilities around the globe report a loss of more than 40 percent of clean water due to leaks. Reducing leaks by 5 percent, coupled with up to a 10 percent reduction in pipe bursts, can save utilities **up to $4.6 billion annually**. By reducing the amount of water leaked, smart water networks can reduce the amount of money wasted on producing and/or purchasing water, consuming energy required to pump water and treating water for distribution. Intelligent solutions can make a difference. The use of different types of smart sensors to gather data and apply advanced analytics, such as pattern detection, could provide real-time information on the location of a leak in the network.

- *Strategic prioritization and allocation of capital expenditures:* Employing dynamic asset management tools can result in a 15 percent savings on capital expenditures by strategically directing investment. Such tools can **save up to $5.2 billion annually**. To close the gap between the capital spending required and the amount of financing available, utilities need access to information to better understand the evolving status of their network assets, including pipes.

- *Streamlined network operations and maintenance:* By implementing smarter technology that provides the critical data, via remote operations, utilities can **save up to $2.1 billion annually**, or up to 20 percent savings in labor and vehicle efficiency and productivity. A smart water network solution can help streamline network operations and maintenance by automating tasks associated with routine maintenance and operation of the water distribution system.

- *Streamlined water quality monitoring:* Smart water networks can **save up to $600 million annually**, or 70 percent of quality monitoring costs, and far more in avoided catastrophe. A smart water network solution for water quality monitoring would enable utilities to automatically sample and test for water quality and intervene quickly to mitigate potential issues. By implementing such a system, utilities can incur lower costs from labor and equipment needed to gather samples, as well as a reduction in the amount and cost of chemicals used to ensure regulatory quality standards.

The right players must take action.

Our research found key challenges to implementing smart water networks. However, those challenges are not insurmountable, provided the right players join forces.

- *Lack of a strong business case:* Sixty-five percent of survey respondents frequently cited unfavorable economics or the lack of a solid business case as key barriers to adoption of smart water networks. But it is important to understand the business case to use smart water technologies as an alternative to investing heavily in capital expenditures.

- *Lack of funding even if there is a business case:* Possible solutions to lower the barrier to entry include risk-sharing contracts to lower upfront investment required and third-party suppliers who manage and analyze the data.

- *Lack of political and regulatory support:* Utilities suggested that regulatory support at all levels – as well as incentives – would be critical to kick-starting smart water management, beginning in water-scarce areas where the need for water efficiency and conservation is greatest.

- *Lack of a clear, user-friendly integrated technology solution:* Fragmented product and services offerings from various vendors make it difficult for utilities to integrate a common business plan across their disparate operating divisions.

People and technology will bring smart water networks into focus.

Moving smart water networks past the barriers and taking it from promising experiment to widespread reality will require engagement across a diverse set of stakeholders including utilities and municipalities, regulators, investors, industry and utility associations, technology providers and academia. Collectively, these industry leaders can address the environmental and financial needs for smart water networks to revolutionize the water distribution infrastructure of the future.

Utilities can partner with technology providers to develop and refine solutions and establish benefits of smart water networks. They can also explore opportunities to learn more about the benefits of investing in holistic solutions to smart water networks.

Regulators can reward and incentivize improvements in operational efficiency. Simply diverting savings captured by utilities to other municipal operations or reducing tariffs and price increases leaves little incentive for utilities to seek additional productivity improvements. If water utilities have the capability to monitor water on a real-time basis, regulators could consider defining new standards which require more frequent reporting and testing.

Just as industry associations and individual industry leaders played a significant role in encouraging legislation needed to push adoption of electric smart grid solutions, the same approach should be taken for smart water solutions.

Now is the time to act.

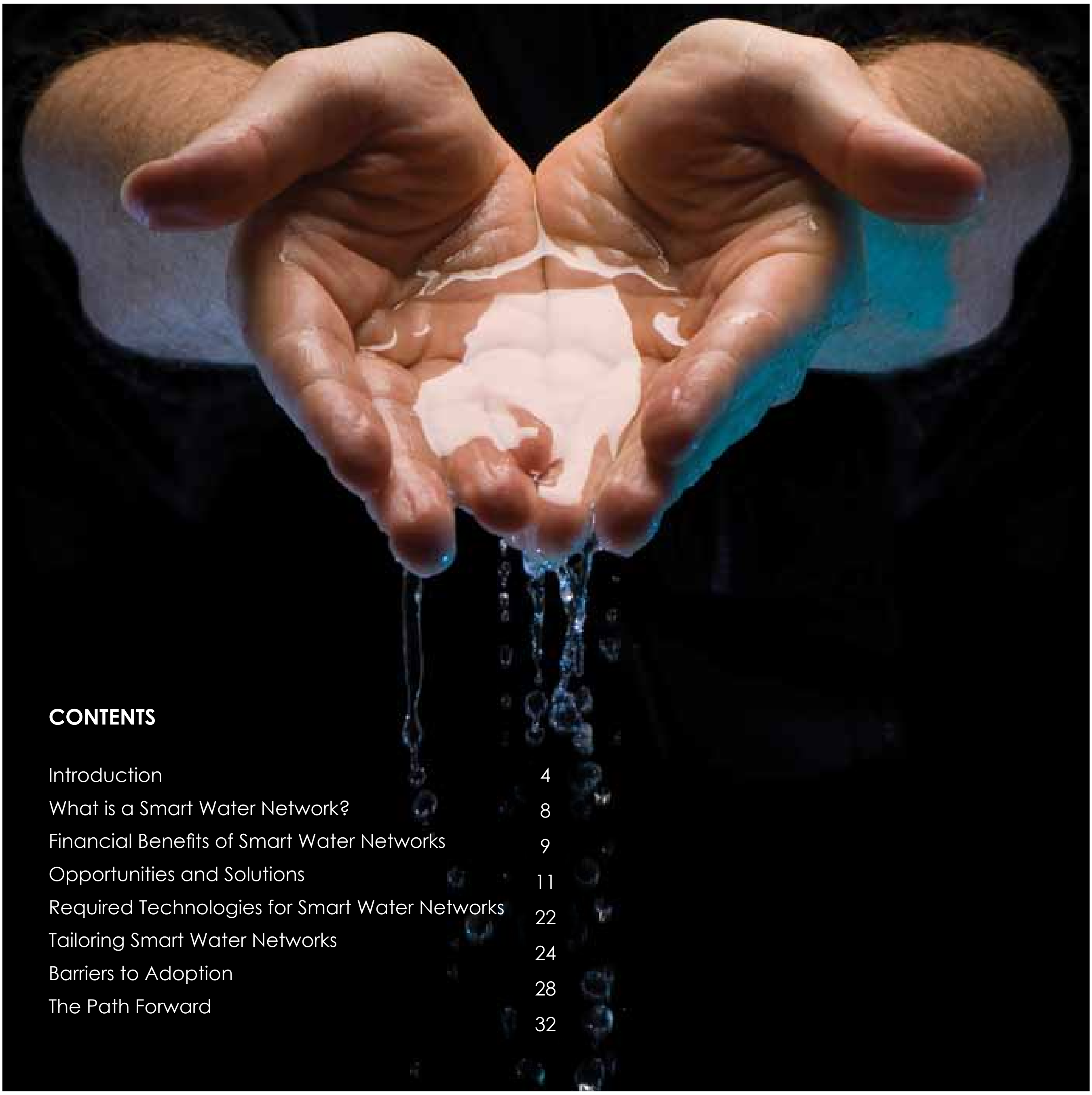
All of our findings on smart water networks point to a massive opportunity for utilities and could truly revolutionize water distribution networks around the world – many of which have remained largely static and untouched for decades.

The world can adopt smart water networks if we focus on partnering the right technologies with the right stakeholders.

Through innovative partnerships, the situation could be drastically improved; utilities and municipalities, regulators, investors, industry and utility associations, technology providers and academia have an opportunity to affect change.

Approximately two-thirds of the world's population, or 4.6 billion people, face water stressed conditions in the next decade[2]. With the human toll and and the financial well-being of utilities at stake, the time to act is now.

[1 and 2] http://www.un.org/waterforlifedecade/scarcity.shtml



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INTRODUCTION

Water scarcity and water quality are emerging as key issues of public concern and more pressing inhibitors of growth in cities and countries around the world. As a result, the market for safe, available water and for the infrastructure and technologies that treat and transport water is expected to continue to grow rapidly as stakeholders look for new solutions and approaches to integrated water resource management.

Smart water networks offer utilities a tremendous opportunity to improve productivity and efficiency while enhancing customer service.

Yet, despite the market's increasing size and significance, many utilities continue to struggle with forming a convincing business case to replace and upgrade aging and inefficient distribution networks. According to Growing Blue, a consortium of industry colleagues, scientists, academia and environmental professionals at leading NGOs, one-third of reporting countries lose more than 40 percent of the clean water pumped into the distribution system because of leaks before that water reaches end consumers.[3]

However, the same utilities have been unable to obtain the financial resources or the political support to tackle these inefficiencies. Insufficient public and private financing for infrastructure improvements has long been recognized and continues to be constrained. Utilities are forced to seek creative sources of savings in order to fund capital expenditures. Estimates show that the cost of repairing and expanding the potable water infrastructure in the United States alone will exceed $1.7 trillion in the next 40 years[4]. Yet, many regulatory policies fail to reward cost-conscious efforts to upgrade or better manage networks. In addition, water conservation efforts often result in lower utility revenues.

Around the world, consumers and regulatory bodies have been slow to demand and create the types of incentives for investment in infrastructure modernization that helped drive development of the electric smart grid. A utility in Asia reported that "water scarcity and low water tariffs have starved our utility of revenue and so investments to improve infrastructure fall to lowest priority." Indeed, the top priority of water utilities is far more basic: to simply build and expand the infrastructure needed to supply surging populations with safe drinking water.

While many utilities have identified the need for smarter infrastructure and technological investments, few have embraced an end-to-end smart water network. Smart water networks offer utilities of all varieties a tremendous opportunity to improve productivity and efficiency while enhancing customer service. Smart water networks also have incredible potential to help alleviate the impending water scarcity.

This white paper outlines the potential benefits of smart water networks, such as increased efficiencies and productivity enhancements that smart water network technologies can unlock. It also presents the benefits of smart water networks to various industry stakeholders and identifies the path forward in achieving widespread adoption of smart water network solutions.

