MAZARS

2017 U.S. WATER INDUSTRY OUTLOOK

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2017 U.S. WATER INDUSTRY OUTLOOK

Water made headlines in main street newspapers in 2016, with the major contamination discovery in Flint, Michigan, the drought in California, and the presidential campaign. These headlines highlight how vital water is to the U.S. economy and the American people, and the challenges the industry faces.

Over the years, our Outlook has advocated that water requires specific political and financial support to face successfully the challenges that lie ahead. In this year's Outlook, we continue to provide an overall picture of the water industry and identify its future trends.

While we have maintained our traditional survey structure, addressing the three broad topics of Operations, Finance and the Industry's Future, we continue to improve the Outlook. This year's Operational Innovation section focuses on energy efficiency and cybersecurity, due to feedback on last year's survey, which highlighted these areas as major priorities for the industry. We are also pleased to include interviews with three industry leaders and our cybersecurity expert. We trust that you will find their perspectives insightful.

The backbone of this Outlook is a 26-question survey that took place in late 2016 in which we capture the perspectives of different stakeholders in the industry, including water and wastewater systems and operations management, procurement or other support for water and wastewater companies, and government regulators (Figure 1). Of the respondents, 88% are in company management, of which 63% are in executive positions and 25% are in middle management (Figure 2).

Respondents from the public sector include regulators (economic), government-operated systems (municipal and local utilities), and water-related non-governmental organizations, whereas private sector companies include system operators, companies servicing the water industry, and the investment community. The private sector is heavily represented, comprising approximately 72% of respondents (49% of whom are privately owned and 23% are investor owned). The remaining 28% are respondents working primarily for the public sector.

We greatly appreciate your support, and we thank the respondents for both taking time to respond to our survey and for their honest contributions. We are also specifically thankful to four interviewees who shared their perspectives. The Water Industry Outlook's results continue to shine a light on U.S. water industry trends, help us contribute to the knowledge base, and allow us to provide our perspective.

The results of this survey are for information purposes only. We emphasize to readers and users of this survey that every water system is unique and highly influenced by the political, resource, legal, and customer environment.

—The Mazars USA Water Group

.01 DEMOGRAPHICS

FIGURE 1 – INDICATE THE PRIMARY NATURE OF YOUR BUSINESS:

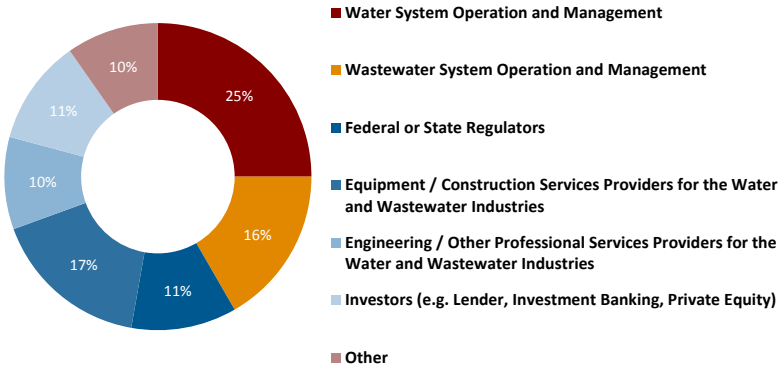


FIGURE 2 – INDICATE YOUR CURRENT POSITION/ TITLE (CLOSEST APPROXIMATE):

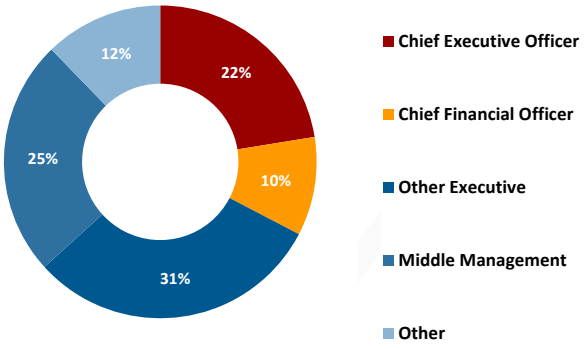


FIGURE 3 – INDICATE THE OWNERSHIP STRUCTURE OF YOUR BUSINESS / ORGANIZATION:

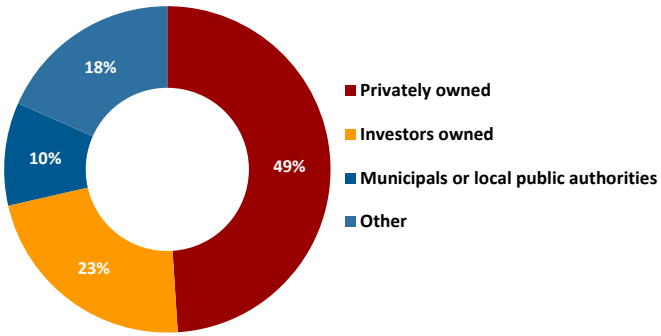
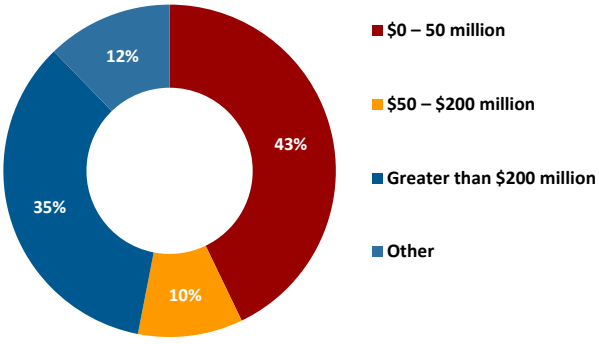


FIGURE 4 – INDICATE THE REVENUES OF YOUR ORGANIZATION FOR THE MOST RECENT YEAR-END:



.02 EXECUTIVE SUMMARY

INNOVATION

In our 2014 and 2015 surveys, we acknowledged that energy efficiency is one of the most important factors for improving service quality. In our opinion, implementing and using energy efficient technologies will prove to be a key performance differentiator within the water industry. Nearly one-half of the respondents are employed by organizations that have implemented an energy-efficiency program within the last three years. Most of these companies reduced their energy costs from 5% to 10%. Even more impressive, nearly 5% of these companies reduced their energy costs by more than 30%.

Energy is one of the largest contributors to operational costs incurred by water and wastewater entities. As a result, reducing energy costs leads to significant savings and improves operating efficiency. Further, although implementing an energy-efficiency program has a positive impact on cost savings, it also creates environmental benefits by reducing the energy footprint to provide water and wastewater services. This is vital for an industry that is the steward of water and, therefore, should lead environmental responsibility.

Our respondents rated energy-efficient advance water treatment technologies as the top factor in bringing benefits to the water industry, followed by high-efficiency pumping systems and high-efficiency aeration systems. Energy-efficiency solutions are an obvious focus within the water industry. In addition, smart metering and data analytics are considered to be among the most important technology advances bringing the greatest benefits to the industry. Smart metering allows identifying weaknesses and opportunities for improving water and wastewater operational cycles through more detailed and accurate data, and is considered to be the first step in implementing and monitoring efficient technologies.

CYBERSECURITY

Cybersecurity is considered to be the top threat facing business and our nation's critical infrastructure, according to reports and testimony from the Director of National Intelligence, the Federal Bureau of Investigation, and the Department of Homeland Security. Participants in our survey are well aware of the growing importance of cybersecurity. More than half of the participants are employed by companies that have identified cybersecurity as a significant risk. Cybersecurity and data privacy systems are considered to be the most relevant and useful resource to mitigate cybersecurity system risk. These systems respond to evolving cyber-attacks either by adding more security tools and/or increasing the sensitivity of the security tools already in place.

IT risk is considered paramount in most organizations, and most of them have IT risk-management strategies in place. IT risk must be monitored and mitigated, especially with omnipresent information and communication technologies in companies' processes. According to our respondents, introducing new internal procedures, implementing new corporate policies or codes of conduct, and increasing investment in IT infrastructures and monitoring systems are the most common practices companies employ to mitigate the IT security risk. It is apparent that both quantitative and qualitative practices are necessary to mitigate risk.

FINANCE

Aging Infrastructure and Capital Expenditures
A continuing challenge and a top concern for the water industry is its aging infrastructure, as it can have a direct result on service disruptions and have a negative impact on water quality. Although the American Society of Civil Engineers (ASCE) just released its 2017 Report Card for America's infrastructure in March 2017, the previous Report Card, issued in 2013, gave the US a D+ grade which was maintained as a grade in 2017 as well. As significant capital expenditures (capex) are necessary to address aging infrastructure, respondents expect it to increase next year, compared to past years. This positive trend also could indicate an understanding and clearer recognition of respondents' aging water systems. In addition, the trend toward increasing capex ultimately would result in higher tariff rates.

Access to Financing
The industry needs ready access to financing to fund the significant capex necessary to upgrade and modernize water systems throughout the US. Yet respondents note that access to capital is an ongoing challenge, a result that contradicts our perspective on the market. Recent legislation, such as the Water Infrastructure Finance and Innovation Act (WIFIA), Water Infrastructure Improvements for the Nation Act (WIIN), which includes the Water Resources Development Act (WRDA), and the new administration's plans for infrastructure are all expected to have significant, positive effects on financing solutions for upgrading infrastructure.

Reporting Standards
Respondents noted that water company reporting standards could be enhanced to provide users and investors with more relevant insight. Some of the more noteworthy areas of disclosure improvements relate to capex programs, environmental and/or compliance risks, and operating matrixes. In our view, the water industry should lead the way to more transparent reporting on water risks and impacts.

FUTURE OF THE INDUSTRY

With 37% of respondents now located in water-supply-challenged areas of the U.S., and the expectation that this percentage will rise to 46% over the next 10 years, evidence is building that water resource availability is a major obstacle facing the industry. It raises the concern that the industry currently may not be prepared, and may not have taken adequate steps to assess risk and plan for future availability.

On the other hand, survey respondents expect to see minor changes in water supply sources over the next several years, which may indicate that despite water supply issues, they have no plans to diversify water sources to confront them. Does this mean we must plan to reduce water usage? If so, successful water reduction plans may result in a related increase in water tariffs for consumers.

This year's Outlook highlights the complex planning needed to continue providing customers with an affordable, sufficient, and safe utility. Securing the water industry's future demands that we continue to plan and balance many factors, including public opinion, economic trends, environmental impact, regulation, customer rates, and politics.

.03 OPERATIONS

INNOVATION

Results from our 2014 and 2015 Outlooks recognized energy efficiency as a main factor for improving service quality. This year, we added an Operations section to the Outlook in an attempt to gauge the acceptance of energy-efficiency programs within the water industry.

The respondents indicated that 44% of them are employed by organizations that have implemented an energy-efficiency program within the last three years (Figure 5). Further, within the 56% employed by organizations that have not yet implemented such a program, more than one-half are now assessing energy-efficiency strategies (Figure 6). Although on the surface this energy-efficiency assessment may appear to be positive, results broken down between the public and private sectors provide a more sobering view. Programs implemented within the last three years have been completed primarily within the private sector—the private sector leads the public sector in embracing energy-efficiency programs.

This is consistent with typical adoption rates between the private and public sectors. Private sector organizations throughout many industries (not just water) take the lead in identifying the value proposition behind new management, technologies, and innovative technical solutions. We anticipate that over the next five to ten years, that dynamic will change, as the public sector's success stories, best practices, and benefits of implementing specific energy-efficiency technologies will be shared and become well known within the industry.

