State of the Water Industry 2023

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American Water Works Association

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Acknowledgments

The American Water Works Association (AWWA) is the largest nonprofit, scientific, and educational association dedicated to managing and treating water, the world's most important resource. With approximately 5,000 members, AWWA provides solutions to improve public health, protect the environment, strengthen the economy, and enhance our quality of life.

AWWA thanks Westlake Pipe & Fittings for sponsoring the 2023 State of the Water Industry (SOTWI) survey. The survey and report were developed with support from Eastern Research Group (ERG) under contract to AWWA. ERG assisted with survey design, implementation of the survey, analysis of the data, and development of the report and associated graphics. AWWA thanks ERG for their contributions to the 2023 SOTWI survey and this report.

AWWA would also like to thank all the survey respondents who took time to provide their valuable insights this year and for the past 20 years of the SOTWI survey. The survey is a reflection of the dedication that water professionals bring to their jobs every day, and the value of the service they deliver.

"AWWA members always amaze me. It seems like the harder the challenges get, the more confident and optimistic our members become. It's clear there are some significant hurdles in front of us—from infrastructure replacement to resource challenges to new contaminants to cybersecurity concerns—but water professionals never blink, they simply find ways to solve the problems in front of them and keep providing the world's most vital resource to their communities."

David LaFrance
AWWA CEO

"In the face of water supply issues, accelerated climate change and other challenges, it is incumbent upon the water community to develop a bold, creative and long-range strategic plan that ensures a robust water future; such is the premise of Water 2050. I am confident that through this effort and those of all our water community members, we will create a future water landscape that is both sustainable and resilient."

Joe Jacangelo
AWWA President

Introduction

AWWA's State of the Water Industry (SOTWI) survey is designed to identify water sector challenges and investigates possible underlying causes and drivers. Each fall, AWWA surveys the water sector asking for their input. In November 2022, when the survey closed, 4,123 water professionals had shared their opinions by responding to the survey—our highest number of responses yet!

This year marks the 20th edition of the SOTWI survey, and responses continue the general six-year trend of increasing optimism (5.0 on a scale of 1 to 7) about the water industry, now and in the future. To all water professionals: you are our water heroes. We thank you for all you do to protect public health.

The current regional (i.e., the region where respondents work most often) health of the sector as rated by respondents is 5.5; looking ahead five years, the anticipated regional soundness of the water sector is 5.3. This local optimism is likely driven by a better understanding of the water systems in the areas in which we work, and the ability to support and improve those very same systems.

The top 10 issues facing the water sector remain similar to past surveys, with infrastructure rehabilitation and replacement topping the list of issues. Finding the money for infrastructure rehabilitation and replacement and long-term drinking water supply availability round out the top three issues.

Of large-scale phenomena, respondents identified supply chain challenges as having the greatest negative impact on the sector, followed by inflation, recession, and pollution. Nine out of 10 respondents reported experiencing supply chain delays for equipment, materials, chemicals, or supplies in 2022.

AWWA thanks everyone who so generously gave of their time to participate in this year's survey, and we look forward to continued input on future surveys. The Technical and Research Program team welcomes all readers' feedback. You can reach us at research@awwa.org.

Water 2050

Did you notice the icons on the cover of the report? Those represent the key drivers of AWWA's Water 2050 initiative: Sustainability, Technology, Economics, Governance, and Social/Demographics. AWWA's Water 2050 initiative seeks to establish a long-term vision of the future of water.

Visit the State of the Water Industry Executive Summary for in-depth analysis on how the data here tie into those critical drivers to the future of water at awwa.org/SOTWI. And dive into AWWA's Water 2050 initiative at awwa.org/water2050.





American Water Works Association
Dedicated to the World's Most Vital Resource

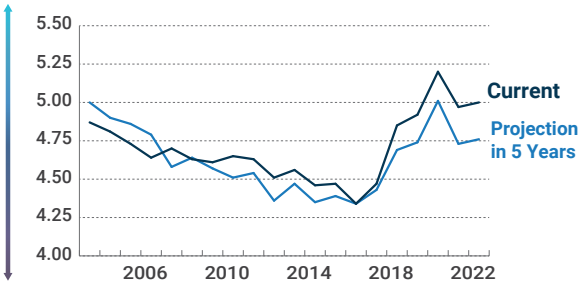
Highlights from the 2023 State of the Water Industry Report

AWWA's annual State of the Water Industry (SOTWI) survey provides an industry-wide self-assessment. The survey is designed to identify water sector challenges and investigates possible underlying causes and drivers. This year marks the 20th edition of the SOTWI survey, and responses continue the general six-year trend of increasing optimism (5.0 on a scale of 1 to 7) about the water industry, now and in the future. The top 10 issues facing the water sector remain similar to past surveys, with infrastructure rehabilitation and replacement topping the list of issues.

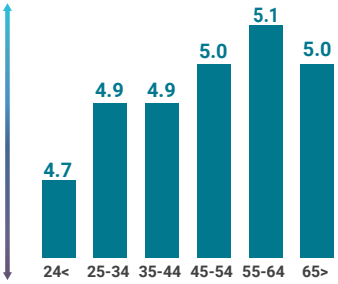
Optimism

2023 Optimism Score:
5 out of 7

State of the Water Industry 2004–2023

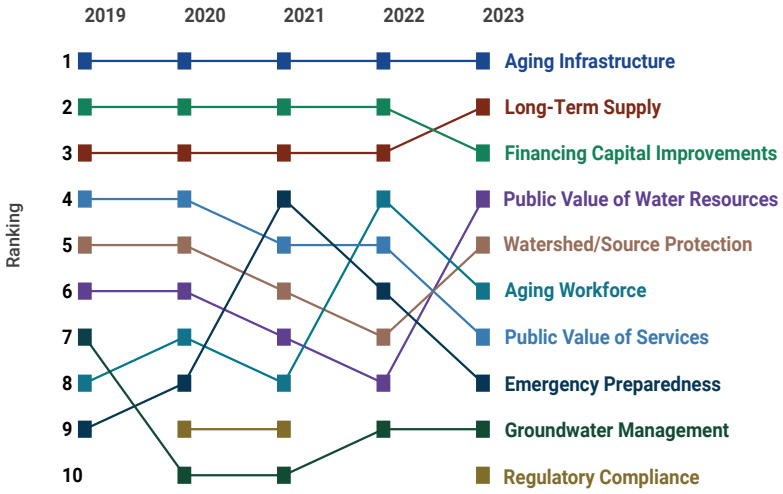


2023 Optimism Breakdown by Respondent Age



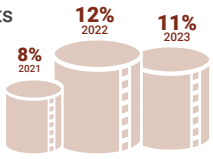
Challenges

Top Ten Challenges 2019-2023

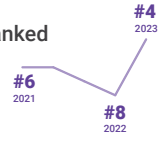


Aging Infrastructure, **Long-Term Supply**, and **Financing Capital Improvements** have consistently been top challenges.