[3] http://growingblue.com/wp-content/uploads/2011/04/Growing-Blue.pdf

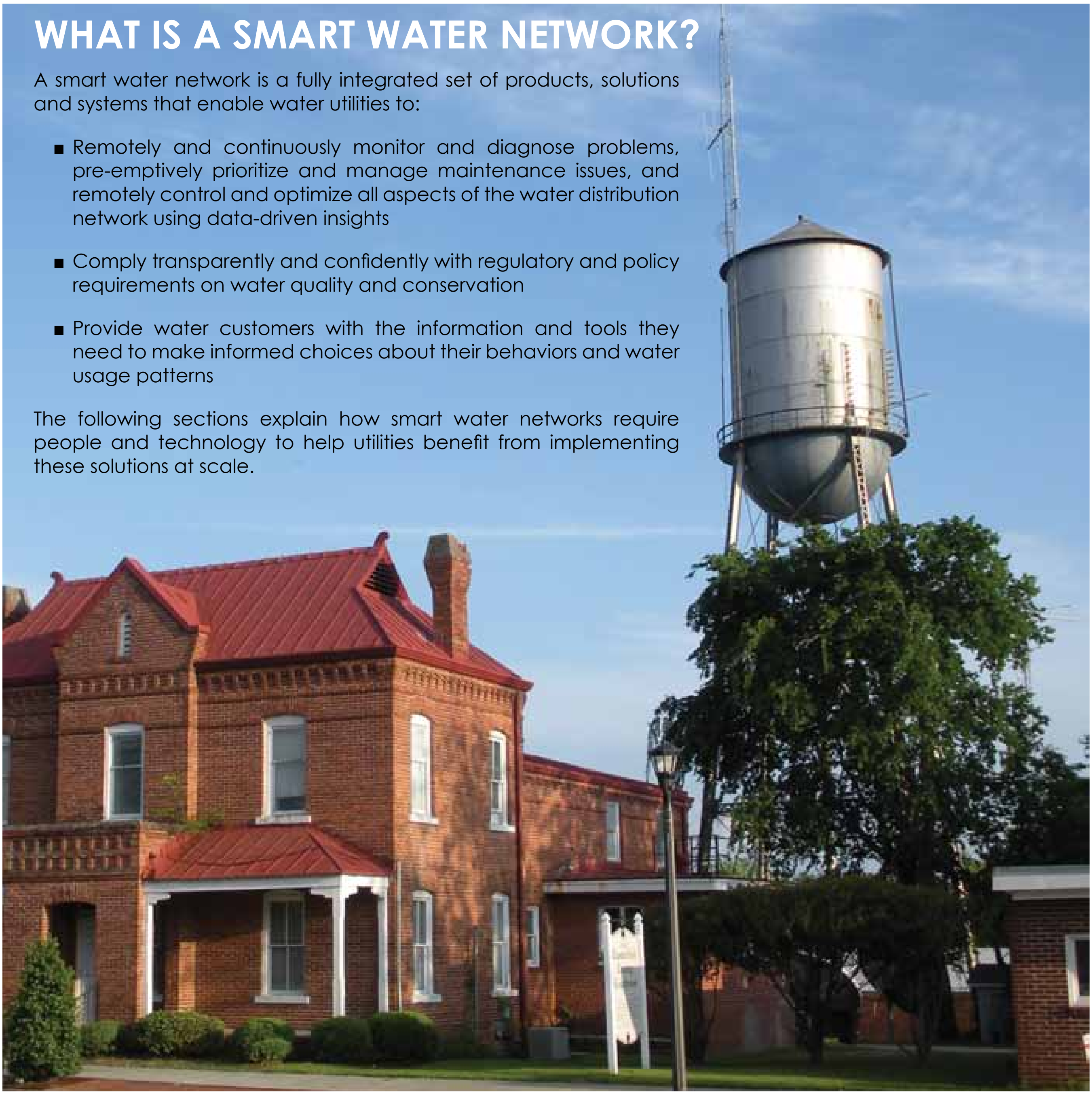
[4] American Water Works Association (AWWA) report: "Buried No Longer: Confronting America's Water Infrastructure Challenge"

WHAT IS A SMART WATER NETWORK?

A smart water network is a fully integrated set of products, solutions and systems that enable water utilities to:

- Remotely and continuously monitor and diagnose problems, pre-emptively prioritize and manage maintenance issues, and remotely control and optimize all aspects of the water distribution network using data-driven insights
- Comply transparently and confidently with regulatory and policy requirements on water quality and conservation
- Provide water customers with the information and tools they need to make informed choices about their behaviors and water usage patterns

The following sections explain how smart water networks require people and technology to help utilities benefit from implementing these solutions at scale.

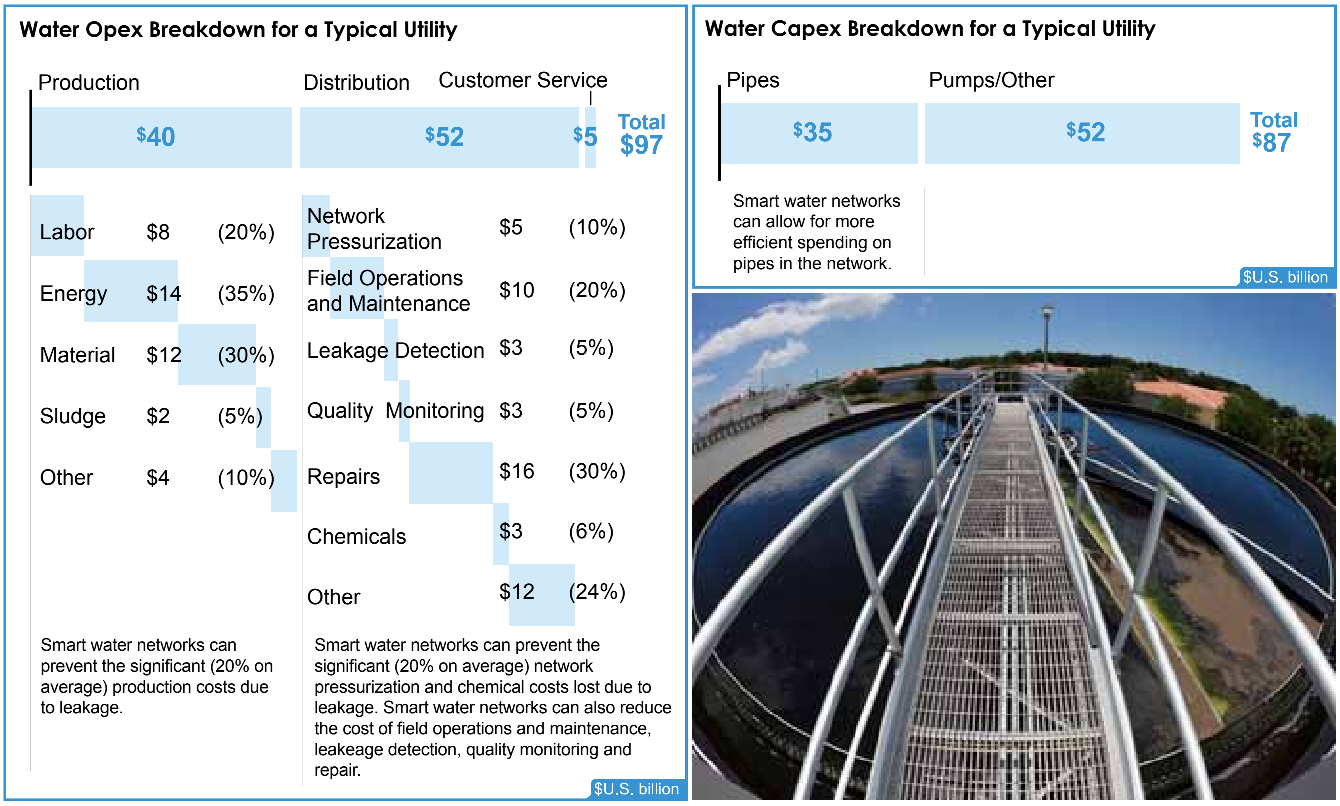


FINANCIAL BENEFITS OF SMART WATER NETWORKS

As illustrated in figure 1, utilities worldwide spend nearly $100 billion on water-related operations and almost $90 billion on capital expenditures each year. Based on interviews with utilities, much of the spending is inefficiently allocated and savings opportunities are lost because utilities:

- Do not have access to sufficient information regarding leaks, status of pipes and water quality
- Do not have data and knowledge integration across multiple operating divisions
- Are not capable of analyzing the information to drive decisions
- Lack sufficient access to automated technologies that could turn information analysis and decisions into network improvements in real time

Figure 1. Cost breakdown of global water utility expenditures by process step



Note: Operating expenditure forecast and water and wastewater capex forecast, derived from Global Water Intelligence, "Global Water Market 2011-Meeting the World's Water and Wastewater Needs Until 2016," (March 2010), overview available at http://www.globalwaterintel.com/publications-guide/market-intelligence-reports/global-water-market-2011/

Utilities can save between $7.1 and $12.5 billion each year by implementing smart water solutions.

Figure 2. Summary of global savings by smart water solution

Category	Savings as Percentage of Baseline Cost		Description
Leakage and Pressure Management	2.3 - 4.6	(3.5%)	Reduction in leakage levels by precise detection of leaks; predictive modeling to estimate potential future leaks and pressure managment
Strategic Capital Expenditure Prioritization	3.5 - 5.2	(12.5%)	Improved dynamic assessment, maintenance, replacement, planning and designing of network to optimize spending on infrastructure needs
Water Quality Monitoring	0.3 - 0.6	(0.4%)	Automatic water sampling, testing and quality monitoring; reduction in costs from labor and truck rolls for manual sample collection
Network Operations and Maintenance	1.0 - 2.1	(1.6%)	Real-time, automated valve/pump shutoff to facilitate flow redirection and shutoffs; more efficient and effective workflow planning
Total Smart Water Savings Opportunity	**7.1 - 12.5**	**(7.4%)**	

$U.S. billion

Globally, water utilities stand to realize significant savings from technologies and solutions designed to manage and monitor smart water networks. Our research shows that utilities can save between $7.1 and $12.5 billion each year from implementing smart water solutions that reduce operational inefficiencies and optimize capital expenditures. As illustrated in figure 2, more than 5 percent of current operating and capital budgets could be repurposed and reinvested in network upgrades or given back to water users in the form of lower rates and tariffs.

OPPORTUNITIES AND SOLUTIONS

Consistent with the findings in the global water utility survey, leakage and pressure management, capital spending optimization, streamlined water quality monitoring, and network operations and maintenance represent the biggest opportunities to improve utility performance.