FIGURE 5 – HAS YOUR COMPANY IMPLEMENTED AN ENERGY EFFICIENCY PROGRAM WITHIN THE LAST 3 YEARS:

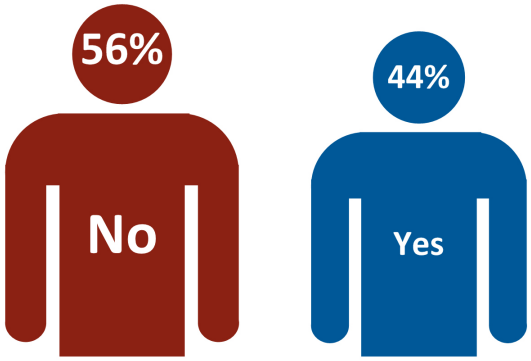


FIGURE 6 – IF NO, WHAT WOULD YOU DEEM THE STATUS OF YOUR COMPANY'S CURRENT IMPLEMENTATION OF ENERGY EFFICIENCY PROGRAMS:

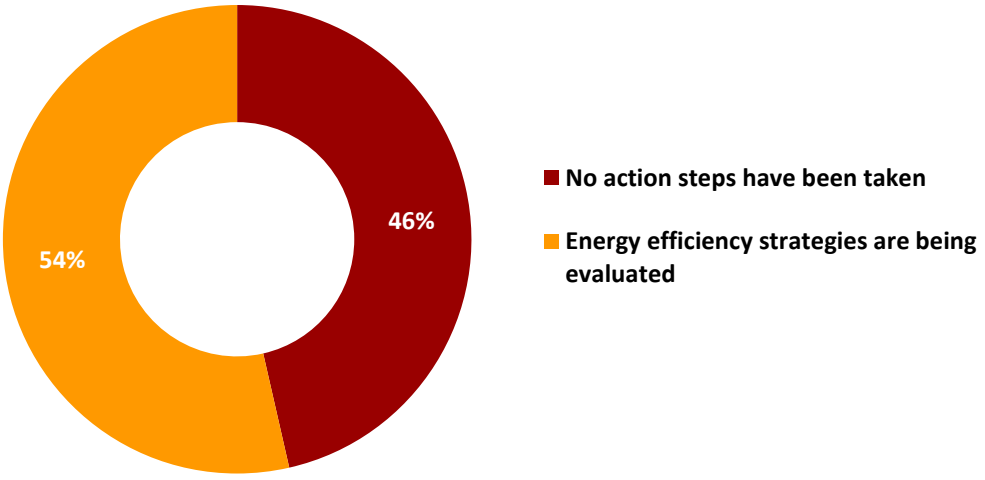
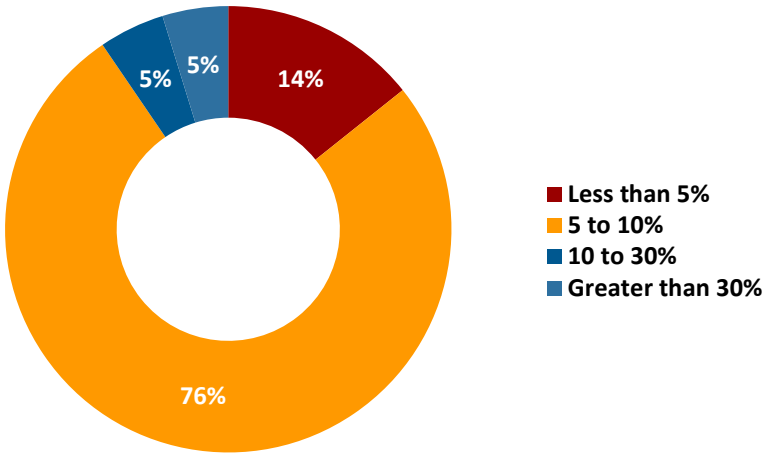


FIGURE 7 – IF YES, WHAT WAS THE TOTAL PERCENTAGE REDUCTION OF ENERGY COSTS ACHIEVED BY YOUR COMPANY SINCE THE IMPLEMENTATION OF THE PROGRAM:



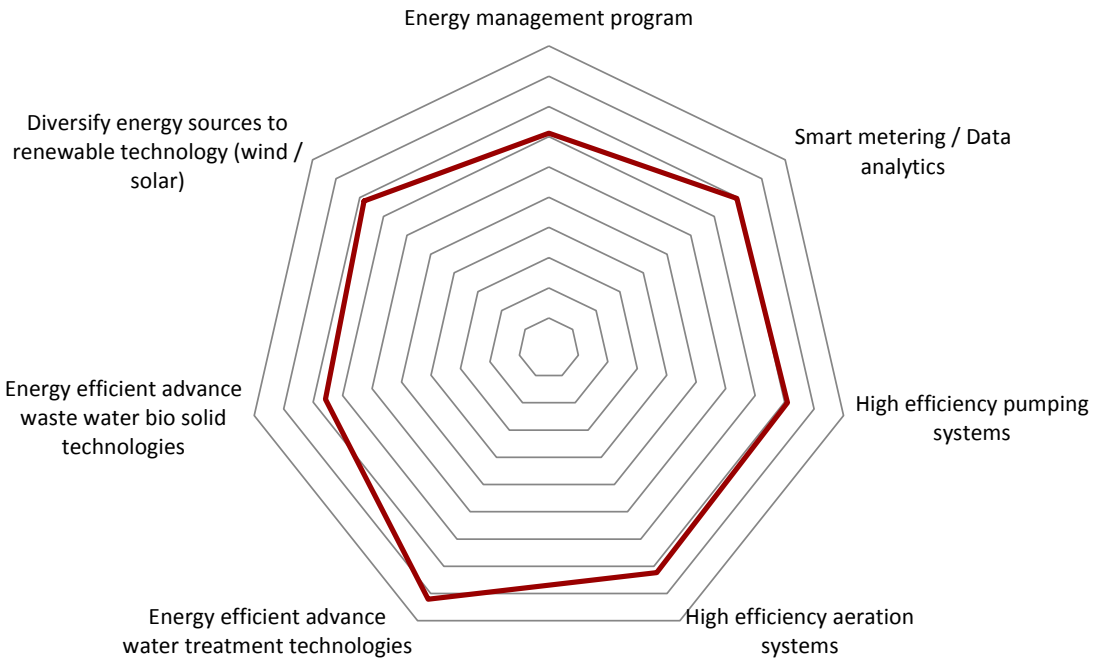
Our 2015 Outlook underscored the efforts water utilities were making to develop methods and processes to improve their key performance indicators, including implementing energy-efficiency technology. This year's respondents indicated that significant cost savings resulted from energy-efficiency programs.

Indeed, 76% of respondents employed by organizations that implemented energy-efficiency measures within the last three years reported 5% to 10% in reduced energy costs. Further, an additional 5% of respondents achieved energy costs reduction of more than 30%.

Energy is one of the largest operational costs that water and wastewater operations incur. So reducing energy expense leads to significant cost savings and presents a clear opportunity for the water industry to free up cash flow for other investments.

Finally, although implementing an energy-efficiency program can save costs, it also creates environmental benefits within the water utility space by reducing the amount of electricity and energy required to provide water and wastewater services.

FIGURE 8 – PLEASE INDICATE WHICH OF THE FOLLOWING ENERGY EFFICIENCY TECHNOLOGY ADVANCES WILL BRING THE GREATEST BENEFITS TO THE WATER INDUSTRY:



Our 2015 Outlook asked respondents whether they expected to see technology play a key role in water industry competitiveness in the next 10 years, and 80% of respondents overwhelmingly agreed that it would. To help us gather specific information on the types of technology that will drive the greatest performance improvement, we asked a more detailed question on technologies in this year's Outlook. The respondents cited the following technology advances as most likely to bring the greatest benefits to the water industry:

- Energy-efficient advance water treatment technologies
- High efficiency aeration systems and pumping systems
- Smart metering and data analytics

The water industry is focused on these findings, which is supported by conversations we had with industry leaders. Clearly, implementing and using energy-efficiency technologies surrounding advance water treatment, aeration, and pumping systems are key differentiators in improving water industry performance.

Our prior surveys emphasized that smart metering and data analytics provide more detailed and accurate data to identify weaknesses and highlight opportunities to improve the water and wastewater operational cycles. For instance, better data analytics can help prioritize tasks regarding leaks and breaks in the water system, or change key fixed assets in case of deficiency. These analytics help align resources with the actual data, such as how the price of electricity affects power needs or water storage. Use of smart metering and data analytics is an important first step in implementing and monitoring efficient technologies.

Finally, our survey stresses two other advances that can benefit the water industry: diversifying energy sources to renewable technology (wind and solar) and energy-efficient advance waste water technologies (bio solid waste to energy).

INNOVATION IN THE MUNICIPAL WATER SECTOR

INTERVIEW WITH CRISTINA AHMADPOUR, PRESIDENT OF ISLE INC.

CRISTINA AHMADPOUR,
President of Isle Inc.

01. DO YOU AGREE WITH THE PERCEPTION THAT THE WATER INDUSTRY IS SLOW TO ADOPT NEW TECHNOLOGY? HOW CAN THE INDUSTRY CHANGE THIS PERCEPTION?

Although I agree with this perception, we must consider it in context. This burden does not sit only with municipal end users, which tends to be the perception of technology companies, investors, and other stakeholders. It also sits equally with innovators and technology providers who have a disconnect from the market's wants and needs. Providers of emerging technologies who are unfamiliar with the water sector assume that because their widget saves 10%-20% on energy, or their new app reduces administrative staff time and optimizes field reporting, or enables real time monitoring of water/wastewater quality, etc., a municipality will surely be interested. Even with a defined value proposition, the provider bears the burden of understanding its end customer and determining how the solution will improve its overall mandate, which is to deliver reliable and consistent sewer management and water services. Further, the provider must understand the return on investment from operational, compliance, and treatment perspectives, how the solution will be integrated, who will use it, and its upstream and downstream impacts. We find that many providers introducing new technologies lack this insight, and end up learning this important market information the hard way. Then, of course, there is the reality that the procurement process creates additional layers in securing the sales, and can lengthen the sales cycle, although channels exist to avoid these delays.

02. HOW CAN THE INDUSTRY CHANGE THIS PERCEPTION?

For technology providers, it will come through education and understanding all of the stakeholders involved. Ultimately, this will help them, their investors, and partners set realistic expectations of how the market will receive their technology. It is vital for the water utility (the end user) to embrace innovation through a formalized process, allowing qualified technologies to be presented and evaluated. Moreover, water utilities should collaborate with other regional utilities to develop mechanisms that leverage unused infrastructure as testing sites for pre-commercial technologies.

03. WHAT ARE THE KEY DRIVERS TO NEW TECHNOLOGY ACCEPTANCE AND INNOVATION, AND SPECIFICALLY, AS THEY RELATE TO ENERGY EFFICIENCY?

A handful of energy efficiency and/or renewable energy technologies have struggled in the water sector, specifically in the municipal vertical. Key drivers, however, continue to be demonstrating added value on top of energy efficiency benefits. Examples of these are enhancements to treatment, reduction of capital cost due to reduced mechanical size, ease of use, integration, etc. Some states in the US offer credits per kwh saved; a huge driver for many end users to offset the costs associated with retrofitting existing equipment/processes. The biggest barriers tend to be complicated integration, high capex costs, and the impacts to overall processes that

04. WHAT ARE THE AREAS OF OPPORTUNITY FOR TECHNOLOGY AND INNOVATION THAT WILL HAVE THE GREATEST IMPACT ON THE WATER AND WASTEWATER INDUSTRY?

Resiliency is an overall theme, and we'll see more of it as the sector adapts to changing climate, growing (or shifting) populations, and managing aging infrastructure to meet and exceed water and wastewater mandates. This is because resiliency has a clear economic benefit for the utilities' regional stakeholders. Secondly, much of the US's pipe infrastructure was put in place in the earlier part of the 20th century. The Water Alliance recently published that over 650 water main breaks occur each day, resulting in a significant cost to utilities, the public, and the environment. Opportunities for trenchless technologies to help utilities identify, inspect, clean, rehab, and repair pipes, specifically the 24-inch or larger ones, are key areas of interest that we've observed here at Isle.

05. WHAT TECHNOLOGY DO YOU EXPECT TO BE WIDELY IMPLEMENTED BY WATER AND WASTEWATER TREATMENT OPERATIONS IN THE NEXT 10-20 YEARS?

The use of cloud-based platforms, online and real time monitoring, efficient aeration technologies/processes (MBAR and ceramic UF membranes), and the use of satellites for water and environmental resource management are among the technologies that I expect will become widely implemented in the next 10-20 years.

06. WILL NEW TECHNOLOGIES CHANGE THE INDUSTRY BUSINESS MODEL OF WATER TREATMENT PLANTS/WASTEWATER TREATMENT PLANTS? IF SO, HOW WILL THE MODEL CHANGE?

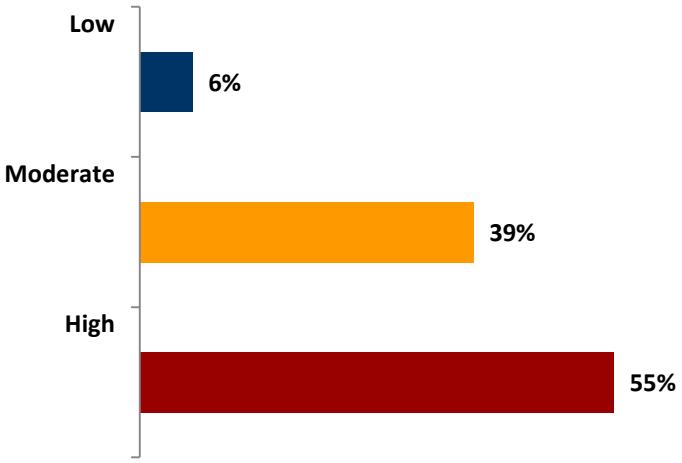
This is an interesting question best answered with a few examples. Emerging technologies (not necessarily new) are improving the way a utility captures and documents the flow of water supplied on the distribution side, and the flow and quality of water as it enters the collection system. Tools exist that enable utilities to evaluate and develop more robust fee structures to service their customers. Although there is a process in place for approving increased rates, technology will enable utilities to justify appropriately the true cost of the services they provide, which, over time, can eventually lead to an industry-wide adjustment of sewer and water rates.