11% of respondents indicated their utility will be challenged to meet anticipated **Long-Term Water Supply Needs.**



40% of respondents ranked **Public Understanding of the Value of Water Resources** as critical.



Regulations

20% of respondents are extremely concerned about their ability to comply with regulations related to **PFAS.**

15% of respondents are extremely concerned about their ability to comply with regulations related to **Lead and Copper.**

Water Rates

Percent of utility management respondents who expect to increase water rates in the coming year:

64% 2021

72% 2022

78% 2023

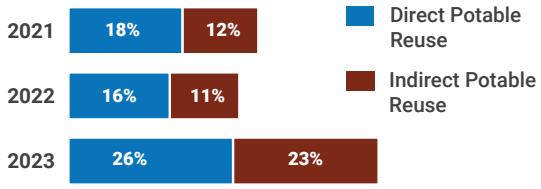
Actions

Utility respondents are actively planning or working on lead service line replacements:

38% indicated their planned capital improvement projects include lead service line replacements.

68% indicated they are implementing lead line replacement programs.

Of respondents who answered the survey question about augmenting their existing supplies, the following **said yes to potable reuse:**



Utility respondents have fully implemented or are in the process of preparing:

88% emergency response plans

72% risk and resilience assessments

60% of utility respondents have implemented or are considering implementing a **climate action plan.**

Water 2050

The SOTWI survey has asked the water community to identify current and future challenges and concerns for two decades. Looking ahead to the year 2050, the future of water requires an innovative, collaborative community culture that embraces and adopts new technologies across the full water cycle. AWWA's Water 2050 initiative has identified five critical drivers that will influence progress toward a sustainable and resilient water future: Sustainability, Technology, Economics, Governance, and Social/Demographics. Learn more about AWWA's Water 2050 initiative at www.awwa.org/water2050.

- Sustainability
- Governance
- Technology
- Social/ Demographics
- Economics

State of the Water Industry

AWWA's annual SOTWI survey provides an industry-wide self-assessment, gathering information to support the water community's fundamental tenets—which include safeguarding public health, supporting and strengthening communities, and protecting the environment.

As has been our practice since the first SOTWI survey was conducted in 2004, the 2023 survey asked participants for their opinion of the current and future health of the water industry through the following questions, using a scale of 1 to 7, where 1 = not at all sound and 7 = very sound. The respondents were asked the following:

- Please indicate your opinion of the current state of the water industry.
- Please indicate your opinion of the state of the water industry five years from now.

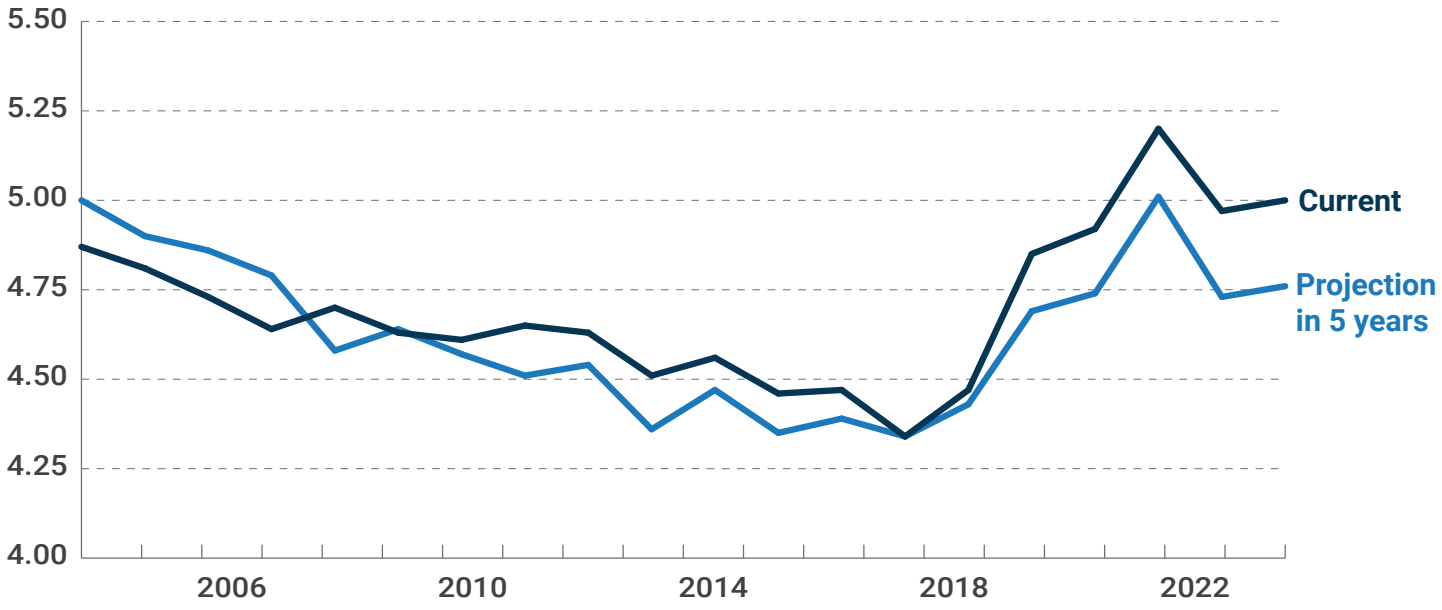
Figure 1 depicts the average scores as rated by all participants answering these two questions since 2004. The current overall health of the water industry as rated by all respondents is 5.0, trending up slightly from 4.97 in 2022. This value continues a consistent upward trend, from a low of 4.34 in 2017. Looking forward five years, the anticipated soundness of the water industry also saw an incline from 4.34 in 2017 to 4.76 in 2023.

There is one outlier in that trend, a score of 5.2 in the 2021 report. Drivers for the optimism and that outlier remain unquantified, but one possible explanation for the 2021 high rating could be the positive exposure water professionals received as essential workers during the COVID-19 pandemic. The trending optimism displayed in Figure 1 remains encouraging.

In addition to asking about the overall soundness of the water industry, the 2023 SOTWI survey inquired about regional soundness (referring to the region in which respondents work most often), again using a scale of 1 to 7, where 1 = not at all sound and 7 = very sound.