Figure 3. Biggest opportunities to improve the performance of utilities

	Levers	Base as a Percent of Total	Savings Opportunity	Potential Savings	Basis of Savings Opportunity [3]
Leakage and Pressure Mgmt.	Reduced waste of produced/ purchased water	Production costs = 41% of Water Opex	2 - 5 percentage point reduction in leakage	$1,400	Global Water Intelligence, "SWAN's way - in search of lost water," (June 2011) [A]
	Reduced waste of energy costs from pumping	Network pressurization = 5% of water Opex	2 - 5 percentage point reduction in leakage	$182	Global Water Intelligence, "SWAN's way - in search of lost water," (June 2011) [B]
	Reduced leakage detection costs	Leakage detection = 3% of water Opex	20 - 25 percentage point reduction in leakage	$584	D.C. Water case study, referenced in AWWA Webcast, "AMI Improves Customer Service and Operational Efficiency," (February 2012) [C]
	Fewer pipe bursts	Pipe repairs = 16% of water Opex	5-10% reduction of pipe bursts	$1,168	Malaysia case study, referenced in Global Water Intelligence, "SWAN's way - in search of lost water," (June 2011) [D]
	Reduced waste of chemicals from leakage	Chemical treatment [1] = 3% of Opex	2-5 percentage point reduction of leakage	$109	Global Water Intelligence, "SWAN's way - in search of lost water," (June 2011) [E]
Capital Allocation Optimization	Reduced pipe Capex	Pipe Capex = 40% of water Capex	10-15% savings on pipe Capex	$4,348	Alaskan water and wastewater utility case study, derived from interview with an industry expert
Water Quality Monitoring	Reduced costs from manual samples [2]	Sample collection = 1% of water Opex	30-70% savings on sample collection costs	$197	Estimate based on industry expert opinion
	Reduced chemical costs	Chemical treatment = 3% of water Opex	5-10% of savings on chemical costs	$234	Estimate based on opinion of a representative water utility's lab expert
Network Optimization and Maint.	Fewer O&M-related truck rolls	Network O&M costs = 8% of water Opex	10-20% savings on network O&M costs	$1,557	D.C. Water case study, referenced in AWWA Webcast, "AMI Improves Customer Service and Operational Efficiency," (February 2012) [F]

[1] Applies only to chemical treatment in water distribution network

[2] Excludes U.S.

[3] Savings opportunities represent conservative estimates derived from existing cases or expert opinion

References

[A, B, D, E] http://www.globalwaterintel.com/archive/ 12/6/market-profile/swans-way-search-lost-water.html

[C, F] http://www.acwa.com/events/awwa-webcast-ami-improves-customer-service-and-operational-efficiency

$U.S. million

IMPROVED LEAKAGE AND PRESSURE MANAGEMENT: $2 BILLION TO $4.6 BILLION IN SAVINGS

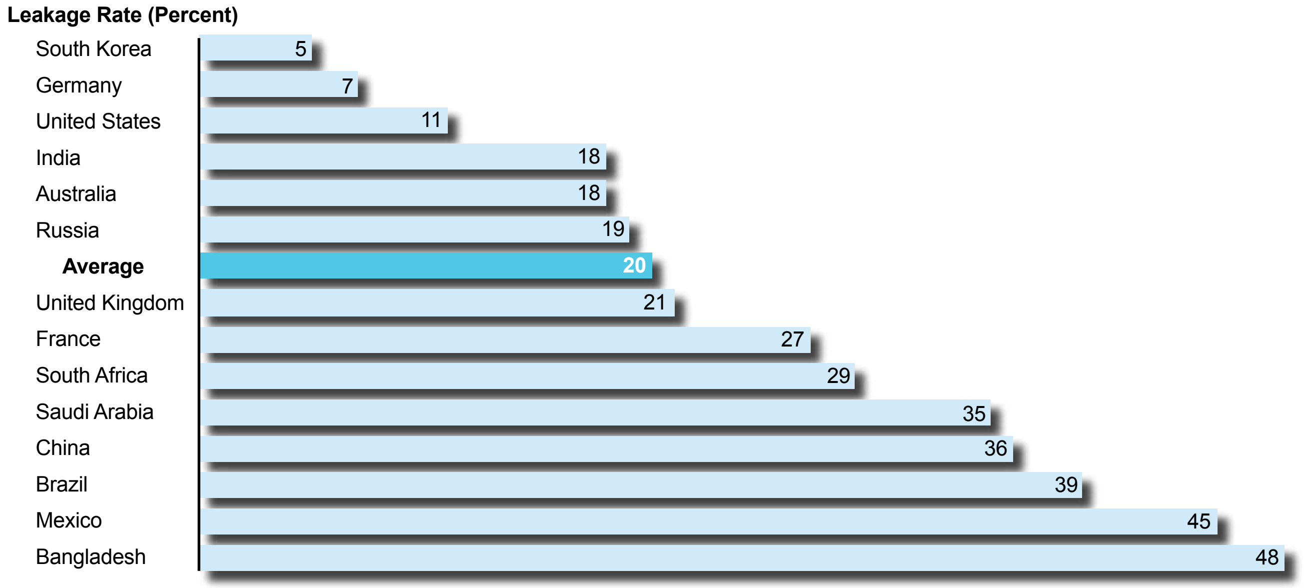
Opportunity

Water leakage in the distribution network is difficult to detect and is an important issue that will draw increased attention in the coming decades. Globally, one-third of all reporting countries face leakage levels of more than 40 percent of the clean water treated and pumped into the distribution system. Figure 4 outlines leakage rates by country.

Many utilities currently manage leakage and pressure primarily on an ad-hoc and reactive basis, responding to visible or obvious leaks and bursts and repairing infrastructure as needed. This approach is not only costly and time consuming, due to the mobilization of large field forces to address problems after they occur, it is also extremely risky, with water losses going on for months potentially leading to flooding in houses and stopping traffic for days or weeks at a time. In addition, limits on the ability to monitor and control water pressure in real time can lead to pipe bursts that cause major water losses and significant disruptions in service.[5]

As demand for clean water increases in the coming decades and supply remains stagnant or shrinks, solutions to manage and minimize leaks will become increasingly critical. As we have learned, many water utilities struggle to even measure and locate leaks in their distribution networks, let alone implement leak-reducing solutions. Most utilities have little or no visibility into the amount of water leaked in their networks. Only 40 percent of water utilities reported they have leak detection devices, according to our survey of global water utilities, though the need is recognized by all respondents. Surveyed utilities identified fixed-leak detection devices as their most desired technology.

Figure 4. Leakage rates by country



Source: GrowingBlue, "Water. Economics. Life." pp. 22-30, available at **http://growingblue.com/wp-content/uploads/2011/04/Growing-Blue.pdf.**
Average based on country-level leakage percentage estimates weighted by water opex spending by country.

[5] Smart Water Networks Forum, "The Value of Online Water Network Monitoring" (January 2012), available at http://www.swan-forum.com/uploads/5/7/4/3/5743901/the_value_of_online_monitoring.pdf.

Globally, one-third of all reporting countries face leakage levels of more than 40 percent.

Collectively, water utilities lose an estimated $9.6 billion on an annual basis because of leaked water. Of those losses:

- Nearly $8 billion is attributed to wasted operational expenditures on water production
- More than $1 billion of energy pumping costs are wasted
- More than $600 million of chemical costs are spent on lost water

In addition to the nearly $9.6 billion, approximately $2.5 billion is spent annually on leak detection efforts.

The economic drivers for these losses were identified by our water utility survey, during which utilities around the world consistently highlighted wasted energy costs, wasted water treatment costs and misdirected network repair and maintenance as the three most significant challenges for network leakage.

Solution

The desire for real-time data on leakage and pressure management emerged as a key finding from our global smart water survey. A real-time, accurate approach to leakage and pressure management can drive significant savings against the $10 billion of estimated losses. Smart water networks can identify leaks early. This early detection reduces the amount of water that is wasted and saves utilities money that would otherwise be spent purchasing and treating additional water. By reducing the amount of water leaked, smart water networks can reduce the amount of money wasted on producing and/or purchasing water, consuming energy required to pump water and treating water for distribution. These solutions include the use of flow sensors to gather data, analyze the data using algorithms to detect patterns that could reveal a leak in the network, and provide real-time data on the location of a leak. In addition, pressure sensors and pressure-regulating valves can allow for automated feedback and controls to ensure that pressure does not reach a level high enough to cause a pipe burst. These technologies can provide additional savings by reducing the cost of leak detection and decreasing pipe repair costs by preventing pipe bursts. Many utilities recognize the benefits of improved leakage and pressure management, including a large utility in the UK: "Real-time data will allow us to take leak detection and response to the next level by allowing us to react quickly and eliminate reliance on customer alerts."

It is estimated that current technologies can reduce leakage by 2 to 5 percentage points globally. This underlying assumption was echoed in the global smart water survey, where approximately 68 percent of respondents indicated a desire to reduce leakage by 5 percent over current levels during the next five years.

As illustrated in figure 5, global operational expenditures related to water production, energy consumption and water treatment could be reduced by approximately $1 to nearly $2.5 billion. Including the reduction of leak detection and pipe repair costs, the total aggregate savings opportunity from leakage and pressure-related improvements ranges from $2.4 to $4.8 billion. The most significant challenges are illustrated in figure 6.

Figure 5. Savings from leakage and pressure management

Category	Baseline Cost	Savings Opportunity	Calculation	Potential Savings
Production	$40,000	2 - 5 percentage point reduction in leakage[1]	$40,000 x 2 - 5%	$800 - $2000
Network Pressurization	$5,000	2 - 5 percentage point reduction in leakage[1]	$5,000 x 2 - 5%	$100 - $250
Chemicals	$3,000	2 - 5 percentage point reduction in leakage[1]	$3,000 x 2 - 5%	$60 - $150
Leakage Detection	$3,000	20 - 25 percentage point reduction of all leakage detection costs[2]	$3,000 x 20 - 25%	$600 - $750
Repairs	$16,000	5 - 10 percentage reduction of pipe bursts[3]	$16,000 x 5 - 10%	$800 - $1000
			Total	**$2,360 - $4,750**

Reducing leakage by 5% can save $2.4 billion

Note: Values are rounded and thus may not match other values in this paper

1 Based on Global Water Intelligence, "SWAN's way - in search of lost water," (June 2011), available at http://www.globalwaterintel.com/archive/12/6/market-profile/swans-way-search-lost-water.html

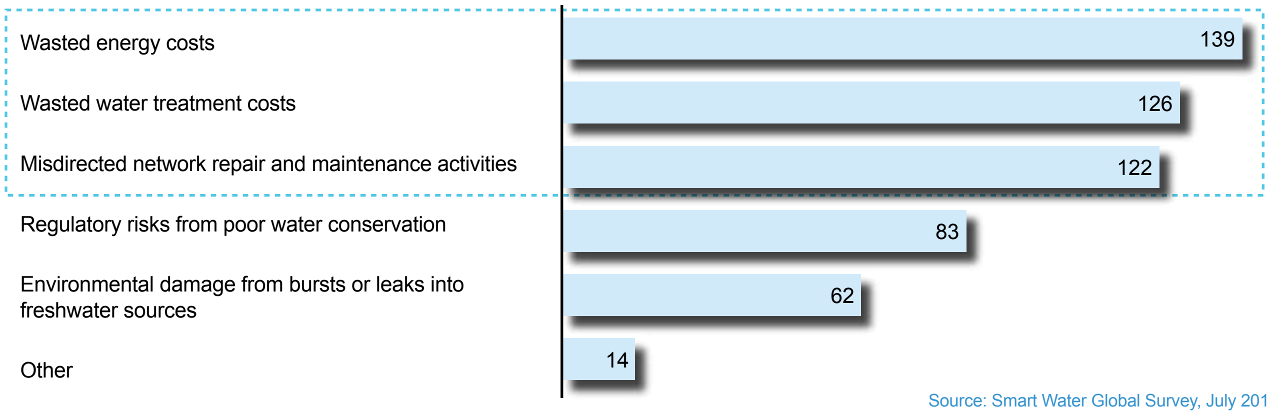
2 Based on D.C. Water case study, referenced in AWWA Webcast, "AMI Improves Customer Service and Operational Efficiency," (February 2012), available at http://www.acwa.com/events/awwa-webcast-ami-improves-customer-service-and-operational-efficiency