Another example relates to bio solids management, where the potential exists for policy (local, state, federal) to change the business model for the wastewater sector that extends beyond innovative technologies. It includes incentives to leverage proven innovative solutions now in the marketplace, whether pursued in house or through private-public partnerships.

A third example is decentralized treatment that will affect the traditional treatment model. Decentralized treatment has amazing potential, but the utility network has not made a strong economic and operational case for it. Decentralized treatment will be supported more by utilities that have storm water and urban management plans, and they will use it as a strategy to minimize increasing system capacity due to limited space and funding

CYBERSECURITY

FIGURE 9 – DOES YOUR ORGANIZATION IDENTIFY CYBER RISK AS:



We added a section on cybersecurity to our Outlook this year, to gauge where the water industry stands in assessing and mitigating IT risk and, more specifically, cyber risk. Network connectivity proliferation, the disappearance of distinct organizational borders, and the increasing motivation and capabilities of cyber adversaries have transformed water industry cyber risk from a technical consideration for a single department into a significant business risk affecting the entire enterprise.

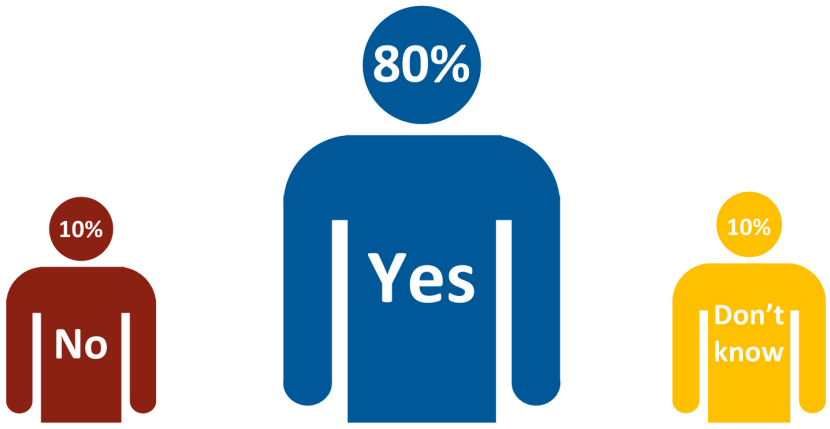
Within industries that rely on Industrial Control Systems (ICS), there were more cybersecurity incidents in 2015 and 2016 than in any prior year. Within the water industry, there have been recent incidents involving ransomware, unauthorized remote access to SCADA systems (systems that manage operational aspects of critical infrastructure), and the attempted sale of SCADA access.

Survey respondents are aware of the cybersecurity's growing importance. Indeed, 55% of respondents' companies have identified cybersecurity as high risk, and 39% consider it to be moderate risk. Cybersecurity risk is significant for the water industry due to tragic outcomes cyber-attacks could have, such as water and environmental contaminations, or the loss or disclosure of key information.

American Water Works Association shares, "Cybersecurity is considered as the top threat facing business and critical infrastructure in the United States, according to reports and testimony from the Director of National Intelligence, the Federal Bureau of Investigation and the Department of Homeland Security." [1]

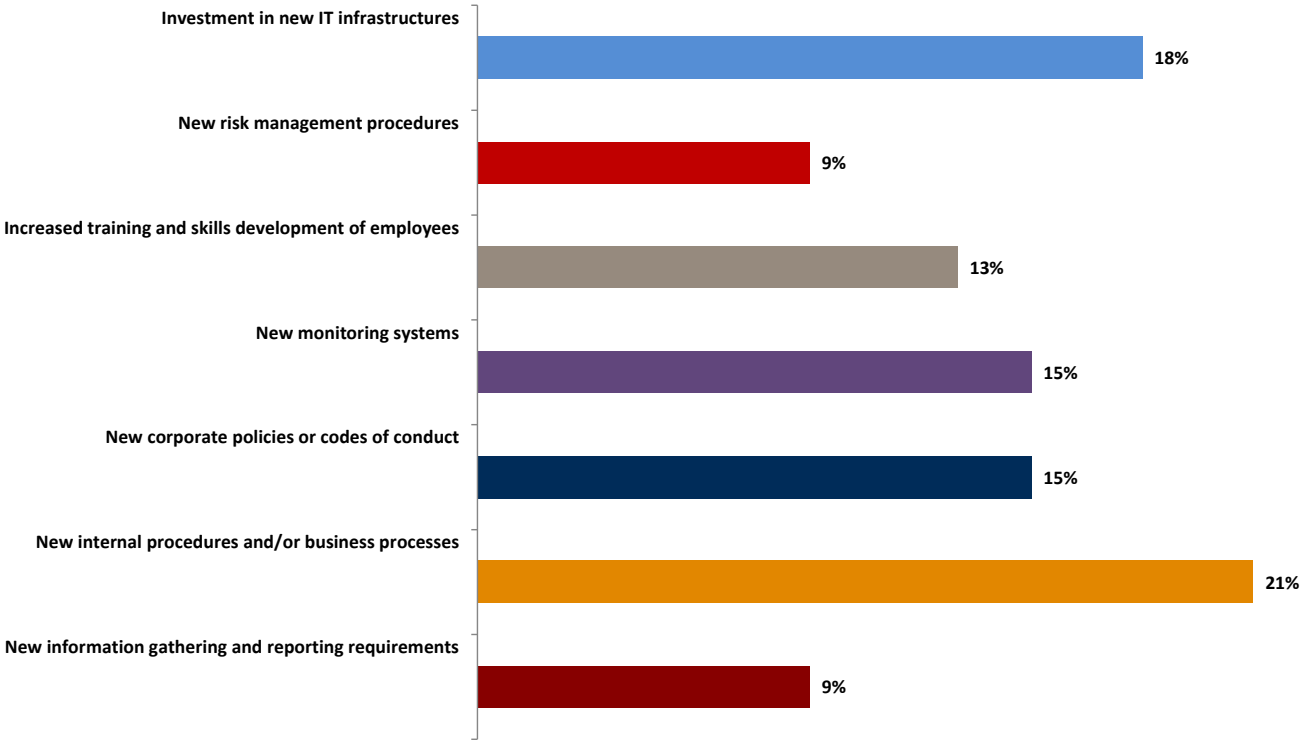
1. Source: https://www.awwa.org/resources-tools/water-and-wastewater-utility-management/cybersecurity-guidance.aspx

FIGURE 10 – IN THE LAST 2 YEARS, HAS YOUR COMPANY CHANGED ANY OF ITS INTERNAL PROCEDURES OR IT SECURITY SYSTEMS IN RESPONSE TO THE INCREASE IN CYBER SECURITY RISKS:



IT risk must be monitored and mitigated, especially with companies' omnipresent information and communication technology processes. Companies view this risk as substantial, and have put IT risk-management and mitigation procedures in place in the past two years, according to 80% of respondents.

FIGURE 11 – WHICH ADDITIONAL MEASURES OR CORPORATE PRACTICES HAS YOUR COMPANY INTRODUCED IN RECENT YEARS TO MITIGATE IT SECURITY RISK:

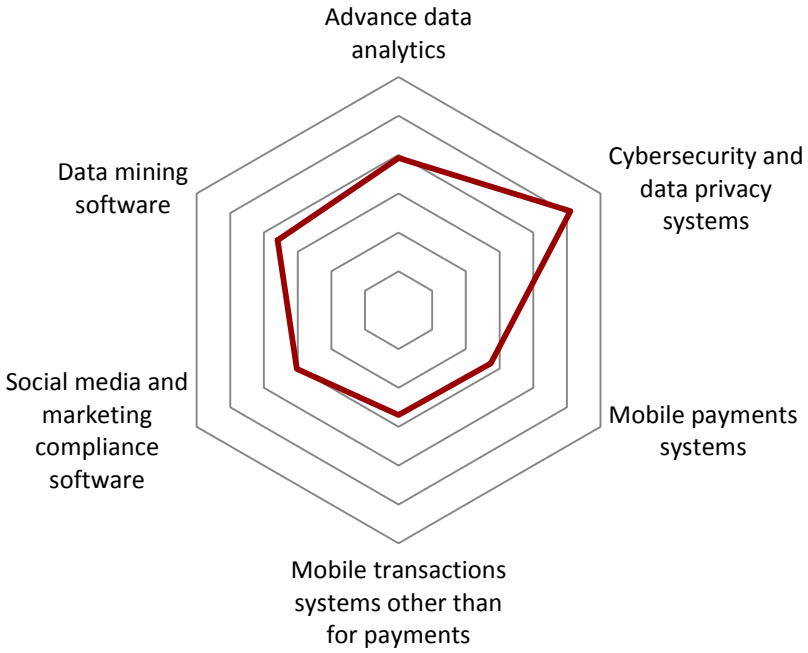


Introducing new internal procedures, corporate policies or codes of conduct, and increasing investment in IT infrastructure and monitoring systems are the most common practices companies use to mitigate IT security risk. And both quantitative and qualitative practices are necessary.

In recent years, according to Survey respondents, 21% of companies introduced new internal procedures and/or business processes, and 18% invested in new IT infrastructures to mitigate IT security risk.

Fifteen percent of respondents' companies implemented new monitoring systems, corporate policies, or codes of conduct. New information gathering and reporting requirements do not appear to be a top practice in mitigating IT security risk, as only 9% of respondents declared that their companies have introduced these practices in recent years.

FIGURE 12 – ON A SCALE OF 1-3, WITH 1 STAR BEING NOT AT ALL USEFUL AND 3 STARS BEING EXTREMELY USEFUL, INDICATE HOW USEFUL EACH OF THE FOLLOWING TECHNOLOGIES HAS PROVEN IN MITIGATING CYBER SECURITY SYSTEM RISK:



Respondents view cybersecurity and data privacy systems to be the most relevant and useful resources for mitigating cybersecurity system risk. They are responses to evolving cyber-attacks, and include either adding more security tools and/or increasing the sensitivity of the security tools already in place.

Respondents rate advanced data analytics as the second most useful technology for mitigating cybersecurity system risk. These have proven useful in assisting companies in complying with transparency and risk-management requirements.

The Outlook's respondents consider data-mining software to be the third most useful technology for mitigating cybersecurity risk. Data-mining software is the process of analyzing data from different perspectives and summarizing it into useful information. It identifies correlations, or patterns among dozens of fields in large relational databases. The increase in the number of cyber-attacks has made data-mining-based techniques a critical component of detecting security threats.

Technically, data mobile payments systems, mobile transactions systems (other than for payments and social media), and marketing compliance software are rated lower than the three technologies listed above.

MITIGATING RISK WITH EFFECTIVE CYBERSECURITY

INTERVIEW WITH BRIAN BROWNE, PRINCIPAL AT MAZARS USA LLP

BRIAN BROWNE, PRINCIPAL
Mazars USA LLP

01. WE NOTE THAT 80% OF OUR SURVEY RESPONDENTS INDICATED THEY HAVE IMPLEMENTED CYBERSECURITY PROCEDURES TO MITIGATE IT RISKS IN THE LAST TWO YEARS. DO YOU FEEL THAT THIS PERCENTAGE IS CONSISTENT WITH OTHER INDUSTRIES WITHIN THE US?

Although the degree to which cyber risk is being addressed actively varies by industry and organization, this response rate does reflect the increasing cyber risk awareness. The specific cyber risks are largely dependent on the particular "crown jewels," or critical assets, and the corresponding threats to those assets.

02. BASED ON YOUR BACKGROUND IN CYBERSECURITY, DO YOU FEEL THAT MOST ORGANIZATIONS IN THE U.S. UNDERSTAND THE REAL THREAT OF CYBERSECURITY AND HAVE IMPLEMENTED SUFFICIENT PROTECTION MEASURES?

The recognition of cyber risk definitely has grown, regardless of industry and geography. The general public is inundated with the frequency of news reports of data breaches and other security incidents, and the impact of many of those incidents has been significant. In response, organization leaders have begun to recognize that cyber risk is no longer a technical consideration for a single department, but a significant business risk for the entire enterprise. This is also reflected in increasing awareness and expectations for boards and directors to provide proper cyber risk oversight.