Figure 1. State of the water industry: All respondents 2004–2023

Optimism of Survey Respondents Measured on a Scale of 1 to 7
1 = not at all sound and 7 = very sound
(Total respondents = 4,088)



Respondents rated the current regional health of the water sector as 5.47 (*n* = 3,969). Looking ahead five years, the anticipated soundness of the water industry in the region where survey respondents work most often is 5.33 (*n* = 3,965).

The region-specific scores are typically higher than the overall scores. The reasons for the regional results are not immediately apparent but may be explained by respondents having a better understanding of the water systems in the areas in which they work, and their direct support for these same systems, leading to naturally biased scores.

Water Sector Challenges

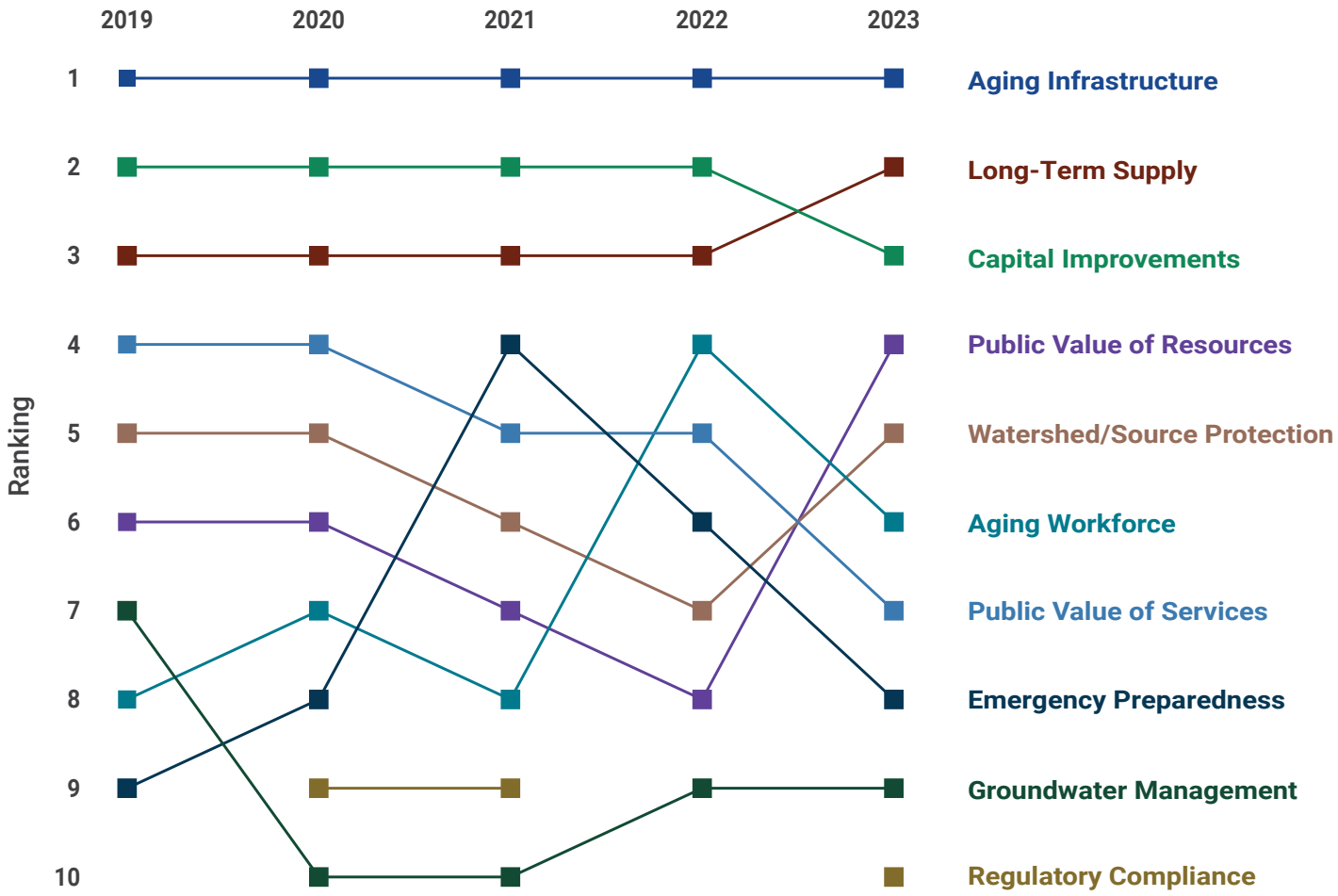
To determine and rank the major issues currently facing the water sector, participants were asked to rate the importance of several challenges on a scale of 1 to 5, where 1 = not important and 5 = critically important. The top 20 challenges, as ranked by 2023 SOTWI survey respondents, are shown in **Table 1**. In addition to the average scores, the table shows the percentage of respondents who scored a challenge as critically important (i.e., 5 on a scale of 1 to 5).

Table 1. Issues facing the water sector in 2023 as ranked by all respondents

2023 Ranking	Water Sector Challenge	Weighted Average	% Ranked as Critical
1	Rehabilitation & replacement (R&R) of aging water infrastructure	4.43	56.2
2	Long-term drinking water supply availability	4.41	57.3
3	Financing for capital improvements	4.27	50.9
4	Public understanding of the value of water resources	4.15	39.6
5	Watershed/source water protection	4.12	40.2
6	Aging workforce/anticipated retirements	4.08	42.5
7	Public understanding of the value of water systems and services	4.06	35.2
8	Emergency preparedness	4.05	33.2
9	Groundwater management and overuse	3.99	37.5
10	Compliance with current regulations	3.89	28.1
11	Water conservation/efficiency	3.89	29.9
12	Talent attraction and retention	3.84	27.5
13	Cybersecurity issues	3.83	29.8
14	Drought or periodic water shortages	3.80	30.3
15	Compliance with future regulations	3.79	24.1
16	Cost recovery (pricing water to accurately reflect the cost of service)	3.78	22.2
17	Water loss control	3.75	21.0
18	Energy use/efficiency and cost	3.69	18.1
19	Improving customer, constituent, and community relationships	3.69	17.8
20	Asset management	3.68	17.3

Figure 2 shows the past five-year history of this survey's top 10 challenges, demonstrating strong consistency in the top three issues. Rehabilitation and replacement of aging water infrastructure ranked as the most pressing issue facing the water sector, as it has for these five years and more than a decade. For the first time in this same period, long-term drinking water supply availability moved up a rank to overtake financing for capital improvements as the second-most significant issue. Availability of long-term drinking water supply also had the highest percentage of respondents rate the issue as critically important. Emergency preparedness dropped back to the No. 8 rank after rising to No. 4 in 2021 during the height of the COVID-19 pandemic (survey taken in the fall of 2020). For the remaining issues, the order has shifted slightly but remains relatively consistent, as it has for many years.