3 Based on Malaysia case study, referenced in Global Water Intelligence, "SWAN's way - in search of lost water," (June 2011), available at http://www.globalwaterintel.com/archive/12/6/market-profile/swans-way-search-lost-water.html

$U.S. million

Figure 6. Most significant challenges from leaked water

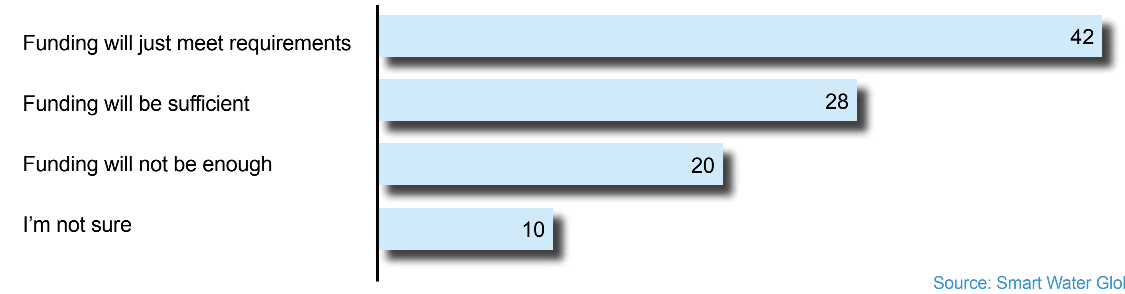
What are the most significant challenges to your business from leaked water?
Number of times selected as the first, second or third most important opportunity
Total N=182



Source: Smart Water Global Survey, July 2012

Figure 7. Funding availability for capital infrastructure projects

How available is funding for capital infrastructure projects for your utility during the next 5 - 10 years?
Percent of respondents
Total N=182



Source: Smart Water Global Survey, July 2012

Water utilities lose an estimated $9.6 billion on an annual basis because of leaked water.

STRATEGIC PRIORITIZATION AND ALLOCATION OF CAPITAL EXPENDITURES: $3.5 BILLION TO $5 BILLION IN SAVINGS

Opportunity

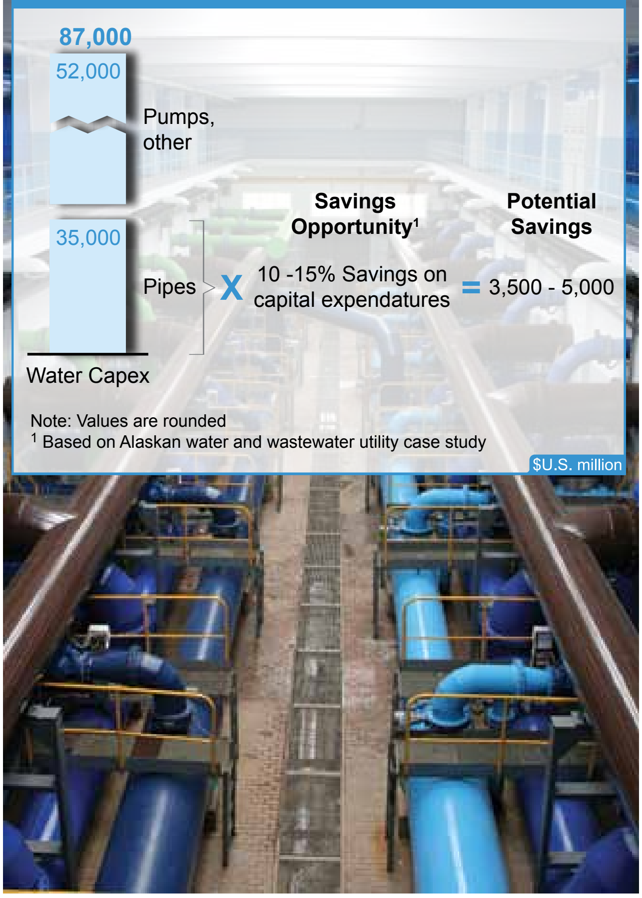
In addition to operational inefficiencies, utilities face deteriorating network assets and a lack of funding for maintaining and improving those assets. The American Water Works Association (AWWA) has estimated that the cost of repairing and expanding the potable water infrastructure in the United States alone will top $1 trillion in the next 25 years and $1.7 trillion in the next 40 years. In addition, a recent survey conducted by Black & Veatch shows that 34 percent of U.S. utilities surveyed believe that they will not have sufficient funding for their capital infrastructure projects. On a global level, our smart water survey identified a similar gap, with only 28 percent of utilities indicating sufficient capital to meet their infrastructure needs during the next five to 10 years, and approximately 20 percent who believe they do not have sufficient funding. Figure 7 outlines availability of funding for capital infrastructure projects.

Our utility research shows that more than 50 percent of respondents reported funding constraints for capital infrastructure projects. Most utilities also lack the ability to anticipate network deterioration and, as a result, cannot strategically plan for necessary repairs and replacements. While many of them have embraced geographic information systems (GIS) in order to map maintenance work orders, they often lack the ability to prioritize and properly time maintenance to deploy capital expenditures more efficiently.

Utilities need access to information to better understand the evolving status of pipes throughout the network.

To close the gap between the capital spending required and the amount of financing available, utilities need access to information to better understand the evolving status of pipes throughout the network. Improved understanding will allow utilities to avoid premature replacement and to identify problems that require replacement of equipment before catastrophic failures occur. Figure 1 shows that approximately $35 billion is spent on capital expenditures directed toward pipes in the water distribution network annually; this area represents a major spending driver for utilities.

Figure 8. Savings from capex allocation optimization



Note: Values are rounded
[1] Based on Alaskan water and wastewater utility case study

Solution

Utilities can optimize capital expenditures by leveraging data to identify the "right life" of assets, incorporating parameters such as criticality, age, material, soil condition and pressure and maintenance history to determine the appropriate risk profile of pipes in the network. Advanced modeling software can leverage that data to estimate the remaining life of assets, integrating with GIS and other mapping tools to help utilities prioritize maintenance activities and understand the potential risk and impact of asset failure. Interviews with utilities revealed great interest in the opportunity for improved capital allocation through smart water networks. "Collection of real-time flow and pressure data will enable easier pressure adjustment, inform pipe replacement and energy management," expressed a large German utility. A large Australian utility reiterated, "This information would be a huge help with capital investment decision making."

By leveraging its database of asset conditions and updated risk profiles, utilities can use predictive analytics for the most critical locations. This is far more cost effective than the current method of systematically – and perhaps unnecessarily – replacing miles of pipe and other assets. A prioritized approach also ensures that capital expenditures are optimized with minimal impact and disruption to communities and customers.

For example, recent efforts by a utility in Alaska illustrate the potential impact of smart water networks on capital-asset management. Using risk-based algorithms to prioritize network renewals, the utility has been able to save $30 million of $130 million over six years. As illustrated in figure 8, **improved asset management could reduce capital expenditures on pipes in the water network by 10 to 15 percent and the use of such algorithms could result in global savings ranging from nearly $3.5 billion to more than $5 billion**.

STREAMLINED WATER NETWORK OPERATIONS AND MAINTENANCE: $1 BILLION TO $2 BILLION IN SAVINGS

Opportunity

Given the complexity of water distribution systems and the need to maintain water service to consumers at all times, routine utility operations and maintenance can be costly and time-consuming. Today, few water utilities can adjust and control distribution system operations remotely and in real time. Utility personnel often must shut off valves manually and perform other operations in the field, slowing repairs, installations and maintenance activities. In addition, inefficient allocation of human resources leads to higher numbers of repair crew truck deployments and higher costs to address various issues in the network. "We are in the stone age for our work orders management," reports a Belgian utility. It comes as no surprise that field operations and maintenance costs exceed $10 billion per year globally, representing a significant portion of utilities' operational expenditures.

Solution

A smart water network solution can help streamline network operations and maintenance by automating tasks associated with routine maintenance and operation of the water distribution system.

While supervisory control and data acquisition (SCADA) and other solutions used today allow water utilities to control and operate assets remotely in the distribution system, the level of control is limited and not enabled in real time. Many maintenance activities involve the use of labor-intensive, time-consuming truck deployments to operate physical hardware.

A smart water network solution for streamlined operations and maintenance would extensively deploy automated and remote-controlled valves and pumps that can be used to quickly shut off flow and adjust pressure to facilitate maintenance, installation and asset replacement activities. Business intelligence and analytics software and robust dashboards can bolster transparency on key performance indicators in real time and can also integrate with SCADA systems to enable remote control of the distribution system.

A more robust distribution system with remote-controlled assets would help utilities save on labor costs, optimize maintenance needed and reduce disruptions to customers and communities from water shutoff. **One case study in our survey demonstrates that through improved efficiency of field operations and maintenance, 10 percent to 20 percent savings on these costs could be achieved, saving utilities approximately $1 billion to $2 billion on an annual basis.**

Figure 9. Savings from streamlined field operations and maintenance

Baseline Cost	Savings Opportunity	Calculation	Potential Savings
$10,000	10 - 20%	$10,000 x 10 - 20%	$1,000 - $2,000

Note: Values are rounded
1 Based on D.C. Water case study, referenced in AWWA Webcast, "AMI Improves Customer Service and Operational Efficiency," (February 2012), available at http://www.acwa.com/events/awwa-webcast-ami-improves-customer-service-and-operational-efficiency

$U.S. million

Field operations and maintenance costs exceed $10 billion per year globally.

STREAMLINED WATER QUALITY MONITORING: $300 MILLION TO $600 MILLION IN SAVINGS

Opportunity

Ensuring that consumers receive clean water that meets stringent quality standards is another important concern for both water utilities and regulators. Many regulators are imposing higher water quality standards and focusing increasingly on managing security risks and vulnerabilities in the distribution system. There is a greater need to conduct frequent and rigorous assessments to protect against threats to the water supply as a result of rapid population growth, urbanization and the dangers of contamination and bioterrorism. "Measuring water quality in the network near hydrants has become increasingly important because it would allow us to identify any possible security breaches to the network," explained a large U.S. utility.