03. IN YOUR VIEW, WHAT ARE THE KEY DESIGN AND IMPLEMENTATION COMPONENTS OF A COMPANY'S COMPREHENSIVE CYBERSECURITY PROGRAM?

The cornerstone for managing risk is an enterprise-wide cyber risk management framework with adequate staffing and budget. This is important for every organization, but especially for more distributed and decentralized organizations that require a consistent approach to managing risk. The framework should consider the intersection of vulnerabilities and threats, the likelihood of occurrence, and the corresponding impact to the organization. This should produce a prioritized risk register from which management can decide which risks to avoid, accept, mitigate, or transfer through insurance.

Another foundational item is adopting a cybersecurity control framework of people, processes, and technology that is leveraged to manage ongoing risk. This control framework can be adjusted and aligned to evolving risks through the cyber risk management process.

Specific to the water industry, the American Water Works Association (AWWA) has published Process Control System Security Guidance for the Water Sector, a handbook that gives water sector utility owners/operators a consistent and repeatable recommended course of action to reduce vulnerabilities to cyber-attacks. This guidance, based on the NIST Cybersecurity Framework, provides direction based on how the utility or organization uses its process control system.

04. IN YOUR OPINION, WHAT ARE THE TOP TWO OR THREE AREAS THAT A COMPANY SHOULD BE AWARE OF FROM A CYBER SECURITY RISK STANDPOINT?

Beyond the cyber risk management and cybersecurity control frameworks, some of the current common areas of cyber risk focus for organizations are:

Crown Jewels –
Management should understand the organization's most critical data assets—where they reside, how they flow through the organization, and who has access to them. This foundational understanding supports a focused and efficient protection and cyber risk reduction strategy. As part of this strategy, management should consider not only high probability risks, but also low probability/high impact risks that would be catastrophic.

Third Party Risk –
Management should understand cyber risks present not only within their own organization's infrastructure, but also within the larger ecosystem of partners, suppliers, affiliates, and customers within which it operates. The degree of connectivity that the organization has with third parties can increase its cyber risk exposure, as several well-known and significant breaches were initiated through third parties.

Simulations/"Table Top" Exercises –
The various ways in which company executives have handled data breaches at their organizations clearly demonstrate that proper incident response planning is not only a necessity for IT staff and management, but also for corporate executives and directors. Corporate brands have been negatively affected by unclear and inconsistent executive communication. The handbook by the AWWA recommends that directors participate in simulations, or "table top" exercises, to become familiar with their incident response procedures and communication approach.

05. SYSTEMS THAT MANAGE OPERATIONAL ASPECTS OF CRITICAL INFRASTRUCTURE (I.E. WATER AND WASTEWATER) ARE COMMONLY KNOWN AS SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) SYSTEMS. WHAT DO YOU CONSIDER TO BE THE TOP RISKS ASSOCIATED WITH THIS TYPE OF WIDESPREAD AND REMOTE IT ACCESS POINTS, AND WHAT ARE SOME WAYS TO IMPROVE PROTECTION?

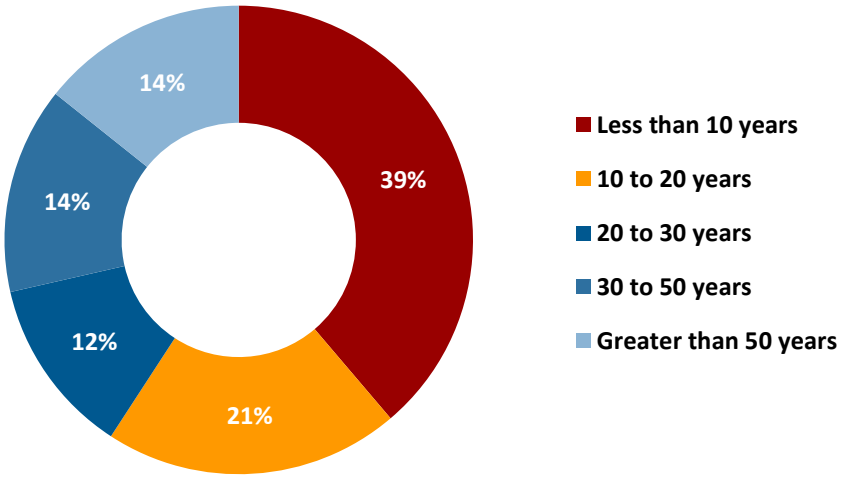
The primary threats to critical infrastructure, including the water industry, are nation states, cybercriminals, and insiders. Nation states such as Russia, China, North Korea, and Iran, will most likely continue to attempt disruptive or destructive attacks against critical infrastructure, including the water industry. The relevant attack vectors used by cybercriminals against critical infrastructure include both ransomware and SCADA access as a service (SAaaS). Although the most prevalent ransomware infection results in encrypting an organization's files until a ransom is paid, many have predicted its evolution to attack critical infrastructure by disrupting /ceasing operations, or preventing access to an asset until the ransom is paid. Similarly, SAaaS also represents an evolution of a well-established cybercriminal business model. Selling Access as a Service to compromised networks and systems has existed, but recent evidence shows that it is expanding from the more typical corporate asset to SCADA systems. Lastly, negligent or malicious insiders, including employees, vendors, and partners, can represent a significant threat to the water industry. Even an unintentional victim of a phishing attack that results in a malware infection can introduce significant risk to an organization.

.04 FINANCE

On November 16, 2016, the American Water Works Association ("AWWA") sent a letter to President-Elect Donald Trump, expressing the hope of working collaboratively to address the critical issues now facing the water industry. Water infrastructure investment was the top priority in the AWWA's letter. Infrastructure aging has continued to be a top concern among our survey respondents each year, and we have noticed a negative trend in the remaining useful life of infrastructure in 2016, compared to results in previous surveys.

In 2016, 39% of respondents indicated that they estimate fewer than 10 years of remaining useful life for their water mains. This was a significant increase from 19% in 2015, and 7% in 2014. The survey also indicated that in 2016, 21% of respondents estimated remaining useful life of 10 to 20 years, up from 14% in 2015, and 7% in 2014. Additionally, 12% of respondents estimated remaining useful life of 20 to 30 years, compared to 10% in 2015, and 15% in 2014. Finally, 14% of respondents in 2016 stated that their water mains have 30 to 50 years of remaining useful life, a significant decrease from 38% in 2015, and 52% in 2014, and 14% of respondents reported more than 50 years of remaining useful life, well below 19% in both 2015 and 2014.

FIGURE 13 – WHAT IS THE AVERAGE REMAINING USEFUL LIFE OF THE DISTRIBUTION AND / OR COLLECTION NETWORK IN YOUR SYSTEMS:



Although the most common response from municipal and private companies was remaining useful life of fewer than 10 years, public company respondents said it was more than 50 years. This indicates that public companies are investing more in their systems, which is consistent with our finding in Figure 14, below.

Although the data show significant swings in useful life estimates, we emphasize that systems have not aged that much, compared to our prior years' surveys, and therefore the results reflect either the effect of our respondents' mix or a greater understanding and/or a clearer recognition that systems are aging. We certainly believe that this 2016 picture is closer to reality than previous results would indicate.

A few references for U.S. Water infrastructure:

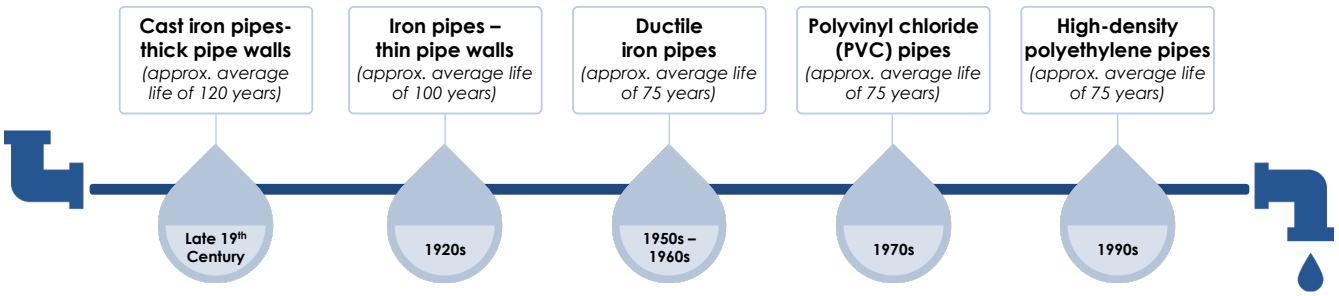
- 1.7 trillion gallons of water wasted every year due to broken and leaky pipes [2]
- Approximately 240,000 water main breaks occur each year in the United States [3]
- Cost to replace all pipes in the United States would reach more than $1 trillion [4]

"In this country, 44% of America's water infrastructure will be considered poor, very poor, or life elapsed," notes Susan Story, President and CEO of American Water Works." [5]

Sources:

2. http://www.foxbusiness.com/features/2016/01/28/america-s-water-infrastructure-is-in-need-major-overhaul.html
3. http://www.asce.org/
4. https://www.awwa.org/
5. http://www.foxbusiness.com/features/2016/01/28/america-s-water-infrastructure-is-in-need-major-overhaul.html

Throughout the country, useful life of water distribution pipes (the core of the problem) varies, based on when they were installed (i.e., it usually coincides with population growth). The following illustration is a timeline of the primary materials used for water pipes, along with an approximate average life:

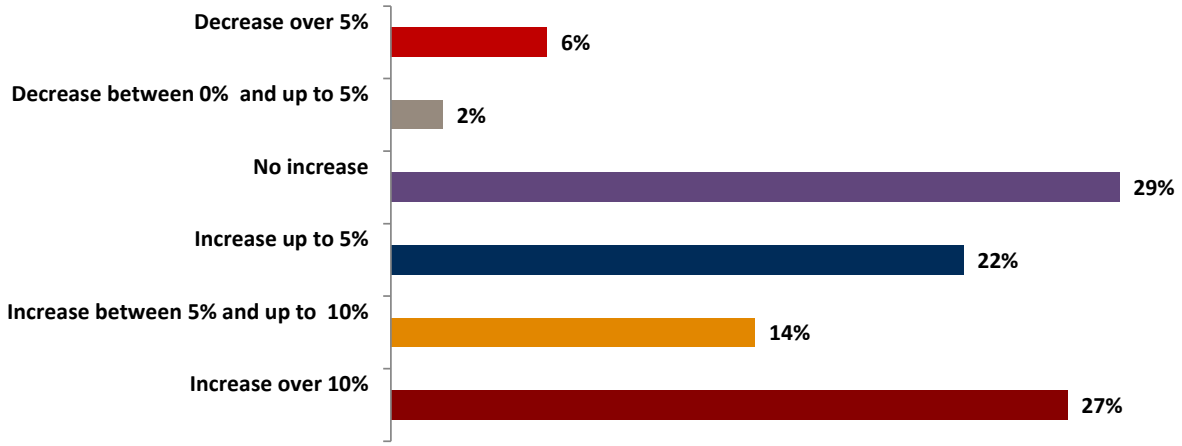


To assess a situation, the industry looks at asset replacement rate as the key indicator. From a high-level perspective, a water system with an average useful life of 100 years requires an approximate 1% investment of capex each year to replace the entire system. Although the industry as a whole started to increase investments in its systems, in prior decades the investments were typically below 1%, and perhaps closer to .5%. This ultimately resulted in the industry's operating older distribution systems nationwide, leading to a $1 Trillion water infrastructure gap.

The Trump administration's commitment to rebuilding the country's aging infrastructure, in order to provide citizens with clean, safe water, is an issue that can gain bipartisan support in Congress, although how to obtain the required funds to support this process will be debated. The administration has alluded to a number of measures and regulations aimed at addressing this investment gap, such as "through the American Energy & Infrastructure Act- leverage public-private partnerships, and private investments through tax incentives, to spur $1 trillion in infrastructure investment over 10 years." [6]

6. Source: https://www.donaldjtrump.com/press-releases/donald-j.-trump-delivers-groundbreaking-contract-for-the-american-vote

FIGURE 14 – INDICATE WHICH STATEMENT BEST APPLIES TO THE TREND OF YOUR ANNUAL CAPITAL EXPENDITURES IN 2016 COMPARED TO THOSE IN 2015:

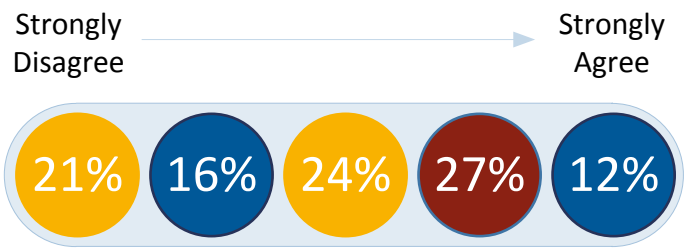


Although 63% of respondents in 2016 indicated they would spend more on capex than in 2015, we noted a significant increase in respondents who have plans to maintain or decrease the level of investments: 27% in 2016, compared to 13% in 2015. The respondents' decision not to increase capex over last year could be driven by the significant increases in total investments noted in 2015.