Figure 2. Top 10 issues facing the water sector as ranked by all respondents, 2019–2023



Other emerging issues identified by the respondents were cybersecurity (ranked as 10th top issue in the 2022 survey) and cost recovery—i.e., pricing water to accurately reflect the cost of service (ranked as the 10th top issue in the 2019 survey).

Other Important Issues

The 2023 SOTWI survey provided an open-ended question asking participants whether there were other issues they felt ranked at least "very important" but were not listed. The 398 write-in responses reflect a broad range of issues. Workforce issues were a common write-in response—in particular, how to attract, train, and pay the water workforce of tomorrow. Respondents pointed out that the public's value and respect for water professionals is critical for attracting qualified staff and that training operators for both exam certification as well as long-term professional development is also a challenge. High school courses, trade schools, and college education need to be tailored to water system operations. Not surprisingly, pay is a significant issue. Respondents expressed that compensation should be comparable to other careers in the industry, allowing systems to attract and retain operators and staff. In the past, others have pointed out that along with aging infrastructure we have an aging workforce. Respondents in 2023 noted that knowledge retention within the industry, and specifically of operators, is a major concern.

Examples of workforce issues throughout the water industry

Engage

- It is critical to value the people and employees dedicated to providing safe water and wastewater services to our communities.
- Recent and upcoming retirements coupled with low recruitment are continued workforce concerns.

Compensate

- Compensation needs to be comparable to other careers to encourage retention and recruitment within the industry.
- Compensation should reflect the importance of water industry professions.

Train

- Operators need access to training programs and materials for exam preparation and certification.
- High school courses, trade schools, and college education need programming tailored to water system operations.
- Knowledge retention within the industry, specifically of operators, is a major concern.

Large-Scale Phenomena

To understand the potential impacts of certain large-scale phenomena on the water sector, all SOTWI survey participants were asked to rank a list of issues on a scale from 1 to 5, where 1 = significant negative impact and 5 = significant positive impact with the question, "What impact (positive or negative) do you think the following large-scale phenomena will have on the overall water industry in 2023?"

Table 2 provides a ranking of these large-scale phenomena. Results show that more than half of water professionals believe supply chain challenges will have a significant negative impact on the water sector in 2023. As in previous years, inflation, recession, pollution, and extreme weather events remain top issues for 2023. Although some individual respondents ranked one or more phenomenon as having a positive impact, none of the weighted averages rose to neutral or positive level.

Table 2. Impact of large-scale phenomena on the water sector in 2023

Significant Impact From 1 (Negative) to 5 (Positive)	Phenomenon	% Indicating Significant Negative Impact
1.71	Supply chain challenges	57
1.87	Inflation	46
1.97	Recession	39
2.05	Pollution	29
2.07	Extreme weather events	33
2.10	Energy costs	34
2.12	Labor costs	28
2.19	War	29
2.24	Climate change	26
2.29	Global pandemic	21
2.34	Terrorism	19
2.53	Bond markets	13
2.53	Stock markets	11
2.58	Unemployment	15
2.60	Agriculture	12
2.61	Housing markets	12
2.70	Urbanization	11
2.72	Population growth	17
2.84	Business/industrial activities	9

Supply Chain Challenges

The water industry continues to face high demand and global manufacturing delays for the chemicals, goods, and services needed to effectively operate. Prompted by the COVID-19 pandemic and exacerbated by the economy and extreme weather events, supply chain shortages add to capital improvement challenges.

All survey respondents were asked whether their organization has experienced supply chain delays for equipment, materials, chemicals, or supplies in the past year. Nearly all respondents, 92% (*n* = 2,688), replied that they had seen supply chain delays, with 62% of those respondents experiencing supply chain delays in all categories (equipment, materials, chemicals, and supplies).

Extreme Weather

SOTWI survey respondents indicated, as shown in Table 2, that extreme weather events are anticipated to have the fifth-most significantly negative impact on the water industry.

Focusing on extreme weather events, the National Centers for Environmental Information (NCEI) tracks and evaluates climate events, in the United States and globally, that have great economic and societal impacts. NCEI reports that during calendar year 2022, in the United States "there were 18 weather/climate disaster events with losses exceeding $1 billion each to affect the United States." This is down from the peak of 22 events in 2020 but substantially higher than the 1980–2022 annual average of 7.9 events. Overall, the 2022 events resulted in the deaths of 474 people and had significant economic effects on the areas affected, with severe storms constituting the majority of the events, but with tropical cyclones responsible for the large majority of the costs. NCEI also reports that since 1980, "the U.S. has sustained 341 weather and climate disasters where overall damages/costs reached or exceeded $1 billion..." at a total exceeding $2.475 trillion (NCEI 2023). As a part of the trend, 2022 was the eighth consecutive year in which 10 or more separate billion-dollar weather and climate disaster events occurred in the United States.

When asked about the impact of large-scale phenomena on the water sector, climate change remains one of the top 10 concerns. Climate change related issues affecting the water sector include accelerated sea level rise, more intense heat waves, more frequent and intense droughts, and changes in precipitation patterns, among others. Related concerns for the water sector include impacts on water quality, water availability, and infrastructure. Utilities also indicated they are preparing with 60% stating they have or are considering implementing a climate action plan.

60% of utility respondents have implemented or are considering implementing a **climate action plan.**

Assessing Risk and Uncertainty

As stewards of public health and the environment, water professionals are aware of the risks associated with securing reservoirs and wells to protect water supplies, guarding materials at their facilities from theft and sabotage, and planning for routine and extreme events. By incorporating resilience into a risk management framework, utilities can improve their response and recovery strategies, thereby mitigating the potential for loss of service.

The good news: utilities signaled that they are prepared. The 2023 SOTWI survey asked utility respondents if their utility has considered and/or implemented programs and plans related to assessing risk and resilience and emergency preparedness. Overall, 88% of all utility respondents (*n* = 2,192) have fully implemented or are in the process of preparing emergency response plans, and 72% of all utility respondents (*n* = 1,864) have fully implemented or are in the process of implementing a risk and resilience assessment. This includes larger public water systems that were required by the 2018 America's Water Infrastructure Act (AWIA) as well as utilities that were not required to prepare plans and assessments such as water systems serving fewer than 3,301 persons, drinking water utilities outside of the United States, and non-drinking water utilities.