Aging and oversized water infrastructures have also emerged as a water quality concern. "We have Roman pipes that are oversized, and with lower water throughput due to conservation efforts, water is sitting longer and longer in the distribution system," explains a German utility. A large Brazilian utility expresses a similar concern, "With our extended distribution network and aging infrastructure, we need to better understand water quality in the pipes."

Need versus reality

Our global smart water survey revealed that 41 percent of utilities still rely entirely on manual collection of water quality samples, which can take several days, while only 16 percent rely exclusively on automated sampling. Despite this current lack of automated sampling, utilities expressed a strong desire for real-time data on water quality in the near future, demonstrating a large gap between need and reality. While more than 40 percent of utilities would like to have hourly or real-time data measurement for water quality, only 17 percent of them currently do.

Solution

Automated sampling will require near real-time water quality monitoring solutions, both to ensure the

Forty percent of utilities desire hourly or real-time data measurement for water quality.

security of clean water supplies and to help utilities allocate scarce budget resources more efficiently and effectively. With annual costs related to ensuring water quality at approximately $3 billion and heightened regulatory pressure that could potentially increase costs, more than 50 percent of global survey respondents believe water quality regulations will become stricter in the next five years.

A smart water network solution for water quality monitoring would enable utilities to automatically sample and test for water quality and intervene quickly to mitigate potential threats. By implementing such a system, utilities can incur lower costs from labor and equipment needed to gather samples, as well as a reduction in the amount and cost of chemicals used to ensure regulatory quality standards. Furthermore, automated sampling throughout the network will broaden utilities' knowledge of how water quality changes as it travels through the network. "I'd like to measure chlorine levels in the network, and the placement of velocity probes throughout the network would be helpful to understand how hydraulics impact water quality," explained a large utility in the U.K. This knowledge can enable utilities to further optimize their water treatment and quality-testing processes.

A smart solution to water quality monitoring includes sensors for pH, biological indicators, chlorine and other chemicals as well as heavy metals along vulnerable network locations (e.g., hydrants). Strategic placement of sensors along the network can be very effective in detecting contaminants or biological agents, since many of those agents would be preceded by a detectable dechlorinating agent or change in pH levels. These sensors would transmit in real time to a centralized data hub, where analytic software would compare water quality against regulatory requirements and locate potential hazards. Analytics and pattern detection runs using historical data could help minimize false alarms. A water quality dashboard for utility operators can support automated and remote-controlled hardware in the distribution system to shut off water flow and contain hazards.

Sample collection typically makes up an estimated 20 percent of the average utility's water quality monitoring costs. Such costs, according to water experts surveyed, could be reduced 30 percent to 70 percent by moving from manual sampling to online monitoring; global annual costs could be reduced approximately $120 million to $270 million.

Having better knowledge of chemical levels in the network will enable utilities to moderate spending on substances such as chlorine, resulting in additional savings of $150 to $300 million. **Thus, automated water quality sampling could save utilities approximately $270 to $570 million in aggregate as seen in figure 10.**

Figure 10. Savings from water quality monitoring

Category	Baseline Cost	Savings Opportunity	Calculation	Potential Savings
Reduced costs from manual samples	$390[2]	30 - 70 percentage point reduction in sampling costs[1]	$390 x 30 - 70%	$120 - $270
Reduced chemical costs from better information about chemical levels	$3,000	5 - 10 percentage point reduction in chemical costs[1]	$3,000 x 5 - 10%	$150 - $300
			Total	**$270 - $570**

Note: Values are rounded
1 Excludes U.S.
2 Assumes sampling costs represent 20% of total water quality monitoring costs
3 Estimate based on industry expert opinion
4 Estimate based on opinion of a representative water utility's lab expert

$U.S. million

ADDITIONAL BENEFITS OF SMART WATER NETWORKS BEYOND UTILITIES

Smart water solutions will help regulators, lawmakers and municipalities:

- **Achieve greater transparency into water quality and network safety.** Regulators and municipalities want to increase safety, but they also want to reassure the public in an era of increasingly open government. Smart water networks help regulators quickly and immediately learn of quality issues and potential contaminants. In addition, sensors on the market today support regulatory efforts to impose higher water quality standards as well as manage security risks and vulnerabilities in the distribution system.
- **Conserve water.** Reducing leaks and bursts, minimizing the amount of water wasted and boosting operational efficiency will become increasingly critical regulatory priorities in light of looming concerns over water scarcity and rising prices.
- **Deliver improved customer service.** Leading regulators are increasingly focused on measuring and tracking customer service experiences. Britain's Ofwat, for example, has recently changed its water regulatory requirements to emphasize customer service as a key performance indicator. Given increasing consumer engagement on water conservation and billing, Ofwat's focus is a likely indicator of a broader regulatory shift that will take place across markets in the coming years.
- **Maintain price stability.** Water prices are increasing in many parts of the world due to scarcity, high demand and the cost of capital projects to modernize infrastructure. Smart water networks can help regulators and municipal governments slow such increases by reducing the amount of water wasted, improving utility efficiency and ensuring that capital expenditures are prioritized.
- **Minimize community disruptions.** Water main bursts and other major system failures lead to disruptions in daily life – thousands of hours of lost productivity on top of the costs of repair. Better predictive analytics and real-time issue identification will reduce the number and severity of these disruptions.

Smart water networks will help consumers:

- **Receive water with fewer disruptions.** By managing leaks and pressure continuously, water utilities are able to supply water to customers with fewer disruptions from service shutoff and traffic-disrupting water main bursts.
- **Pay for and manage water service easily and transparently.** A smart water network solution that includes smart meters enables e-billing and e-payment options and allows consumers to interact with utilities via web portals for service requests and billing inquiries. Smart metering also enables detection of consumer-level leaks and ensures that consumption is billed accurately and precisely.
- **Manage water consumption more proactively to conserve water and pay less.** As water prices increase and scarcity constrains consumption, smart water networks that enable customers to view and manage their usage will become increasingly valuable.

REQUIRED TECHNOLOGIES FOR SMART WATER NETWORKS

In order to achieve these goals effectively, smart water networks must draw from a wide spectrum of technologies. The good news is many of these technologies are available today. Others are in research and development. As outlined below and in figure 11, these can be viewed as components within five interconnected layers of functionality needed for a comprehensive smart water network solution.

- **Measurement and sensing devices**, such as smart water meters and other smart endpoints, are the physical hardware within the water distribution network that collect data on water flow, pressure, quality and other critical parameters. This foundational layer includes electromagnetic and acoustic sensors that can help detect potential leaks and abnormalities within the distribution system.
- **Real-time communication channels** allow utilities to gather data from measurement and sensing devices automatically and continuously. This layer features multiple communication channels that are used for two-way communications to instruct devices on what data to collect or which actions to execute (e.g., remote shutoff).
- **Basic data management software** enables utilities to process the collected data and present an aggregated view via basic network visualization tools and GIS, simple dashboards or even spreadsheets and graphs. This layer can also include data warehousing and hosting, cybersecurity of computer systems and basic business function support tools (e.g., work order management and customer information systems).
- **Real-time data analytics and modeling software** enables utilities to derive actionable insights from network data. This layer serves as the central source of the economic value of smart water networks for utilities. Dynamic dashboards allow utility operators to monitor their distribution network in real time for hazards or anomalies. At the same time, network modeling tools can help operators understand the potential impact of changes in the network and analyze different responses and contingencies. Pattern detection algorithms can draw on historical data to help distinguish between false alerts and genuine concerns, and predictive analytics allows operators to consider likely future scenarios and respond proactively and effectively.
- **Automation and control tools** enable water utilities to conduct network management tasks remotely and automatically. This layer provides tools that interface with the real-time data analytics and modeling software, leveraging communication channels and the physical measurement and sensing devices within the network. Many utilities have existing SCADA systems that can be integrated with smart water networks to further enhance their control over the distribution system.

Smart water networks must draw from a wide spectrum of technologies.

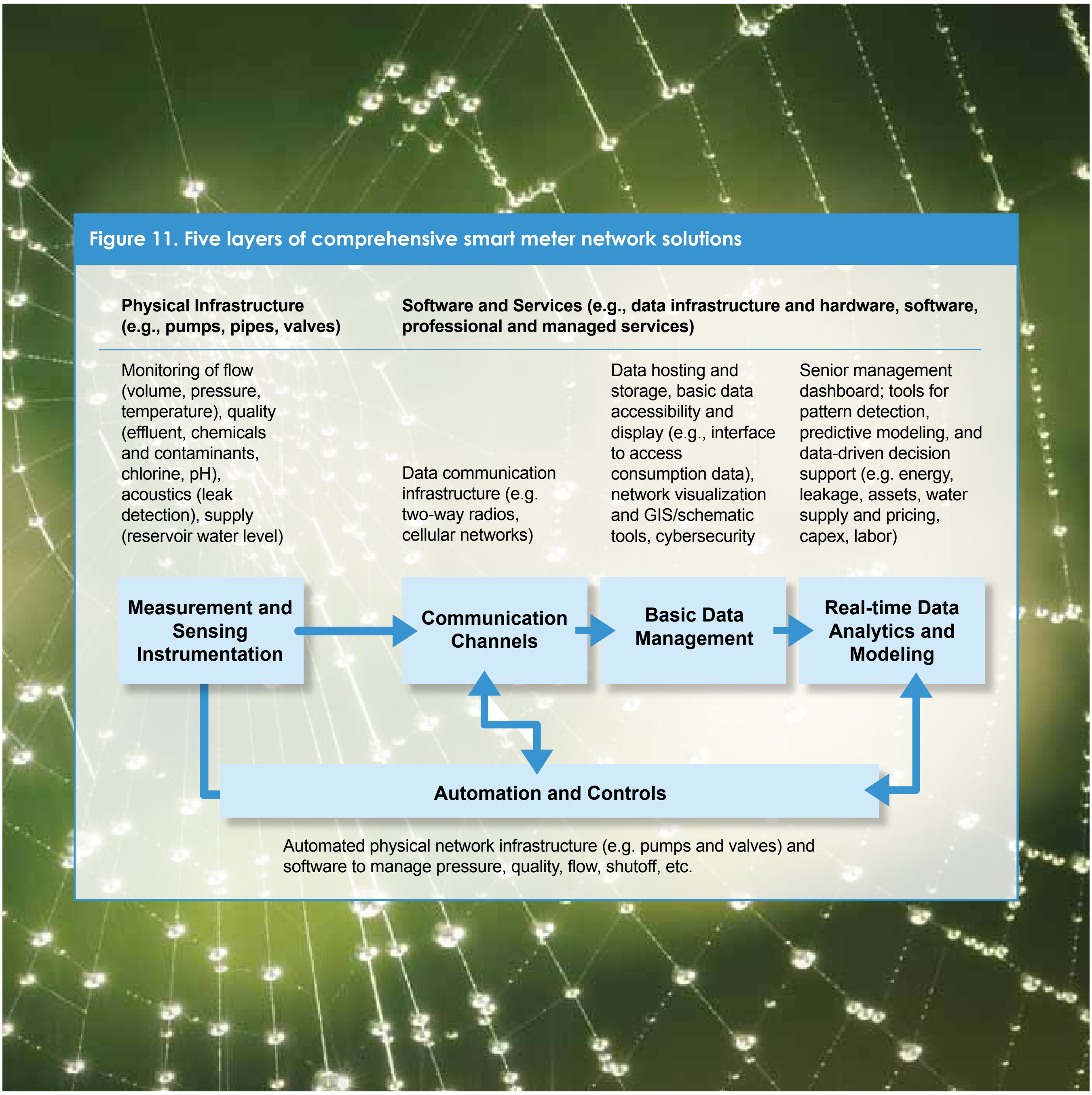


Figure 11. Five layers of comprehensive smart meter network solutions

TAILORING SMART WATER NETWORKS

To help drive adoption of these technologies and services across different markets and ensure maximum effectiveness and return on investment, smart water network solutions will likely need to be tailored according to economic and non-economic utility circumstances. Innumerable mindsets, incentives and interests shape the opportunity for different utility segments. Utility interviews and surveys provide insights into some of the likely factors under consideration.