Infrastructure is of paramount concern to the water industry, and as illustrated in Figure 13, 39% of respondents estimate the average remaining useful life of the distribution and/or collection network is fewer than 10 years. This leads us to conclude that additional capex replacement is required to sustain system operations. However, the increase in the number of respondents stating they have no plans to increase capex compared to 2015 may signal that water systems are either investing at a level now deemed appropriate, or that much larger investments will be needed in the near future.

Comparing the increase in the level of capex with the rather gloomy outlook for decaying water infrastructure points to the need to consider how other factors affect capex. The financial incentives to increase capex investment include recovering investments through rate increase mechanisms. However, the market can accept only a finite increase in water rates. Topics such as customers' understanding of water value or water affordability create pressures on utilities and regulators to maintain reasonable tariffs and annual increases. It is also important to consider creating opportunities to use alternative solutions, such as technical innovations that reduce the cost of extending useful life.

FIGURE 15 – INDICATE HOW STRONGLY YOU AGREE WITH THE FOLLOWING STATEMENT: FINANCING FROM POTENTIAL INVESTORS AND LENDING INSTITUTIONS FOR CRITICAL UPGRADES/MODERNIZATION TO FACILITIES AND INFRASTRUCTURES WITHIN THE WATER UTILITIES INDUSTRY IS DIFFICULT TO OBTAIN AND LIMITED IN AVAILABILITY:



Respondents reported a trend showing financing has become more difficult to obtain, compared to the results of our initial survey in 2012. This finding is consistent with our 2015 analysis. However, 63% of investor respondents indicated that they strongly or slightly disagree with the statement that financing is not available, which is relatively consistent with those respondents identified in the water and wastewater system operation and management category.

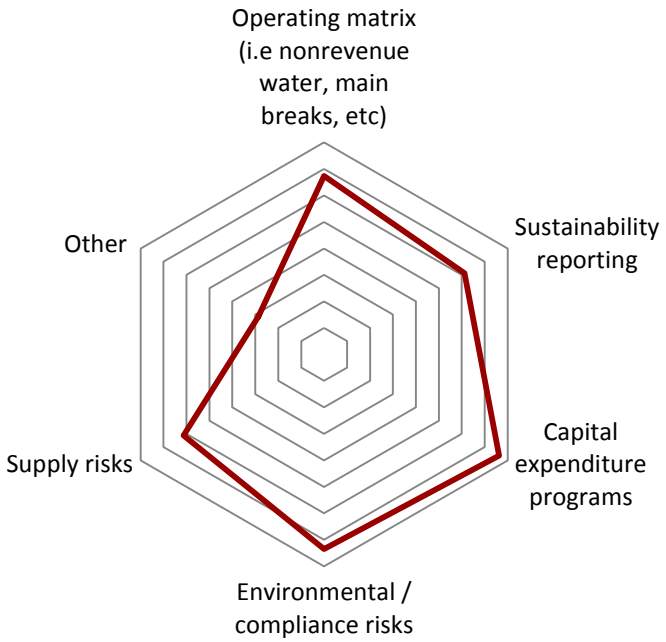
In December 2016, the Federal Reserve increased its key interest rate by 0.25%, followed by another 0.25% increase in March 2017, with the potential for additional rate hikes on the horizon, signaling that the US economy is improving. Higher interest rates will have a direct impact upon the water industry, as it is capital intensive. These higher interest rates will increase borrowing costs, which in recent years have been relatively low and have benefited the water industry. Costs typically are passed down to customers, but this is not always a guarantee, and excess costs would be absorbed by investors, at least in the short-term, making it difficult to attract new ones.

We believe that plenty of capital is available, but fewer projects are attractive from a risk and return perspective. In our 2015 outlook, we pointed out that legislation, such as the Water Infrastructure Finance and Innovation Act (WIFIA), would help these projects attract private capital. However, we have yet to see a WIFIA-financed project. Water Infrastructure Improvements for the Nation Act (WIIN), which includes the Water Resources Development Act (WRDA), along with the new administration's plans for infrastructure spending, are expected to have significant positive impacts upon the water industry's aging infrastructure.

The WIIN (S. 612) includes the WRDA, the Water and Waste Act of 2016, significant tribal and natural resources legislation, and other important measures to help improve and manage our nation's infrastructure. WRDA is significant for investments in the water industry.

The Water Resources Development Act of 2016 (WRDA) authorizes 25 critical Army Corps projects in 17 states. The act notes: "These projects, which have undergone Congressional scrutiny and have completed reports of the Chief of Engineers, will strengthen our nation's infrastructure to protect lives and property, restore vital ecosystems to preserve our natural heritage, and maintain navigation routes for commerce and the movement of goods to keep us competitive in the global marketplace. The bill provides critical investment in the country's aging drinking water and wastewater infrastructure, assists poor and disadvantaged communities in meeting public health standards under the Clean Water Act and Safe Drinking Water Act, and promotes innovative technologies to address drought and other critical water resource needs. The bill also responds to the drinking water crisis in Flint, Michigan, by providing emergency assistance to Flint and other similar communities across the country facing drinking water contamination."

FIGURE 16 – IN WHICH OF THE FOLLOWING AREAS, DO YOU BELIEVE CURRENT REPORTING STANDARDS FOR WATER COMPANIES SHOULD BE ENHANCED TO PROVIDE THE USERS/INVESTORS WITH MORE RELEVANT INSIGHT? (RATE EACH OF THE AREAS ON A 1-5 SCALE, 1 BEING STRONGLY UNNECESSARY AND 5 STARS BEING STRONGLY NEEDED):



Although financial disclosure requirements for reporting purposes are set forth by authoritative guidance, respondents have indicated an interest in enhanced disclosures that contain meaningful insight into water companies' operations. Ranked highest by respondents were financial reporting disclosures for capex programs and environmental and/or compliance risks.

Greater transparency regarding an entity's capex programs would enable the users of the financial statements to better understand the details of current and future investments and the distribution system replacement rate discussed in Figure 13. Disclosing environmental and/or compliance risks also would enable users to assess the potential operational and financial risks. These findings support our opinion that the water industry should lead the way to more transparent reporting on water risk and water impact.

The responses above were followed by operating matrixes, such as non-revenue water, which would provide insight into the amount of water being lost by a company's distribution system or the number and/or frequency of water main breaks that disrupt operations. Next were supply risks, sustainability reporting, and "other".

We note that federal and state regulators consistently indicated that their main interests were in capex programs, environmental and/or compliance risks, and supply risks. Investors noted that their primary interests were capex programs and operating matrixes. Capex programs were also ranked highest among water and wastewater system operations and management. Respondents citing "other" provided examples, such as climate impact on water resources and consumption.

FINANCING WATER'S FUTURE

A CONVERSATION WITH MICHAEL DEANE, DIRECTOR OF NATIONAL ASSOCIATION OF WATER COMPANIES (NAWC) AND JEROME DEVILLERS, PARTNER AT MAZARS USA LLP

MICHAEL DEANE, DIRECTOR
National Association of Water Companies (NAWC)

01. WITH IMPROVED INFRASTRUCTURE NOW A TOP PRIORITY FOR THE NEW ADMINISTRATION, DOES THIS MEAN THAT THE WATER INDUSTRY WILL BECOME PRIVATIZED OWING TO A COMBINATION OF PROMISED TAX BENEFITS AND INCENTIVES?

Michael Deane: The focus on infrastructure that the administration has brought to bear throughout the campaign and now is welcome. I do believe there is a true commitment by this administration to accelerate investment in the nation's infrastructure. Obviously there is a lot of uncertainty still on how that plays out in the long and short term. Not least of which is the extent to which there is any particular federal action at the executive or congressional level, not only what will that be, but when will that be, given the other priorities Congress is working on.

The good news is that we'll have some time to put together a lot of really good ideas, which has already been underway. The transition team has spoken to people across the infrastructure sector including the water industry.

When there is focus on infrastructure, one of the challenges we face in the water industry is making sure water is part of that dialogue as well. In this town and elsewhere, people talk about transportation, roads and bridges, ports and airports which are all important, but of course in my biased opinion, I believe water is more important.

The first thing we need to do in the water industry - broadly speaking and including people in the finance, legal and development world of water and the technology and equipment world of water - is to ensure we are part of anything that goes forward and I am confident that will be the case.

There is a lot of talk around removing tax barriers, which is something the National Association of Water Companies has worked on for many years. As well as others like the US Conference of Mayors and the American Water Works Association working to remove the cap on private activity bonds for water and wastewater projects, which we believe would lead to inflows of capital investment for drinking water and wastewater systems.

02. EVEN THOUGH THE ADMINISTRATION HAS MENTIONED PUBLIC/PRIVATE PARTNERSHIPS, FEW OF THESE HAVE EMERGED OVER THE YEARS. WHY IS THIS SO?

Michael Deane: I do expect an increase in projects because the needs are there. There is an eagerness to look at how we get more private dollars into the nation's drinking water and wastewater infrastructure.

With long-term concessions, what happens sometimes is there are what I call speedbumps. They aren't big barriers, but these types of things, like defeasing outstanding debt, bundle up and make it very hard to get momentum on a project, particularly for small to mid-size cities that don't necessarily have the resources and at some point they just don't go forward.

If you remove some of those barriers and allow communities to go forward with a particular objective they may have, for example, we don't want to have responsibility for running our water system and there is a great utility that serves the area so we can sell it. If you can do that without two years of legal processes and waiting for IRS rulings and other types of things, if we can clear those barriers, local officials can make the decision based on what's best for their community. And the private water operators need to step up to market and put together value propositions that are attractive to various types of municipalities.

03. BASED ON THE RESULTS OF OUR SURVEY, OUR RESPONDENTS VIEW FINANCING FOR CRITICAL CAPITAL EXPENDITURES AS A CHALLENGE FOR THE INDUSTRY. WHAT DO YOU VIEW AS THE GREATEST CHALLENGES FACING THE WATER INDUSTRY IN OBTAINING FINANCING FOR SYSTEM IMPROVEMENTS AND MODERNIZATION?

Michael Deane: There is no lack of capital—but there may be a lack of access to capital depending on the credit or financial situation of a particular water system. The greatest challenge is to align the benefits that we as communities, we as the nation, receive from good, safe, and efficient delivery of drinking water and good, safe, efficient removal of waste water from our homes and businesses. In general, we do not pay enough as customers of those systems and the beneficiaries of the benefits these systems deliver.

So the greatest challenge is to have a rate base of knowledgeable, informed customers who recognize these benefits and are willing to make the investments in those systems.

Financing, whether it be for some municipal systems from the municipal bond market, the corporate debt and equity market for investor-owned utilities, or other new or existing programs, will be another challenge. There is no free lunch—government grants are not the answer. The source of funds is businesses and customers, and direct investment can be more efficient.

That doesn't mean that there isn't a role for some sort of subsidies. As we start to increase rates to where they need to be to cover the full cost of service, we have to acknowledge there are households who because of their financial situation cannot pay their full cost of service. We understand that as an industry, and public officials at the local, state, and federal level, we need to be aware of that. But rather than keeping all the rates down to make sure those people can pay and letting the system deteriorate, set the rates where they need to be and then help those people pay their full cost of service bills.

04. WILL THE PRIMARY FUNDING COME FROM THE PRIVATE SECTOR OR FROM GOVERNMENT PROGRAMS, SUCH AS WIIN AND WIFIA, AND IF SO, WILL THEY HAVE A SIGNIFICANT IMPACT ON THE WATER INDUSTRY?

Michael Deane: Most of the sector is public, and about 15% of the population that is served by a drinking water utility is served by a private utility – it's a smaller proportion on the wastewater side.

Most of the larger public systems have access to the municipal finance market which is the primary source of capital for the bulk of utilities in the United States. For the private utilities, the source is corporate debt and equity markets which are robust and healthy as well. As more business and project delivery models develop, I think we will see a shift of more private dollars going into them. That's the objective of some of these programs like WIFIA - to facilitate, certainly permit, a mix of public and private dollars. For a public-private partnership, financing can be some public money through the municipal debt markets, private money - debt and equity - and it could be some WIFIA money as well.

There also may be acquisitions, particularly of small and medium-sized cities' systems. We're seeing increasing interest in communities where they are struggling with more stringent regulations, compliance issues, aging infrastructure that they have not kept up with and rates that are lower than they should be for political reasons. Post Flint, people are realizing that it's not just about water pipes—these communities also need good operators and managers, good testing , and in some cases an acquisition by private companies makes sense so I believe we will be seeing more.