Survey respondents ranked cybersecurity their No. 13 water challenge, signifying cybersecurity remains a high priority concern for respondents. As discussed in more detail in the next section on the Digital Future of Water, utility participants were asked a broad set of questions assessing information technology (IT) needs and 31% of utilities that responded to this part of the question (*n* = 2,203) indicated that they will update their existing IT system to guard against cyber intrusion, 7% will install a new IT systems for this purpose, and another 24% indicate they are assessing their cyber intrusion needs.

AWWA has noted that according to reports and testimony from the Director of National Intelligence, the Federal Bureau of Investigation and the Department of Homeland Security, cybersecurity is the top threat facing business and critical infrastructure in the United States (AWWA, 2023). AWWA and partner associations have long recognized the importance of cybersecurity and collectively taken actions to support improvements in the water sector. Support efforts will continue into the future as those in the water industry work to bolster cybersecurity efforts and navigate the implementation of cybersecurity requirements.

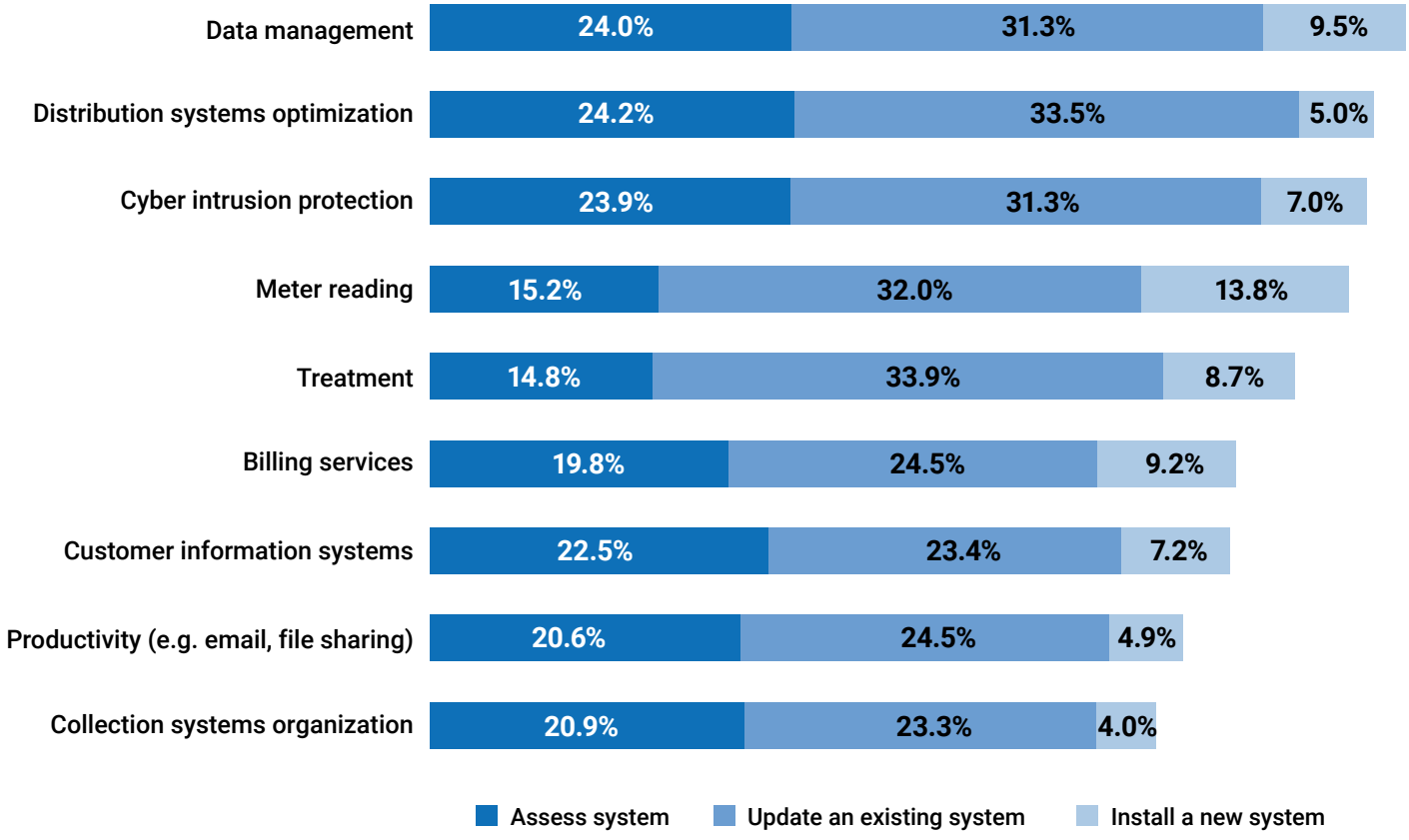
Digital Future of Water

Information Technology

Digital technology in the water sector provides both an opportunity and a challenge for utilities. The availability of new tools dedicated to data-driven decision-making grows annually. Are utilities embracing mobile applications, identifying needed technology, and the influx of data to be managed?

All utility participants were asked if their utility is planning to install, update, or assess IT systems in the following areas over the next year. The resulting responses are presented in **Figure 3**. About 46% (*n* = 2,216) reported plans to update or install meter reading systems, and about 43% plan to update or install new IT systems for water treatment.

Figure 3. Utilities' planning, revising, and assessing IT needs



System Stewardship

In general, the water sector plans, builds, operates, maintains, and replaces the typically large and expensive assets that provide water services, including potable water, wastewater, stormwater, and reuse. System stewardship entails how water and wastewater systems are operated, maintained, and replaced.

Viewing system stewardship from the more traditional view of asset and financial management, specific issues identified regularly through the SOTWI surveys include repairing and replacing aging infrastructure, financing capital improvements, and ensuring cost recovery (i.e., pricing water to accurately reflect its true cost). These issues continue to be important because many water and wastewater systems built and financed by previous generations are approaching or have exceeded their useful lives. They are now facing a critical need for renewal and replacement.

Infrastructure Reliability

Utilities are tasked with adopting a proactive, sustainable, solution-oriented approach to managing assets in order to help maximize the value of service delivery to customers without compromising the ability to meet the needs of future generations. Managing assets requires a full life-cycle approach, starting with effective planning and design and continuing through optimized operations and maintenance (O&M), appropriate rehabilitation, replacement, and asset disposal.