Economic considerations

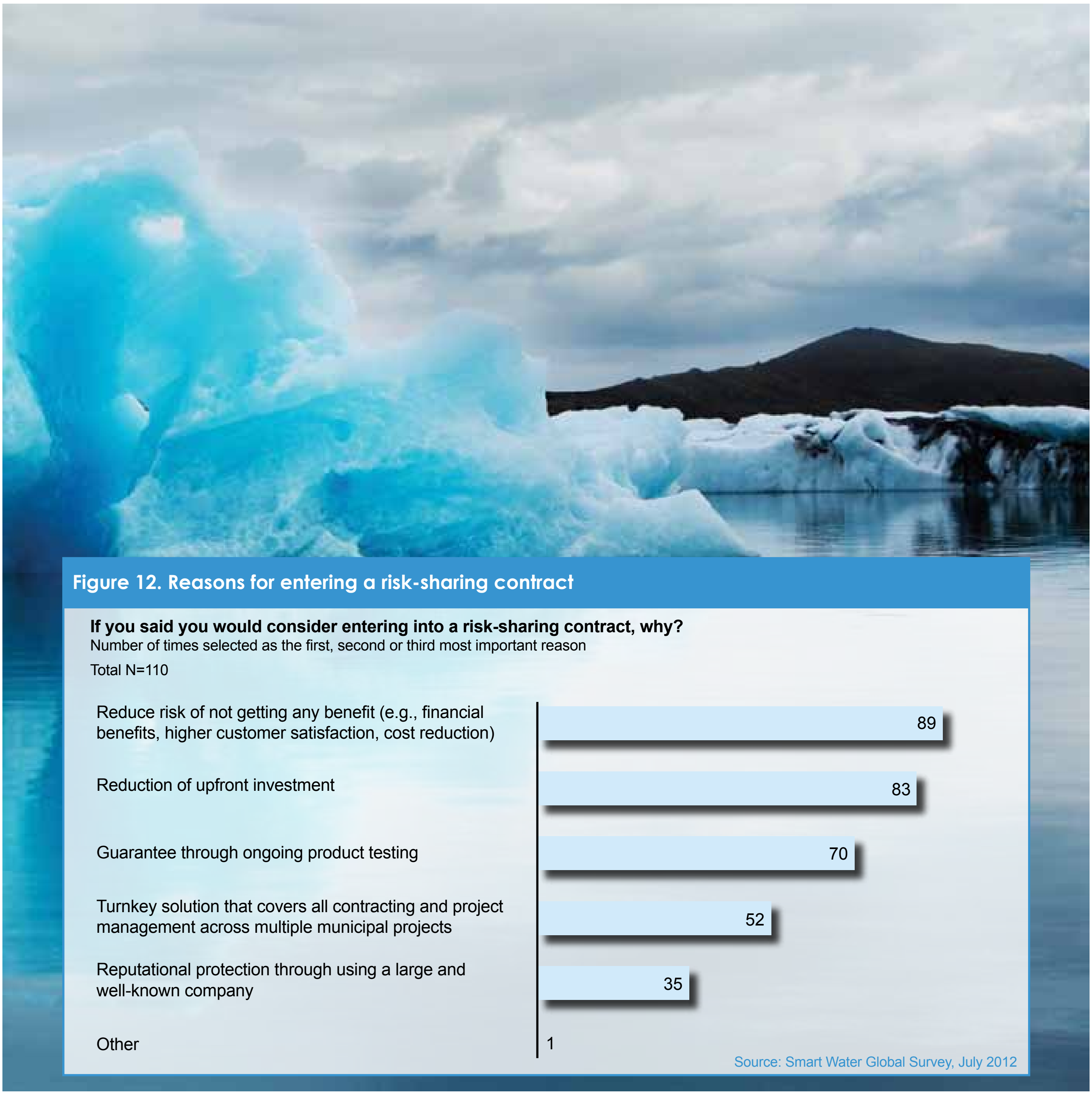
Smart water solutions will need to be tailored according to economic factors such as utility size (i.e., population served), demographic and population shifts, and macroeconomic conditions. For example, interviews with utilities suggest that smaller utilities lack in-house IT capabilities and personnel. "We get overwhelmed with all the data we collect because we don't have anyone who can do anything with it," shared a small utility in the U.S. A large U.S. utility agreed, "I don't know if the economics make sense for small utilities if you don't address the fact that they don't have sufficient IT capacity and data analytics in-house." They went on to say, "Small utilities will have varying interest in smart water. It's less about size and more about level of existing technological sophistication."

As a result, some small utilities say they are likely to favor technology providers that offer "software-as-a-service" solutions or cloud-based network and software hosting. Larger utilities, in contrast, prefer to keep data and software on site when possible and only use a third-party supplier for insight generation for highly complex data analytics. Large utilities also benefit from economies of scale and larger budgets that enable them to invest in smart water network solutions, while smaller utilities may not be able to afford the large fixed costs of meters and other advanced sensor networks. For this reason, a risk-sharing contract may be a preferred option for small- to mid-sized utilities, where they pay a smaller flat rate to a smart water network solutions provider and then share a portion of their additional revenue or saved costs with that provider. As illustrated in figure 12, survey findings reiterated that 20 percent of respondents from both large and small utilities are currently engaged in a risk-sharing contract, while an additional 40 percent said they would consider entering into one in the future.

Interviews also suggest that macroeconomic conditions could play a significant role, with utilities in some developing countries having an excess of funding available for infrastructure investment for a variety of reasons (e.g., access to EU Cohesion Fund grants), while many utilities in developed countries remain heavily budget constrained. This gives utilities in these developing nations a unique opportunity to "leapfrog" the challenges faced in many more established markets by investing in smart water network technologies.

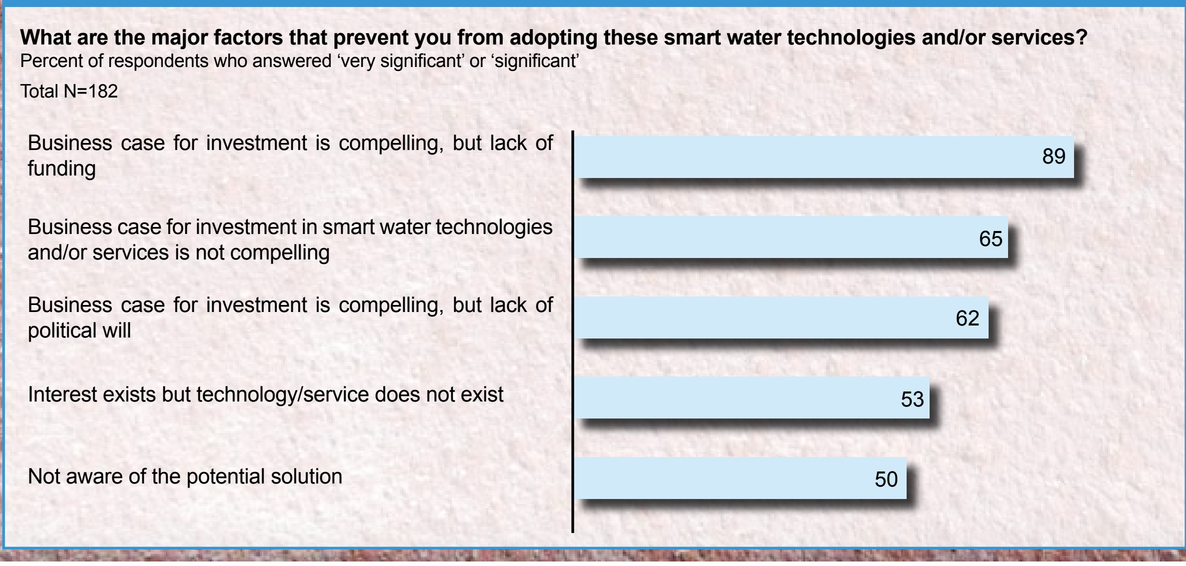
Twenty percent of respondents from both large and small utilities are currently engaged in a risk-sharing contract.

Figure 12. Reasons for entering a risk-sharing contract



Source: Smart Water Global Survey, July 2012

Figure 13. Barriers to smart water network adoption



Approximately 65 percent of respondents cited an uncompelling business case as a 'significant' or 'very significant' barrier to adopting smart water networks.

Non-economic considerations

Non-economic factors affecting the design and deployment of smart water solutions include local topography, water scarcity levels and regulatory conditions. One Australian utility, for example, explained that it would want smart water networks to improve recovery/measurement of non-revenue water and it was less focused on opex-related costs because the utility serves a low topography region where very few areas need pumping. Since most of the distribution is done via gravity, in this case, smart water would be tailored for different terrains so that the business case would deprioritize costs related to wasted energy from pumping.

As another example, in some highly water-scarce areas, utilities may rely heavily on technology for wastewater treatment and reuse, desalination or wholesale purchasing of water from other locations. In fact, 43 percent of all respondents in the survey indicated that they purchase water from a wholesaler. These factors may dramatically alter utility water economics and lead to different incentives and decision-making criteria.

Regulatory environments also differ significantly by geography. The U.S. Environmental Protection Agency, for example, has long focused on enforcing water quality standards (e.g., microbials or water treatment byproducts) while Britain's Ofwat has set price limits to aid consumers and threatened major utilities with fines for failing to meet mandated leakage reduction targets. Europe's Water Framework Directive requires countries to pursue water charges that reflect their costs and heavily promotes water efficiency, which has spurred interest in metering from European regulators and governments. China has focused on drinking water standards and wastewater treatment. In 2006, China's drinking water regulation was updated to the level of The European Union's drinking water standard, which has the most stringent standards in the world. Meeting these standards now requires a significant investment in Chinese water infrastructure, including upgrades to advanced water treatment technologies and rehabilitation of the water distribution network. Chinese regulators have also been improving wastewater treatment regulation in the past 10 years and mandated in 2010 that all new wastewater treatment plants must have sludge treatment capacity and existing plants must retrofit sludge treatment by the end of 2012.