WIFIA is just getting up and running and applicants are seeking loans now. My hope is that WIFIA financing will be in addition to other investments made rather than a substitute for investments that would have been made anyway.

05. WILL WE SEE THE FIRST WIFIA PROJECTS IN 2017?

Michael Deane: It's feasible we could see one or more this year but if they do it right, it will take time. The EPA wants to move as expeditiously as possible to show that WIFIA is a good, viable program and to get additional funding.

06. ALTHOUGH OUR RESPONDENTS IDENTIFIED FINANCING AS A CHALLENGE, THE MARKET VALUE OF LISTED COMPANIES AND WATER INDICES HAS GROWN IN THE PAST TWO YEARS. WITH A LOT OF MONEY CHASING ASSETS, HOW CAN WE RECONCILE THE PERCEPTION THAT THERE IS NOT ENOUGH CAPITAL TO INVEST IN WATER INFRASTRUCTURE?

Michael Deane: A look at the market value of listed NAWC companies clearly reflects there are capital investment needs – we have great access to capital right now and are making those capital investments. Although we are somewhat dependent on the overall regulatory Public Utility Commission (PUC) environment, there is an acceleration of investment in states where the regulatory environment recognizes the need to invest and which have mechanisms in place to make sure the investments are made.

There is a lot of capital looking to invest, whether it be in buying municipal bonds for a AAA-rated state revolving fund or a single A-rated municipality or a listed investor-owned utility, the money is out there.

So, if you are a well-run, a financially healthy utility, I don't see where you a have a challenge getting capital. Does your governing body want to raise the rates necessary to attract that capital? Well, that may be a different story.

For more troubled systems that have management/governance issues and are facing significant capital investment needs, financing can be a challenge and that's where we are seeing a call for subsidies. Those subsidies can help, but they're not a long-term solution. The long-term solution is to make sure every utility has the financial, managerial, and technical capacity to run their system, along with a governing structure that puts in place the management and finances to support it.

07. CAN PROGRAMS LIKE WIFIA BEST BE USED TO ADDRESS THE AGING INFRASTRUCTURE CRISIS?

Michael Deane: I think it remains to be seen. It certainly has the intention and it has the potential to be powerful. I would like to see WIFIA focus on innovation, similar to what happened in transportation (although it's a little different, because a lot of transportation projects don't have a revenue source like a utility does). In the transportation example, if projects couldn't get over the hurdle because they couldn't project a revenue stream, it was hard for them to get private financing. But credit support from the Transportation Infrastructure Finance and Innovation Act (TIFIA) created the financial structure to attract private investment. Using WIFIA to replace 50 miles of aging pipe that the utility knows has been in the ground for 150-200 years is a wasted opportunity. Rather, look for innovative projects like water reuse projects or potential desalination projects where there may be a little more uncertainty of revenue stream or technology risk. The WIFIA assistance gives investors more confidence in the project. So, yes, I'm hopeful WIFIA will have a significant impact, but it won't be the primary funding source.

Jerome Devillers: I like the comparison to TIFIA for the transportation sector, and agree that we must focus on innovation. WIFIA needs to take the technology risk out of the project, and the focus on innovation gives it an interesting perspective. Do you see some of your members, the private water companies, using the WIFIA program?

Michael Deane: We don't know yet and to a large extent we won't know until it's all stood up, the regulations are in place and we really understand the lay of the land. Then we can determine if it makes sense for us. We would be interested in larger projects, in the range of $20 Million or more which may have some regional significance. Even for our well-run private utilities, projects that may have a technology or delivery risk that could make our financing a little more questionable, WIFIA assistance, or subordinated debt, could make it more attractive. But we need to watch how the WIFIA program will run. For example, private companies that supply drinking water and may not participate in a state bond or federal program aren't used to the federal bureaucracy and process. If they opt to use WIFIA, and discover after the initial application that it may take two years to review and finance, they may not move forward if they have alternative access to debt and equity. It also depends on what the federal requirements are, i.e., buy American requirements, federal rather than state environmental review, etc. Those things may be more difficult for a private company which has not previously been subject to them compared with their municipal partner next door.

08. THE WATER INDUSTRY IS AWARE OF THE $1 TRILLION INVESTMENT NECESSARY TO IMPROVE U.S. INFRASTRUCTURE. THE AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE) IS COMING OUT WITH A NEW GAP ESTIMATE THIS YEAR. SHOULD WE EXPECT THE RESULTS OF THAT INITIAL ESTIMATE TO CHANGE? WHAT IS NECESSARY TO MAKE A MEANINGFUL IMPACT, AND WILL THAT GAP BE FILLED?

Michael Deane: I'm not aware of how exactly ASCE came up with the $1 Trillion number, and often times we use the gap estimate incorrectly. The EPA has needs surveys that shows approximately $700 Million in needs—but that's not a gap. A gap means we aren't going to finance it, but those surveys include documented needs that utilities plan to be done and the bulk of it will be financed. The ASCE has come out with its report card again, and years ago, the water industry was thrilled when it earned a D from its previous D minus rating.

Is there a lot of bad infrastructure out there in the water and wastewater world - sure. But is the nation as a whole a D? I'm not sure I agree with that. We have big systems that are in pretty good shape but, overall, infrastructure is in declining shape, which is a problem. If you look at recent surveys done, rates are going up on a regular and significant basis. For good utilities, usually the larger and medium sized ones, they are increasingly putting in place rates to support investment, so yes, I think things will get better.

I'll keep driving home the point that there is no shortage of money, but we have to put a utility in place that can attract capital. It can be done, and it is being done by well-run public and private utilities and systems that decide to sell and consolidate into a larger system. So the gap will be filled, but the ASCE's number is not a magic number.

And don't forget, the needs numbers are based on the way we've always done things. Why should we be investing the same way today as we did in 1972, when the Clean Water Act was passed? We're not only talking about investing from a financial standpoint, but we're also talking about what we invest in. We're becoming much more efficient. Every dollar saved in operational efficiency can be put into the ground in new capital plant without raising a single dollar from a customer. Efficiency covers water loss, energy, treatment technology, and labor—we've done a good job, but we have a long way to go still. We can start filling the gap without asking customers for another penny. It is getting the attention it needs in the last few years—we are headed in the right direction and just have to keep at it.

09. BASED ON THE SURVEY RESULTS, MANY RESPONDENTS ARE LOCATED IN WATER-SUPPLY-CHALLENGED AREAS AND EXPECT SUPPLY ISSUES IN COMING YEARS. IS THE INDUSTRY PREPARED TO FACE FLUCTUATING SUPPLY ISSUES THAT MAY BE PRESENTED IN THE NEXT SEVERAL YEARS? IS THE WATER INDUSTRY PROACTIVE IN MANAGING RISK THROUGH STRATEGIC PLANNING?

Michael Deane: It's difficult to generalize in this business, with our 52,000 community water systems, and our 16,000 waste water systems. In general, are we totally prepared? Probably not. But we're doing a good job in a lot of places. Resiliency of supply has always been an issue that is becoming more of an issue. Some Mid-Atlantic States, for example, have lots of systems and interconnections in densely populated areas and more options for adjusting supplies. Other areas may have climate-induced or environmentally driven long-term supply issues and these more dire areas must focus on supply. But it is not just a matter of supply, it is a matter of significant fluctuation of supply. For example, we are seeing that California doesn't have enough reservoirs to hold the water supply when early rains melt the snow pack in the mountains that is needed for supply later in the year. So there is a lot to be done, and although we're not necessarily fully prepared, we are focusing on it. But generally, there are no short-term solutions—it takes time to put in place what needs to be done.

We're managing water much more holistically now. For example, utilities recognize they are not just a utility, but a utility that is part of a larger watershed that has needs for ecological flows, and has energy and agricultural water needs. We need to balance it all and decide what the best use is for a molecule of water. We are making moves in the right direction, and it gets into issues with governance, watershed management, and the collective management of risk and strategic planning. In some places we are doing really well—in others, not so well.

10. HOW CAN THE INDUSTRY TAKE ADVANTAGE OF REUSE WATER IN THE FUTURE? DO YOU SEE THIS AS A VIABLE SOURCE TO MAKING SIGNIFICANT CHANGE IN THE INDUSTRY? HOW TO YOU SEE WATER REUSE, AND CAN REUSE BENEFIT BOTH THE CUSTOMER AND THE PROVIDER?

Michael Deane: Theoretically, reuse makes sense, but it can be specific to geography. Some places are rain rich, or groundwater rich, and don't have to worry about supply, so it sounds good to reuse it but if there's no reason to do so, and people are depending on your effluent for downstream flows as well, reuse may not make sense. But in many places, once you have gone through the expense of sourcing and treating and delivering water, and collecting and treating it as wastewater, which is usually cleaner that a lot of source water, why not use it again? There are lots of technical issues from a treatment standpoint that need research. Both the EPA and National Science Foundation and others are doing research to make sure reuse truly is safe. Getting back to strategic, integrated planning for supply, we need to make sure we reuse not because it is a sexy thing to do, but because it is the most efficient, best supply for your particular needs. It gets into "for purpose" water—for example, the West Basin Water District's water recycling facility out in California treats some wastewater for technology manufacturers which need highly treated water. Some of the water is treated for golf course irrigation, which doesn't need that same high standard. It's treated for what it is going to be used for – I believe they have five different treatment levels for different uses. So we don't always need potable drinking water, but if we bifurcate it and treat it for different things in areas that have demand for different uses, it makes great sense. It benefits the provider, because it is an efficient, affordable source of water, and the benefits are passed on to the customer.

Jerome Devillers: The reuse question is particularly apropos, as it's an area we're always struggling with. If we treat only what we need to treat to drinking standards, that doesn't make the revenue model better, because there is already decreasing demand, and reuse could decrease that demand even further.

Michael Deane: Reuse works for certain areas where you have close proximity of multiple uses. Yes, it reduces commercial demand for water, but it also depends on whether you can price it that way. If you are highly treating water for a technology manufacturer, you can charge more. So you have to adjust the revenue model to existing needs and existing ways we deliver services.

Jerome Devillers: Thank you Michael, for your informative remarks.

.05 FUTURE OF THE INDUSTRY

The 2016 survey's results make clear that future discussions about issues and challenges in water supply must include proper planning and risk management. Analysis and planning will be critical to the industry's success.

Data presented through Figure 17 was contained in the operations section of previous Outlook results. The question has been moved to this section to provide perspective on current and future trends in water sources. In essence, the results of the 2016 survey indicate that 60% of the respondents' water supply is sourced either from ground or surface resources. To better understand the results, we provided further insight into the responses by analyzing how the data we obtained was concentrated. We did this by focusing on the responses received for ground water, presented in Figures 17 and 18.

Ground water is often the sole supply source for smaller water systems. Approximately 19% of respondents who used ground water to some extent during 2016 obtained all of their water supply from the ground. This compares to 54% of those who used ground water to some extent in 2016 who derived one-half or more of their water usage from the ground. For perspective, if the responses of those who use purchased water as a sole source of supply were removed from the results, a shift in supply mix would occur, resulting in 25% ground water and 31% surface water.

FIGURE 17 – INDICATE THE MIX OF YOUR WATER SUPPLY :

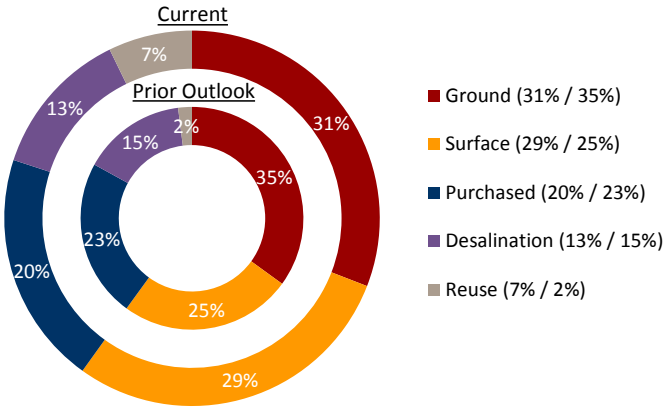
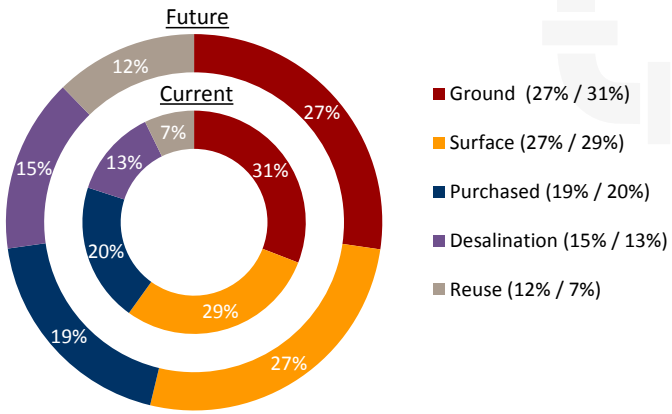


FIGURE 18 – WHAT DO YOU THINK THE SOURCE OF YOUR WATER SUPPLY WILL BE IN THE NEXT 15 TO 25 YEARS:



The results indicate potential inelasticity in water sourcing demands over the next 15 to 25 years. In fact, nearly 60% of the respondents who used ground water as a sole supply source in 2016 predicted that it would remain their sole source of supply over the next 15 to 25 years.