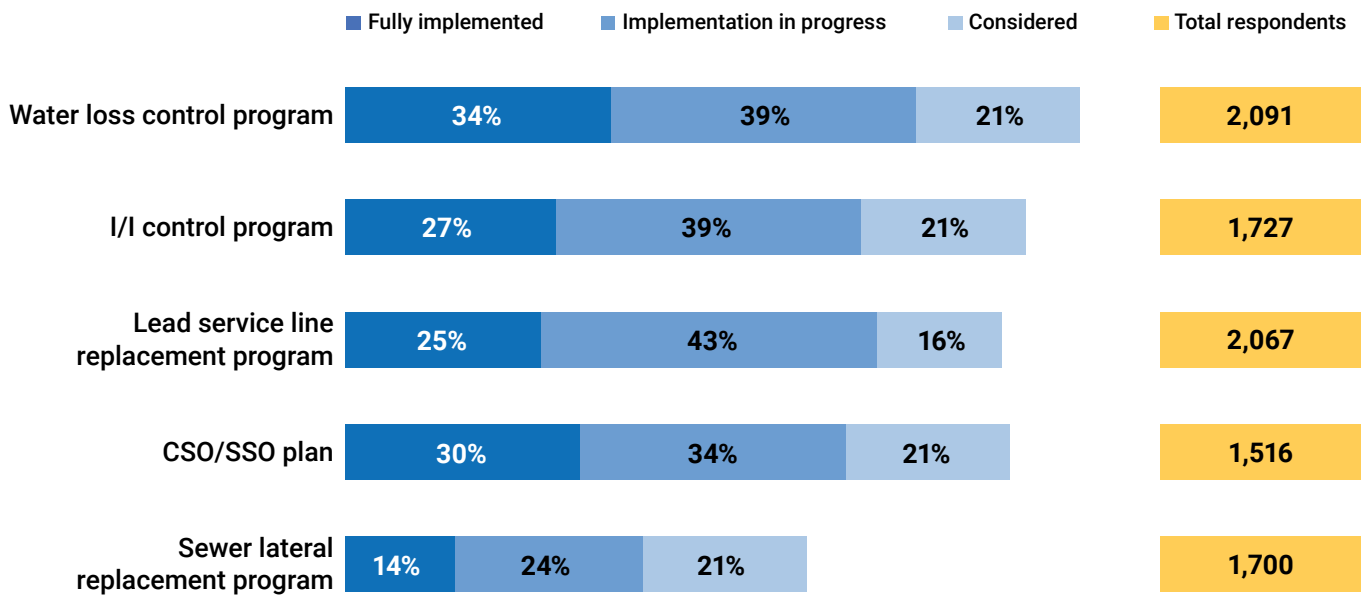
The 2023 SOTWI asked utility respondents the following:

- Has your utility recently implemented or considered any of the following plans or programs? —Asset management plan
- Has your utility recently implemented or considered any of the following plans or programs? —Capital improvement plan

Thirty-one percent of utility respondents (*n* = 2,120) indicated they have fully implemented an asset management plan, while another 48% indicated that implementation is in progress; 46% of utility respondents (*n* = 2,146) have a fully implemented capital improvement plan and another 39% indicated that capital improvement planning is in progress. The data show a slight decrease over time, with asset management fully implemented or in progress declining from 85% in 2021, to 84% in 2022 to 79% in 2023. Similarly, capital improvement fully implemented or in progress declined from 92% in 2021 to 88% in 2022 to 85% in 2023.

O&M activities contribute to infrastructure reliability. The 2023 SOTWI survey asked utility respondents if their utility had explored plans and programs related to any of the following O&M activities: water loss control, infiltration/inflow (I/I) control, combined collection system overflow (CSO) and sanitary sewer overflows (SSO), and lead service line and sewer lateral replacement. **Figure 4** summarizes the responses.

Figure 4. Operations and maintenance plans and programs contributing to infrastructure reliability



Full-Cost Pricing

AWWA holds that the public can best be provided water services by self-sustaining enterprises which are adequately financed with rates and charges based on sound accounting, engineering, financial, and economic principles. Revenues from service charges, user rates, and capital charges (e.g., impact fees, system development charges) should be sufficient to enable utilities to provide for the full cost of service, including the following:

- Annual O&M expenses
- Capital costs (e.g., debt service, other capital outlays)
- Adequate working capital and required reserves

Full-cost pricing—i.e., charging rates and fees that reflect the full cost of providing water and/or wastewater services—should include renewal and replacement costs for treatment, storage, distribution, and collection systems. Some utilities have previously kept their rates low by minimizing or ignoring renewal and replacement costs, but as the useful lives of our infrastructure systems come to an end, managers and the communities they serve are forced to address these costs, sometimes through painful and unexpected rate increases. Issues related to equity and affordability must be considered as rates are adjusted, and each system has its own unique rate-setting challenges based on current conditions as well as recent developments and long-term history.

The 2023 SOTWI survey asked respondents who identified as utility executive/management and financial officers whether their utility has conducted a water and/or wastewater rate study in the past three years.

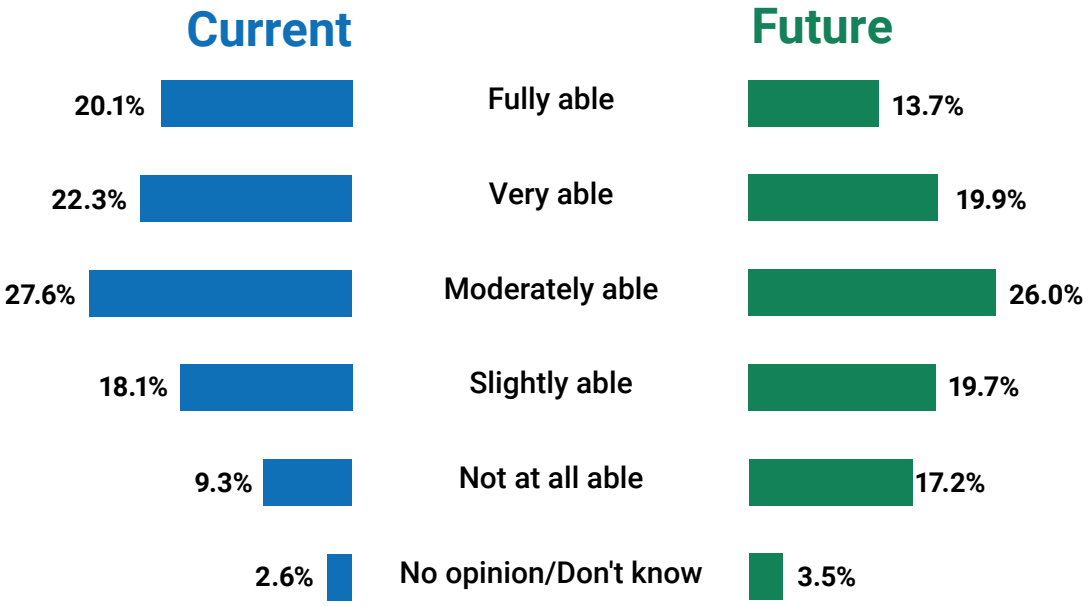
72% of 865 executive/management and financial officers indicated that they **have conducted a water and/or wastewater rate study in the past three years.**