BARRIERS TO ADOPTION

Smart water networks have existed conceptually for years but have failed to gain traction among utilities, technology providers and other industry stakeholders. Some innovative companies have taken steps to integrate various solutions and offer an end-to-end smart water platform to utilities, but adoption of these solutions has been slow.

Based on utility interviews and surveys, smart water networks have not been widely adopted because of lack of consensus or of understanding about the business case, lack of funding, lack of political support and disparate product and solutions. Approximately 65 percent of respondents cited a business case that fails to be compelling as a 'significant' or 'very significant' barrier to adopting smart water networks, while 74 percent and 62 percent of respondents said even given a compelling business case, lack of funding and of political support, respectively, would be challenges to adoption. Figure 13 illustrates those barriers.

Lack of a strong business case

Sixty-five percent of survey respondents frequently cited the unfavorable economics or the lack of a solid business case as key barriers to adoption of smart water solutions. As illustrated in figure 14, of the 119 respondents who answered they weren't sure if there was a compelling base, 57 percent said the benefits were not high enough to justify the investment.

In addition, approximately 39 percent and 43 percent of respondents said the cost of communications infrastructure and automatic/smart meters, respectively, were prohibitively high. Indeed, during interviews, many utilities mentioned that the cost associated with enabling smart water network solutions – such as investments in sensors and hardware, IT infrastructure and software – was perceived to be very high and the value or return on investment would be difficult to quantify. "We make our decisions primarily around a three-year payback, avoidance of fines or ecological payments, better satisfying our customers and improving labor conditions," explained a Russian utility, "but the payback has to make sense." Similarly, a French utility explained, "We worry the cost of a communication infrastructure and support of other systems (e.g., advanced metering infrastructure) is too high."

The recurring cost of maintenance, support and services added another hurdle. "Offsetting costs against maintenance of this technology is key. Data quality is only as good as you maintain it," expressed a large utility in the U.K. Finally, some utilities suggested that it would be difficult for technology providers to make an accurate business case due to the existence of non-economic variables such as opportunity costs, conservation benefits and other "soft" considerations. A small U.S. utility commented, "Smart water networks will need to have a very strong business case to gain traction." "We need a compelling business case to convince decision makers to move away from small operational investments over a long period of time," reiterated a large utility in the U.S. Without a compelling business case, there is little political appetite to eliminate jobs and increase automation in the distribution network via smart water network solutions, utilities said.

Lack of funding even if there is a business case

Lack of funding emerged as a key constraint, even if the business case is compelling. "It's too hard and expensive to buy all at once and manage lifecycle costs because vendors want to sell a 20-year investment all at once," explained a large utility in the U.S. Small utilities echoed the same message, but with even greater concerns around gaining access to financing and mobilizing sufficient funds for an upfront investment. Possible solutions to lower the barrier to entry include risk-sharing contracts to lower upfront investment required and third-party suppliers who manage and analyze the data.

Figure 14. Why the business case may not be compelling

Technological solutions need to be user-friendly, especially for small utilities.

Lack of political and regulatory support

Political support consistently emerged as a theme preventing the adoption of smart water networks, both internal to utilities and external through municipalities as well as regulators.

Internally, key decision makers need to be convinced of the potential for smart water network solutions. In particular, higher-level utility executives should be targeted for decision making. Forty-five percent and 54 percent of survey respondents identified the chief operating officers and chief executive officers of their water utilities as key decision makers on large investments.

Internally, it was also highlighted that a smart water network leader is needed within the organization. "You need someone who is technology oriented and can champion the idea," expressed a Chinese utility.

Externally, political support of municipalities is needed, especially where utilities are publicly owned. "Once you have political support, you can do what you need to do, (e.g., invest) to pull it off in the market," explained a large utility in the U.S. In many cases, this will involve engaging city councils to understand the big picture, as they often make the final decision on large investments. Approximately 40 percent of utility respondents identified their city councils and mayors as key stakeholders who need to be influenced and supportive of the decision.

Generating political support will involve overcoming the current lack of regulatory support for smart water networks, as survey respondents identified regulators as either key decision makers or influencers (25 and 36 percent of respondents, respectively). Utilities suggested that regulatory support at the state and federal level—as well as incentives—would be critical to kick-starting smart water management, beginning in water-scarce areas where the need for water efficiency and conservation was greatest.

In the U.S., utilities noted that on the whole, existing regulations lacked "teeth" for reporting and compliance, providing little impetus to switch to new smarter approaches. Water utilities drew parallels with the Energy Act of 2005, which they said was essential in driving development of the electrical smart grid in the U.S, and suggested that a similar approach would be needed to foster adoption in the water market. In the United Kingdom, where environmental rules accelerated smart metering, the latest stipulations by the Department of Energy and Climate Change (DECC) are spelling out an aggressive technology approach that will push shareholders to fund smart metering via distribution utilities. The European Union broadly has a mandate to reach full smart electric metering by 2020.

Lack of a clear, user-friendly integrated technology solution

Interviews with utilities also revealed concerns regarding perceived deficiencies in smart water technologies on the market. They emphasized in particular the lack of a quality, integrated solution. Proprietary vendor solutions were difficult to integrate, utilities said, and different vendors had different strengths in their offerings. The lack of international open standards for devices posed an additional challenge. "Systems don't mix. We have a data warehouse with encryption and had to create a workaround to integrate/de-encrypt with another system. We need international standards," said a U.S. utility.

Finally, there was a clear message from utilities that technological solutions need to be user-friendly, especially for small utilities that have limited IT staff and don't have the capacity to train multiple operators in data interpretation and analysis.

THE PATH FORWARD

Smart water networks will begin to take hold when the potential value for utilities becomes abundantly clear and the ability to capture that value is made easier. This white paper aims to bring to light the various barriers and opportunities that exist to help utilities around the world make smart water decisions based on a rigorous, analytically sound approach.

This shared understanding, while necessary, is not sufficient to drive widespread adoption of smart water networks. Only with a concerted effort from all major stakeholders can we truly redefine the water industry as it stands today and overcome the looming challenges posed by water scarcity and water quality. Below, we provide some initial thoughts on ways in which industry stakeholders can help catalyze adoption of smart water networks.

Utilities and municipalities

- **Help technology providers pilot solutions and establish benefits of smart water networks.** Utilities, while rightfully wary of change and concerned about return on investment, should recognize the potential for tremendous value from smart water networks and take measured risks. At a minimum, utilities can aid technology providers by sharing data and reaching out to technology providers to help innovators understand utility needs and mindsets.
- **Explore opportunities to learn more about the benefits of investing in holistic solutions to smart water networks.** Utilities need to actively learn about smart water networks and how end-to-end solutions can holistically support improvement in key areas of their utility's performance. As part of this assessment, they should explore to what extent an investment in smart water network solutions could impact their budget for traditional capital spending on infrastructure improvement as well as their budget for operations and maintenance.
- **Identify an internal smart water network champion.** Identify an existing senior manager or hire a champion who is excited by new technologies, seeks opportunities to introduce innovative technologies or services and is willing to explore the business case for smart water networks and champion discussions on the topic with key decision makers within the utility.

Regulators

- **Reward and incentivize improvements in operational efficiency.** Simply diverting savings captured by utilities to other municipal operations or reducing tariffs and price increases leaves little incentive for utilities to seek additional productivity improvements. In countries such as Ireland where regulators decide on tariffs and validate utility investment decisions, potential new investments and adoption of smart technologies should be approached with an open mind. In areas of high water scarcity, regulators should prioritize favorable economic conditions and reward utilities that conserve water by implementing smart water network solutions.
- **Leverage smart water technologies to achieve higher water quality standards.** Regulators have an obligation to ensure the establishment and maintenance of water utility services and to ensure that such services are provided to deliver water quality at rates and conditions that are fair, reasonable and nondiscriminatory for all consumers. If water utilities have the capability to monitor water quality on a real-time basis, regulators could consider defining new standards which require more frequent reporting and testing.

Investors

- **Apply a results-driven investment approach to technologies across the industry.** To achieve maximum impact, smart water networks will require innovative approaches and solutions in all aspects of the value chain, from ubiquitous, battery-powered measurement and sensing devices to software with pattern detection and predictive analytic capabilities. Investors should approach technologies across the entire spectrum with an open mind, funding the most innovative and promising solutions but closely monitoring impact and financial success.
- **Offer financial products, such as long-term, low-interest loans.** Financial support can be funded by payback from technology investments that enable utilities to realize up-front savings from major technology installation investments.

Industry and utility associations

- **Promote innovative solutions and publicly champion smart water networks.** Since the market for smart water network solutions is still in its infancy, industry associations will play a critical role in encouraging utilities, regulators and technology providers to coalesce around a shared vision for smart water networks and their potential benefits for all parties. Indeed, industry associations and individual industry leaders played a significant role in encouraging the legislation needed to push adoption of electric smart grid solutions, and the same approach should be taken for smart water solutions. Industry associations can reiterate the value of smart water network solutions to utilities and regulators by serving as a powerful outlet for promoting the business case for smart water technology and sharing successful case studies and results. They can also reiterate the value that smart water networks deliver to consumers by creating fewer and shorter service interruptions, advancing water quality and improving the availability and transparency of information that consumers need to manage their water consumption and associated costs.
- **Facilitate communication, idea sharing and partnerships between various stakeholders (e.g., technology providers, universities, investors, utilities).** Successful smart water networks will require capabilities drawn from a currently fragmented landscape of technology providers, and industry associations will play a critical role in driving collaboration. Some consortia have made positive strides in defining smart water networks and in bringing technology players and utilities together. These consortia can expand their impact through a more significant effort to educate regulators and utilities.

Technology providers

- **Continue developing concrete, marketable smart water network products and solutions.** Working closely with utilities in research and development and pilot phases will be critical for success, as will collaborative efforts to influence regulators and other key stakeholders.
- **Collaborate to develop and adopt open standards and ensure interoperability of different hardware and software offerings.** Such standards will be critical to driving smart water network adoption since many utilities remain wary of entering into long, costly contracts with individual technology and service providers. Interoperability also ensures backup providers and provides peace of mind that comes from guaranteed continuity of service.
- **Broaden awareness of smart water network technologies and solutions among regulators and the general public.** Industry players in the market today are heavily fragmented and lack established channels for communication and idea sharing. Successful smart water network solutions will require end-to-end capabilities that few players in the industry can provide independently today. Technology providers should foster a collaborative "smart water ecosystem" that begins with advocacy and lobbying work with regulators to increase awareness around the opportunities for smart water networks and encourage regulatory changes that could stimulate adoption. For the general public, technology providers should conduct public outreach to bolster awareness for smart water networks, leveraging the widespread use of electric smart meters and increased conservation efforts. Consumer engagement and awareness of the need for conservation has increased significantly in certain geographies. In Belgium, for example, wastewater reuse and conservation strategies are prevalent among consumers. Simply providing consumers with water usage data helps drive increased conservation and improves public awareness of water challenges. Technology providers can also help consumers understand how concepts in electric smart meters (e.g., their ability to help consumers manage consumption and simplify billing) apply to the water industry as well.