Similarly, 80% of respondents who used surface water as a sole source of supply in 2016 expected that surface water would remain their only supply source over the next 15 to 25 years. The overall results of Figure 18 illustrate a minor shift in the supply mix over that same period: ground water sourcing is expected to decrease by only 4%. Keeping these results in mind, we found contradiction in Figure 20, presented in the following pages, showing nearly 50% of respondents anticipate a water supply shortage in their area within the next 10 years. Are we adequately prepared to confront scarcity in the future?

Without fully understanding the unique situations each respondent considered, we can only make certain assumptions based on an interpretation of the responses. Even if the current source of water were the only option in the respondent's area, or the current method of sourcing were the most efficient and inexpensive option, a growing risk of scarcity in many areas suggests inadequate planning for the future has been done. This is where effective strategic planning and risk management should be leveraged in anticipation of water supply constraints.

However, one can draw a general conclusion from the results in Figure 18. Over the next 15 to 25 years, current sources of ground, surface, and purchased water will be substituted with sources from desalination and reuse. This conclusion suggests that we should expect a shortage of our natural fresh water supply, meaning we will need to rely more heavily on alternative forms of supply to meet demand. In recent years, water shortages have been more frequent, especially in the Southwest. Fresh water scarcity increased for much of the country during 2016, including major areas in the Northeast. This makes planning and risk management vital to the industry's success.

FIGURE 19 – WHEN RESPONDENTS WERE ASKED WHETHER THEY WERE LOCATED IN A WATER SUPPLY CHALLENGED AREA OF THE U.S., THE FOLLOWING RESULTS WERE RECEIVED:

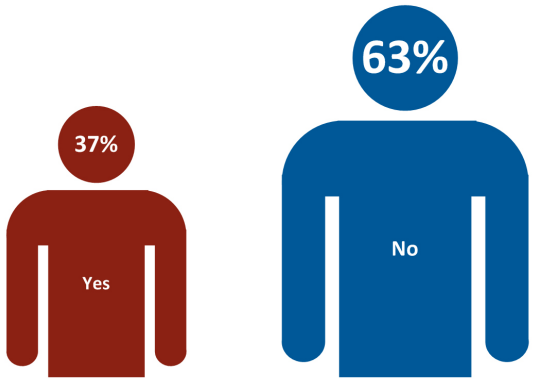


FIGURE 20 – DO YOU ANTICIPATE HAVING WATER SUPPLY ISSUES IN YOUR AREA IN THE NEXT:

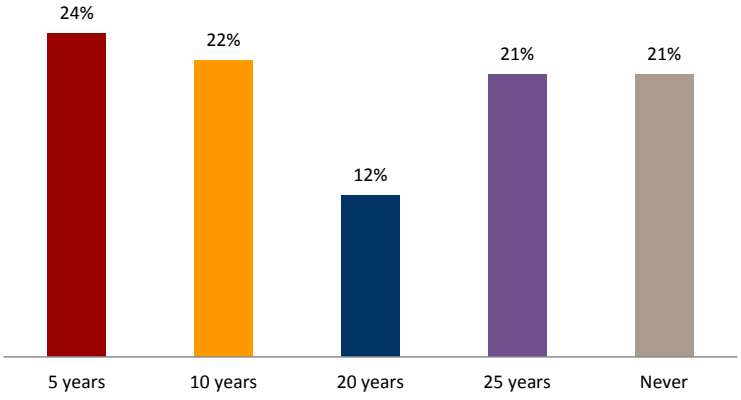
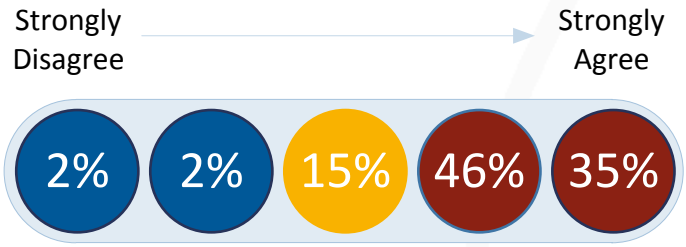


Figure 19 shows that 37% of respondents are located in water-challenged areas. Figure 20 illustrates that respondents expect the scarcity to increase to 46% over the next 10 years. The increasing water scarcity phenomenon has influenced media coverage and also has affected the decisions respondents made when asked to predict the future. Regardless of climate cycles and media coverage, it is important to reflect on whether our current usage behaviors and sources can be sustained. We must decide what steps are

needed to mitigate the challenges we will face over the next 25+ years. In addition to conservation, we must consider diversifying our water supply sources and developing technology to increase water-system efficiency in our future approach. At this point, in areas where extreme water shortage is expected over the next 10 years, it may already be too late to use certain options. For example, approving, developing, and constructing one desalination plant could take up to 10 years. On the other hand, technology advances are typically driven by a need. Right now the nation as a whole does not have critical water needs, but that scenario will look much different in the future. Proper discussion and planning can draw the necessary attention in the marketplace to initiate positive actions.

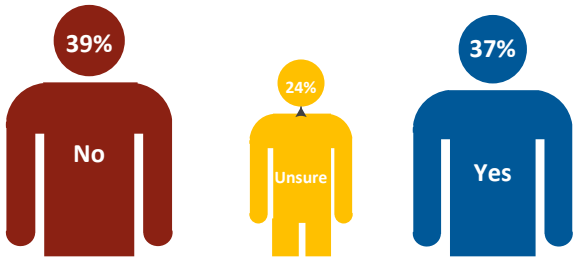
Water as a utility is not like other utilities: Water has fewer substitutes. Basic needs offer little flexibility in consumption. When a customer turns on his water tap, this customer expects to get water. But recent headline-grabbing events are threatening the status quo. Whether it's a voluntary or mandatory water restriction, or the contamination of the water supply (either by lead or some other substance), the industry faces mounting challenges and risks. To maintain basic water needs, the utility encourages both individual and industrial customers to address them. Habits must change. We also must seek conservation efforts, such as temporary restrictions and installing water-efficient fixtures or processes. Reduced consumption does not necessarily mean cost savings for the customer. The utilities industry has a unique, inverse relationship between consumption and end-user prices: When consumption decreases, the price per unit will eventually increase to compensate the utility for lost revenues, which allows the utilities to sustain operations and make consistent capex. Conservation efforts can help, but they are not the end-all solution to resolve anticipated water supply challenges.

FIGURE 21 – RESPONDENTS WERE ASKED TO RATE THEIR AGREEMENT WITH THE FOLLOWING STATEMENT, "DUE TO THE RECENT EVENTS GAINING HEADLINE NEWS COVERAGE, ADDITIONAL REGULATORY COMPLIANCE WILL BE IMPOSED UPON THE WATER INDUSTRY OVER THE NEXT 5 TO 10 YEARS":



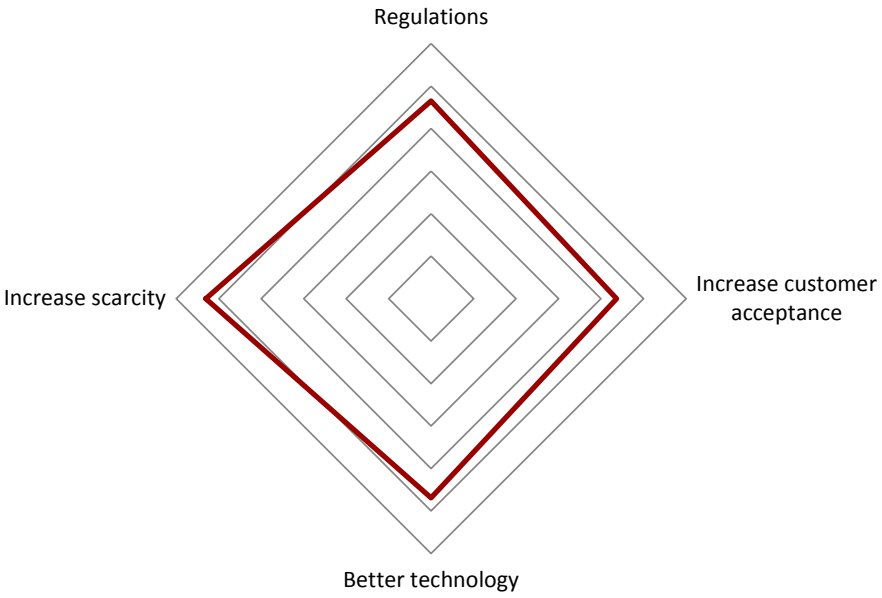
It is clear that respondents foresee increased regulatory compliance standards within the next 5 to 10 years. In fact, more than 80% are persuaded that additional regulatory compliance will be imposed.

FIGURE 22 – AS A FOLLOW-UP TO FIGURE 21 RESPONDENTS WERE ASKED WHETHER THEY BELIEVED THAT INCREASED REGULATORY COMPLIANCE WOULD MITIGATE THE RISK OF FUTURE WATER QUALITY ISSUES TO AN ACCEPTABLE LEVEL:



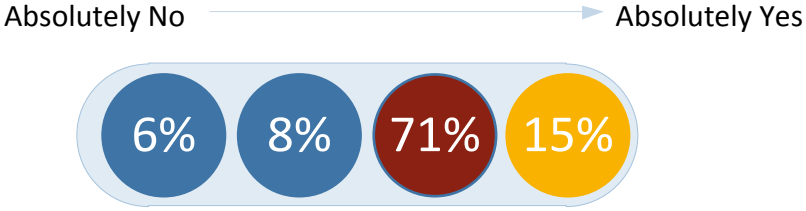
The results of Figure 22 indicate that regulatory compliance is not perceived as the absolute solution to water quality risk. As the industry moves forward and the mix of water sources evolves, new risks will surface. For example, respondents predict the increased presence of reuse water and desalination plants will play an increasingly important role in our water sourcing over the next 25 years. The question remains whether the proper planning is in place to address the inherent risks.

FIGURE 23 – THE INCREASE IN THE REUSE OF WATER IN THE NEXT 15 TO 25 YEARS WAS PREDICTED BY PARTICIPANTS TO BE DRIVEN BY THE FOLLOWING FACTORS:



Although Figure 23 shows a variety of factors driving further adoption of reuse by the water industry, increased scarcity is perceived to be the primary factor. Other drivers, like regulation, technology, and customer acceptance, will pose key obstacles to reuse prevailing to the point where it can become successful in the industry.

FIGURE 24 – WE ASKED PARTICIPANTS TO COMMENT ON THEIR LEVEL OF AGREEMENT THAT THE DESALINATION OPTION IS THE KEY SOLUTION TO ADDRESS WATER SUPPLY CHALLENGES IN THE NEXT 15 TO 30 YEARS:



In recent years, desalination plants have been increasingly popular throughout the world. They are being looked at in the US as a sustainable alternative, but not without criticisms, such as the plant's high initial costs, its impacts on the environment, and high operations and maintenance price tags, all of which lead to higher water prices for the consumer.

The survey results indicate that respondents believe strongly that desalination water treatment will be a key solution in the future, though not the ultimate answer to our evolving water needs. The success of desalination plants in the US has not been extraordinary to date; however, as scarcity proliferates, discussions about desalination plants continue, especially in California, Texas, and Florida. California, for instance, opened a new desalination plant in San Diego, which has a high capacity output, to relieve some of the water shortage in the area. Water prices for consumers will increase in San Diego, but the plant will likely ease water restrictions. Although there are limited choices when it comes to alternative options for water supply, it is interesting how much more the public prefers the desalination plant to the reuse option. Clearly, the public is concerned about the original source of reuse water for drinking and bathing (such as a country reservoir verses the output from a wastewater treatment plant). But we should work to overcome this perception, since reuse water can lower the depletion rate of our pristine water sources, decrease production costs, and reduce the environmental footprint, compared to other possibilities, including desalination. Reuse and recycling of water has many applications aside from drinking and bathing, and these should be considered in the industry's strategic planning to address further water supply challenges.