Full-cost pricing is, in many ways, a utility-specific issue defined by the community a utility serves. To explore the issue at this level, utility personnel who identified only as executive/management and financial officers were also asked the following:

- Is your utility currently able to cover the full cost of providing service(s), including infrastructure rehabilitation and replacement needs, through customer rates and fees?
- Given your utility's future infrastructure needs for rehabilitation, replacement and expansion, do you think your utility will be able to meet the full cost of service(s) through customer rates and fees?

Combining those respondents who indicated they are not at all able and those who indicated they are slightly able to cover the full cost of providing services, 27.3% of utilities are struggling to implement full-cost pricing. This is similar to what was reported in the 2022 survey. In addition, 20.1% of utility personnel who identified as executive/management and financial officers believe they were fully able to cover the full cost of services as shown in **Figure 5**.

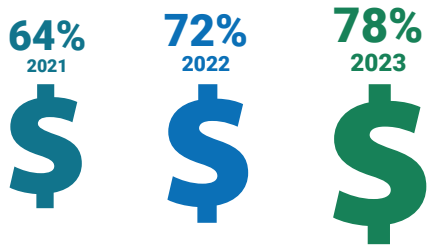
Figure 5. Utility ability to cover the full cost of providing services



To explore the issue further, utility personnel who identified as executive/management and financial officers were asked whether their utility intended to raise water and/or wastewater rates in the coming year.

Seventy-eight percent of respondents (*n* = 863) indicated their utility would be raising water rates in 2023 which is an increase from 72% in the 2022 survey and 64% in the 2021 survey.

Percent of utility management respondents who expect to increase water rates in the coming year

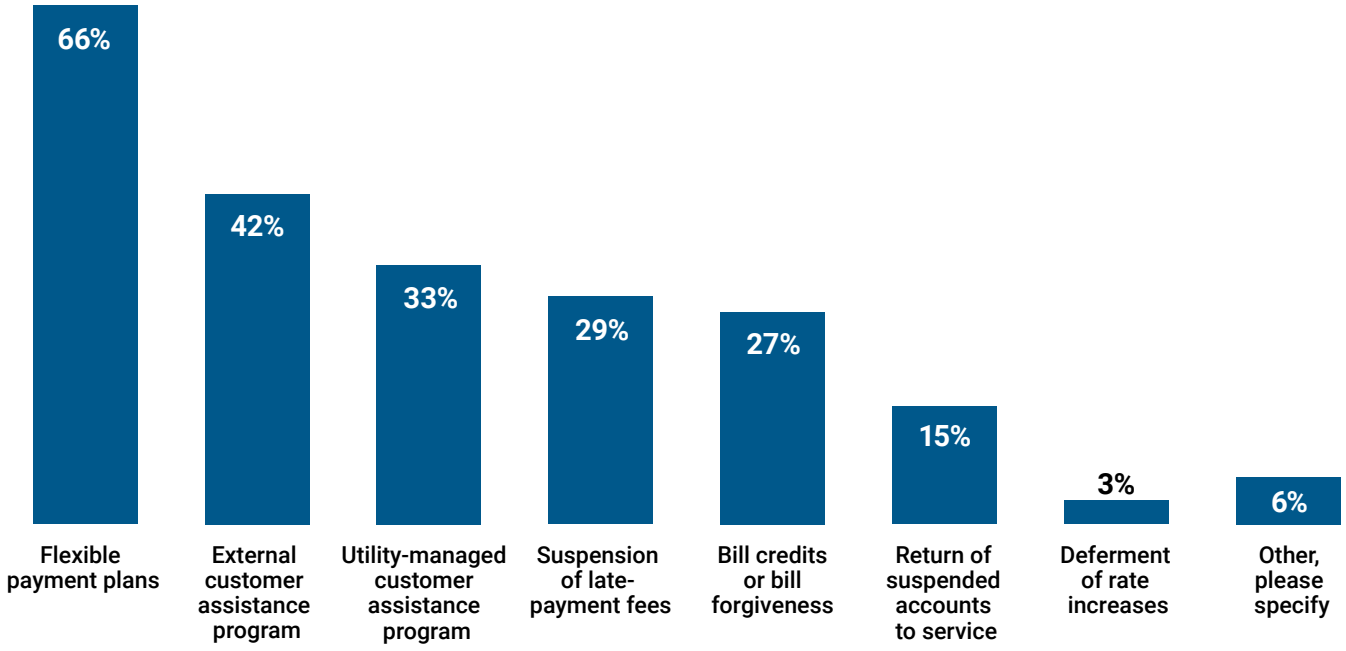


Affordability

Survey respondents who identified as executive/management and financial officers were asked if their utility offered an affordability program to assist low-income customers in paying their water and/or wastewater bill; 54% (*n* = 867) said they either had an affordability program in place or that assistance was offered elsewhere (e.g., through the city).

Figure 6 presents responses to the question asked of utility executives/management and financial officer respondents about which customer assistance programs were in place at their utilities: 66% of respondents (*n* = 741) indicated that they have flexible payment plans, 42% have external customer assistance programs, and 33% have utility-managed customer assistance programs. Late-payment fee suspension and bill credits or bill forgiveness are reported by 29% and 27% of respondents, respectively.