Academia

- **Foster awareness and understanding of water economics, challenges and innovative solutions including smart water.** Like industry and customer associations, academia can serve as a powerful forum to facilitate rigorous conversation, encourage partnerships and collaboration and validate business cases.
- **Fund smart water research.** University research could serve as a launching pad for innovative smart water technologies, on both hardware and software. Some universities are increasingly paying back the costs of their research by monetizing patents. Universities can also invest in educating the next generation of smart water network engineers, managers and leaders.

The future of smart water networks will require a partnership between people and technology.

CONCLUSION

Smart water networks represent a tremendous opportunity for water utilities to realize significant financial savings, address global concerns on water safety and quality, and position themselves for an increasingly resource-constrained future. The time is right for utilities to seize this opportunity, but that success will require the collective effort and collaboration of stakeholders across the water industry.

In this paper, we have drawn on market analyses and a range of utility interviews and survey insights to craft a vision for smart water network solutions and their potential benefits for utilities and their stakeholders. While smart water networks will continue to evolve as industry players innovate and utilities discover new needs and challenges, many of the technologies critical to building smart water networks are in development or already on the market today. Utilities will need to consider carefully which solutions to implement and work closely with technology providers to create the right set of tools.

The future of smart water networks will rely on the partnership between people and technology to address one of our most precious resources: water. The vision of safe, clean drinking water for all is one that smart water networks can help us keep in focus.

SURVEY METHODOLOGY

A team of experienced consultants was commissioned by Sensus to conduct a survey of utilities in more than a dozen countries around the world. As a first step, a number of screening questions were posed to more than 1,000 utility executives to ensure they had sufficient information and perspective to answer questions that would be representative of utility views. The survey included a mix of multiple choice and open-ended questions. Results included 182 completed surveys from around the world and from various size water utilities.

Interviews of utilities- The consultants then conducted blind interviews (i.e., no mention of Sensus) of more than 20 utilities around the world. These interviews covered questions about the financial and operational challenges facing utilities, existing utility activities in smart water systems monitoring and optimization, data analysis, decision-making and controls, implementing these measures and about the projected return on investment. Finally, the questions addressed barriers to implementation of smart water networks. All interviews were conducted for 60 minutes, via telephone with an experienced consultant.

Industry analysis- Industry financial statements were analyzed. Conclusions were formed based on the shared experiences with hundreds of utilities around the world analyzing the operations of utilities and determining the size of the opportunity to improve different financial and operational metrics. Industry experts were interviewed to derive and test assumptions in the models. The global utility market size data was analyzed based on operating and capital expenditures. The numerical ranges used in this paper are due to different assumptions about smart water network adoption.

Overview of technologies- In-depth research was conducted into the technologies of several dozen smart water technology companies. This included a review of reference case materials, available product demonstrations and patents and interviews with utilities that utilize products from smart water technology companies. The research also included interviews with smart water companies via telephone and at industry trade shows.

ABOUT SENSUS

Sensus is a leading utility infrastructure company offering smart meters, communication systems, software and services for the electric, gas, and water industries. Sensus technology helps utilities drive operational efficiency and customer engagement with applications that include advanced meter reading, data acquisition, demand response, distribution automation, home area networking and outdoor lighting control. Customers worldwide trust the innovation, quality and reliability of Sensus solutions for the intelligent use and conservation of energy and water. Learn more at www.sensus.com.

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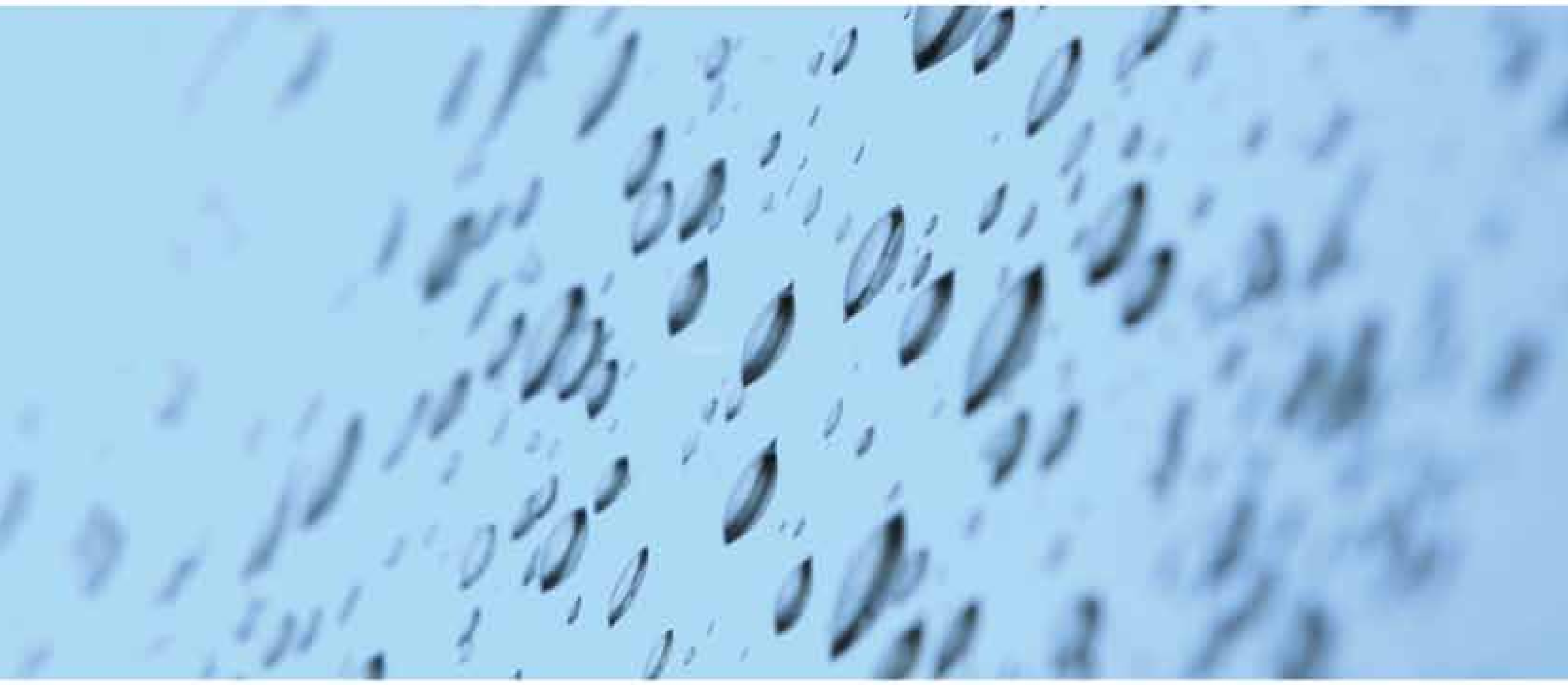

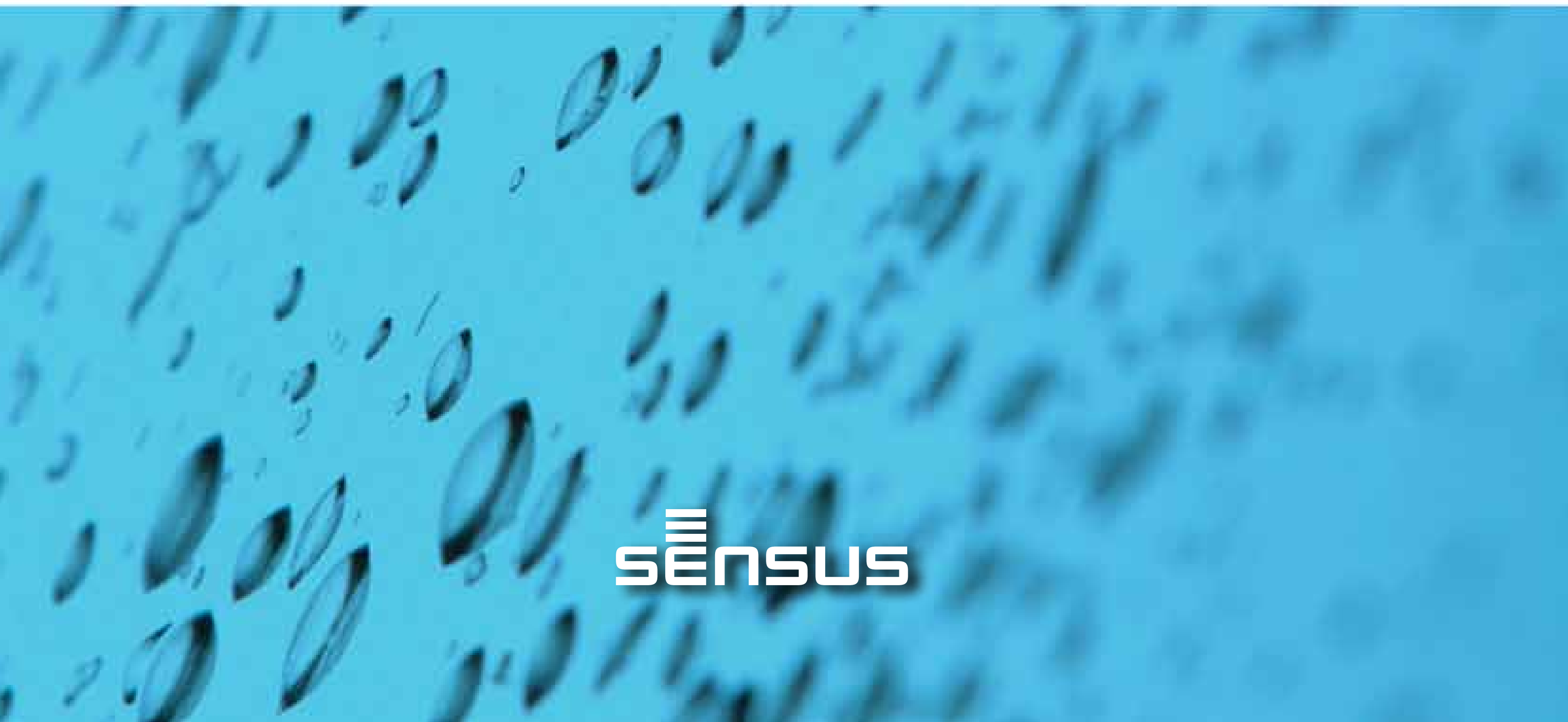
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