The responses to the Future of the Industry section have a common theme. We expect significant change over the next 15 to 30 years, and this change will include a variety of challenges. We know that that there must be a balance of regulatory and public opinion. We also must make decisions regarding the source of our future water supply. The challenges will vary, so solutions will differ from area to area. Large island and coastal communities may continue to rely on desalination as a primary source of water supply, whereas small local communities may be sustained by ground-water sources. However, most communities will need to balance risks and efficiencies among other critical factors to continue to operate successfully. The key to success will depend on strategic planning and risk management. If they are not in place already, these functions must begin immediately and be updated frequently in an effort to anticipate, react, and execute plans to face future challenges. In the end, a system that produces a sufficient supply of safe water in a sustainable and efficient manner will be the common goal, but the road to achieving it will be ever changing.

EVOLUTION, TECHNOLOGY, AND CHANGING WATER SUPPLIES

INTERVIEW WITH ERIC GERNATH, CEO OF SUEZ NORTH AMERICA

ERIC GERNATH, CEO

SUEZ North America

01. WHAT TWO AREAS IN THE WATER AND WASTEWATER INDUSTRY DO YOU SEE OPPORTUNITIES FOR DERIVING THE MOST IMPACT FROM TECHNOLOGY AND INNOVATION?

One of the key innovation areas will be in securing water resources. Due to increasing natural and human-made stressors, more investments are being made to tackle the growing water scarcity issue. These include innovative technologies, partnerships, and financing models to address climate change and leaking infrastructure challenges, while also driving water reuse and conservation.

Additionally, the momentum towards a sustainable water supply continues, with more coastal cities choosing desalination to meet their communities' water needs. It is remarkable how water capacity has risen throughout the past decade. However, employing new technology has resulted in water innovation progressing beyond desalination.

Global Water Intelligence reports that major companies throughout the world have committed more than $84 billion over the past three years to water efficiency and conservation. This investment and focus is spurring progress. We are seeing a greater commitment towards intelligent infrastructure and the stewardship of water resources, ranging from industries reducing their freshwater dependence to technology startups exploring the water-energy nexus.

02. WHICH TECHNOLOGY DO YOU EXPECT WATER AND WASTEWATER TREATMENT OPERATIONS TO IMPLEMENT WIDELY IN THE NEXT 10 - 20 YEARS?

I expect to see smart networks that operate the water/wastewater service and that provide real-time control over water quality/meter readings. The future will bring an improved network system to provide a more efficient and agile operation. In fact, many cities are incorporating the 'smart city' concept into water management right now.

This type of positive change occurs when proactive water utilities monitor their distribution networks and acquire data from the network's critical points (production and storage points, inlets of distribution zone, etc.). As a result, the utilities are able to provide real-time information to centralized SCADA operators. Although this is a remarkable feat, it is not perfect: a SCADA control typically provides point data only, and does not provide information about the rest of the network.

The real-time solution for a smart water network will enable operations managers and control room operators to manage their network in a more informed and resilient manner by:

- incorporating virtual sensors to know hydraulic and water quality parameters at any point of the distribution network, thus enhancing real-time supervision in SCADA;
- evaluating the evolution of water network behavior and identifying potential issues regarding levels of service breaches (in terms of pressure, water quality, etc.) over the next hours and days;
- analyzing the results of an alternative "what-if" scenario and comparing them with the "business as usual" scenario (without relying on hydraulic simulations run from other departments);
- analyzing a complete set of key performance indicators on energy usage, network pressure conditions, and water quality.

03. BASED ON OUR SURVEY RESULTS, RESPONDENTS VIEW FINANCING FOR CRITICAL CAPITAL EXPENDITURES AS A CHALLENGE FOR THE WATER AND WASTEWATER INDUSTRY. WILL THE PRIMARY SOURCES OF FINANCING IN THE FUTURE COME FROM THE PRIVATE SECTOR (I.E. PPP ARRANGEMENTS, PRIVATE ACTIVITY BONDS, ACQUISITIONS, ETC.) OR THROUGH GOVERNMENT PROGRAMS (WIFIA, ETC.)?

As the legislative process has been slow to bring financing alternatives to local water and wastewater utilities, they will be forced to seek innovative models and approaches. As that occurs, utilities will be ready to advance and accelerate their infrastructure financing to mitigate the water crisis.

Over the past few years, several methods of financing water infrastructure investment have been considered, including an infrastructure bank and an expanded State Revolving Fund (SRF) program. Most, if not all, of these methods required a significant amount of federal funding, which is a difficult sell, given the soaring federal debt. Therefore, municipalities will look to private sector money to finance their water infrastructure systems. As one of the largest water services companies in the industry, we clearly have a vested interest in water infrastructure finance.

One legislative measure that many thought would make its way through Congress this year was the Sustainable Water Infrastructure Investment Act, H.R. 1802. Had it passed, this act would have removed water projects from the state volume caps for Private Activity Bonds, spurring increased private investment in water and wastewater systems throughout the country.

04. ALTHOUGH RESPONDENTS IDENTIFIED FINANCING AS A CHALLENGE, THE MARKET VALUE OF LISTED WATER COMPANIES AND WATER INDICES HAVE GROWN SIGNIFICANTLY OVER THE LAST TWO YEARS. THIS SEEMS TO IMPLY THAT A LOT OF MONEY IS CHASING WATER ASSETS. HOW DO WE RECONCILE THIS WITH THE RESULTS OF OUR WATER OUTLOOK SURVEY AND THE PERCEPTION BY RESPONDENTS THAT THERE IS NOT ENOUGH CAPITAL TO INVEST IN WATER INFRASTRUCTURE?

According to Bluefield Research Capital, U.S. municipal water and wastewater utilities' expenditures—including spending on pipes, plants, and pumps—are expected to exceed $532 billion between 2016 and 2025. This forecast, which draws heavily from planned utility budgets, represents a 28% increase over CAPEX during the last ten years.

Although CAPEX spending is predicted to rebound, a substantial decrease in federal funding for water utilities will pass the burden onto states, municipalities, and, ultimately, customers. Residential water and sewer bills have been increasing in the 5% plus range for the past several years, with no end in sight.

According to Bluefield's report, the municipal sector's massive capital requirements are compelling utility decision makers to adopt novel and cost-effective approaches to infrastructure management and build-out. Going forward, markets for trenchless technologies, real-time data and analytics, smart water, and advanced treatment solutions are expected to show significant growth. This growth will present opportunities for private capital in the municipal water sector.

It is estimated that nearly $200 billion of private capital is currently available, and with some additional legislative changes, infrastructure projects will be accelerated and funding options will be more plentiful.

05. RESPONDENTS IN OUR WATER SURVEY VIEW DESALINATION AS THE PRIMARY SOLUTION TO WATER SUPPLY ISSUES. DO YOU BELIEVE DESALINATION WILL PLAY A LARGE ROLE IN SOLVING THIS ISSUE? HAS THE INDUSTRY OVERLOOKED OTHER POTENTIAL SOLUTIONS?

It already has. In North America, a large desalination plant was recently built in San Diego, and SUEZ has started work on an even larger plant in Baja California, Mexico.

In conjunction with desalination, we believe that reuse will also be a major component of water in the future. California and Texas are clearly leading the water reuse model in the U.S. In El Segundo, CA, SUEZ operates and maintains the West Basin Water Reclamation Plant for the West Basin Municipal Water District and its 300 customers whose businesses depend on that water. We produce five different qualities of water treated for commercial and industrial use. In addition, we also treat about 60 million gallons a day to drinking water standards and inject the water into the aquifer. This process helps keep saltwater intrusion at bay and enables water to be pulled up through wells for future residential use.

06. HOW WILL CUSTOMERS BE CALLED UPON IN FUTURE YEARS TO ADAPT WITH THE EVOLVING INDUSTRY, FOR EXAMPLE, PAYMENT OF HIGHER TARIFFS, LIMITS TO CONSUMPTION, ACCEPTANCE OF NON-TRADITIONAL WATER SUPPLY, ETC.? HOW SHOULD THE WATER INDUSTRY BEST ADDRESS THE CUSTOMER EDUCATION PROCESS SURROUNDING THESE ISSUES?

There is no doubt that US water utilities will continue to face critical economic issues. According to a Black and Veatch report, the rising infrastructure demands will likely result in higher prices at the water tap for consumers.

The same report surveyed 368 water utility companies across the country, and the results indicated that 66 percent are not generating enough revenue to cover their costs. Simply put, to be financially sustainable, the utilities must raise their prices. The Black and Veatch report notes that all of the industry's stakeholders—suppliers and customers alike—must engage in an honest dialogue about the "true cost" of ensuring a safe and plentiful water supply.

The need to increase prices is no surprise to water utilities, but it is to customers who expect the same low water bills without any decrease in service, supply, and quality. In order to finance critical investments to improve outdated infrastructure and to maintain a safe water supply, the prices must rise. Without it, the future of the water industry is at risk.

Customer education programs are vital to getting the word out and informing people to invest in their water services. This is different from investments in roads and bridges or other transportation-related infrastructure. In those areas, people can immediately see the difference and improvements. In the U.S., we have become complacent about clean water and assume that it will always be available for us. Sadly, as the problems in Flint, MI and Toledo, OH have taught us, that is clearly not the case.

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ABOUT MAZARS USA LLP

WATER GROUP

AS ONE OF THE NATION'S LEADING ACCOUNTING FIRMS, MAZARS USA PROVIDES THE RESOURCES, EXPERIENCE AND GLOBAL EXPERTISE TO HELP YOU ADAPT IN A DYNAMICALLY CHANGING BUSINESS LANDSCAPE.

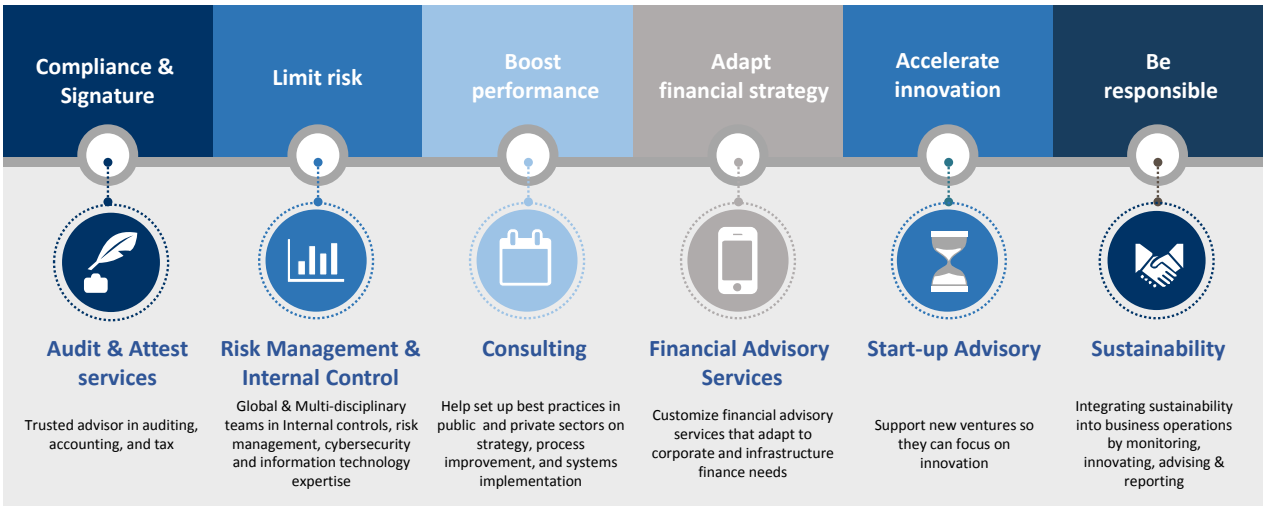
Mazars is a leader in the water and wastewater industry, helping to define key challenges and opportunism facing the sector. With the completion of this fourth U.S. Water Industry Outlook, we continue to advance the conversation about the water industry's future, and its practices and policies.

We specialize in helping organizations identify both near and long term challenges, working with you to create a strategy and implementation plan that will allow you to overcome them sustainably and with cost effectiveness. To stay current with industry trends and issues, we continuously build on our established relationships with executives, regulatory bodies and investors.

We are active participants in industry organizations such as:
- National Association of Regulatory Utility Commissioners
- National Association of Water Companies
- American Water Works Association

Because we listen to our clients, we are able to leverage our extensive water industry experience to help solve their problems in risk management, financial management and operational efficiency. Our comprehensive audit, tax and advisory expertise allows us to uniquely address a wide variety of the industry's needs.

TAILORED SERVICES THAT FITS A NEW GLOBAL WATER CONTEXT



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