Figure 6. Comparison of utilities' customer assistance measures



Changing Water Demands

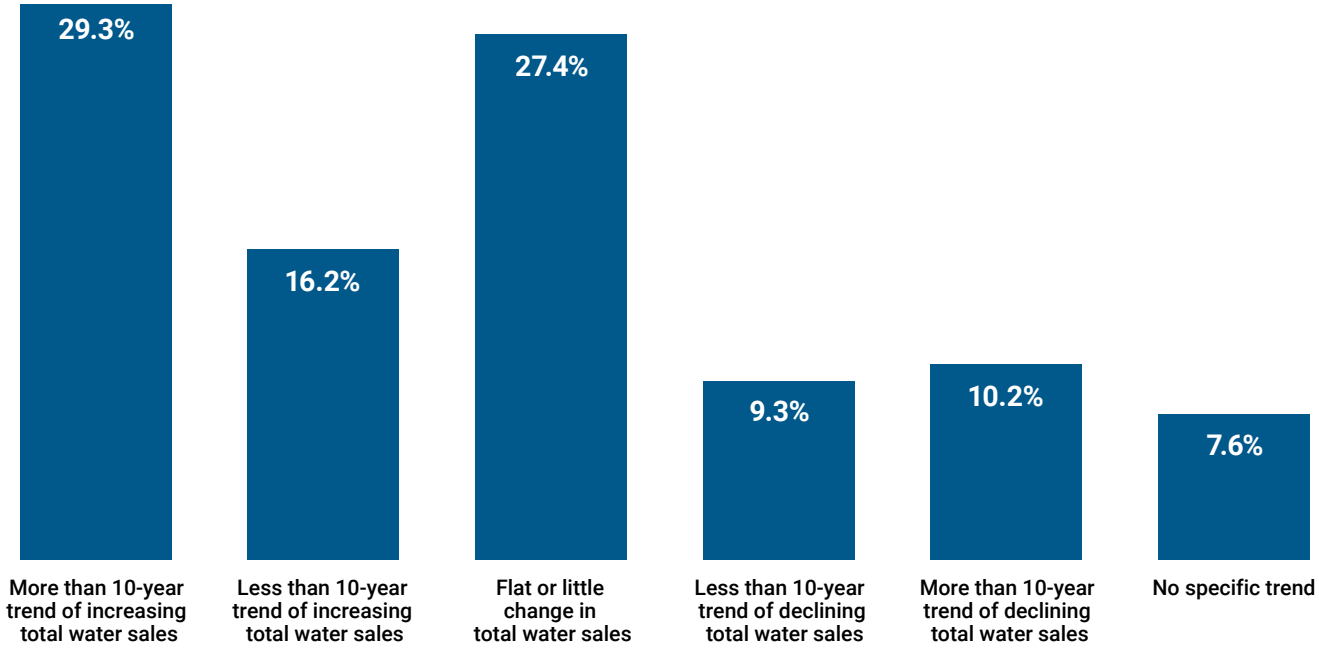
More efficient use of water is a major goal of the water sector. However, in areas where customer growth is slow or nonexistent, declining water use, if left unaddressed, can decrease operating revenue and affect how costs are recovered through rates and charges. In some cases, utilities must explain to customers that their rates must go up even as their community uses the same amount of water or even less.

45% of 865 executive/management and financial officers reported their **utility saw an increasing trend in total water sales**

Utility personnel respondents identifying as executive/management and financial officers were asked about their utility's trends in water sales. Results regarding trends in total water sales are shown in **Figure 7**, revealing that 19.5% of respondents (*n* = 785) are seeing declining trends in total water sales. While 9.3% reported less than a 10-year trend and 10.2% reported more than a 10-year trend in declining total water sales, 27.4% of respondents reported their total water sales were flat or little changed in the past 10 years.

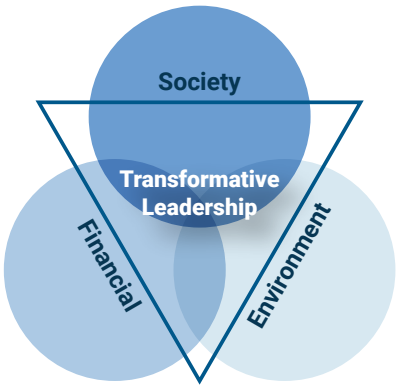
In the 2023 survey, 45.5% of these respondents reported their utility saw an increasing trend in total water sales (either a trend of more than 10 years or less than 10 years), which is similar to past years.

Figure 7. Utility trends in water sales



Transformative Leadership

As mentioned previously, traditional system stewardship focuses on asset and financial management. However, it is becoming increasingly important for organizations to also view system stewardship through an environmental, social, and governance (ESG) lens. Often, organizations are evaluating projects and programs on multiple scales, and looking for value and positive outcomes that deliver on the triple bottom line: social, environmental and financial performance.

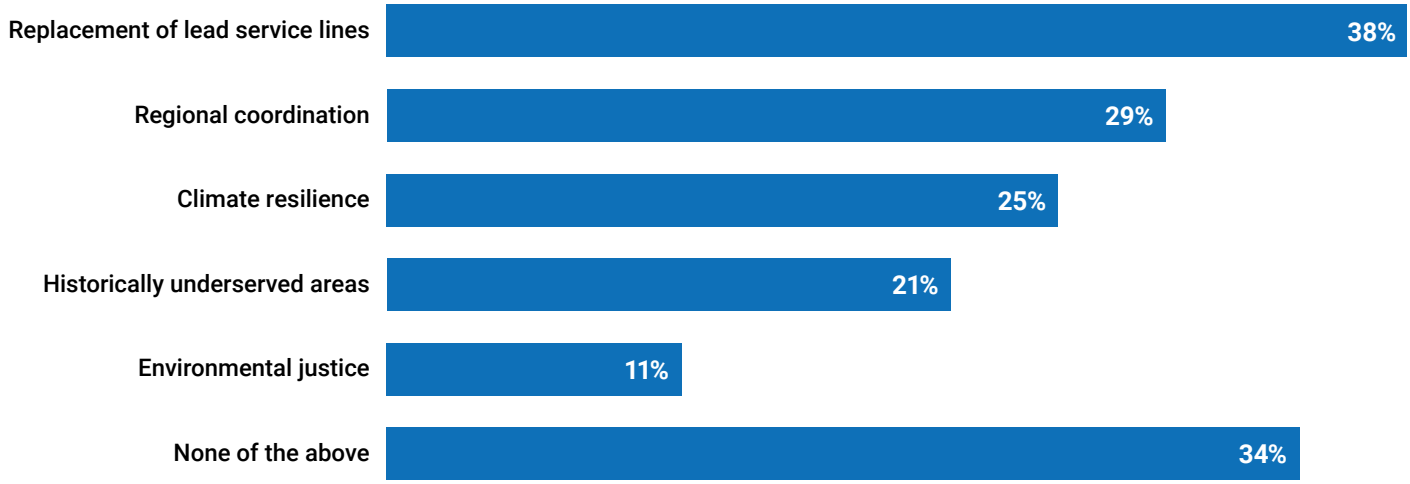


Respondents were asked the following question about the types of issues addressed by their planned capital improvement projects:

- Do your utility's planned capital improvement projects address any of the following? (Select all that apply)

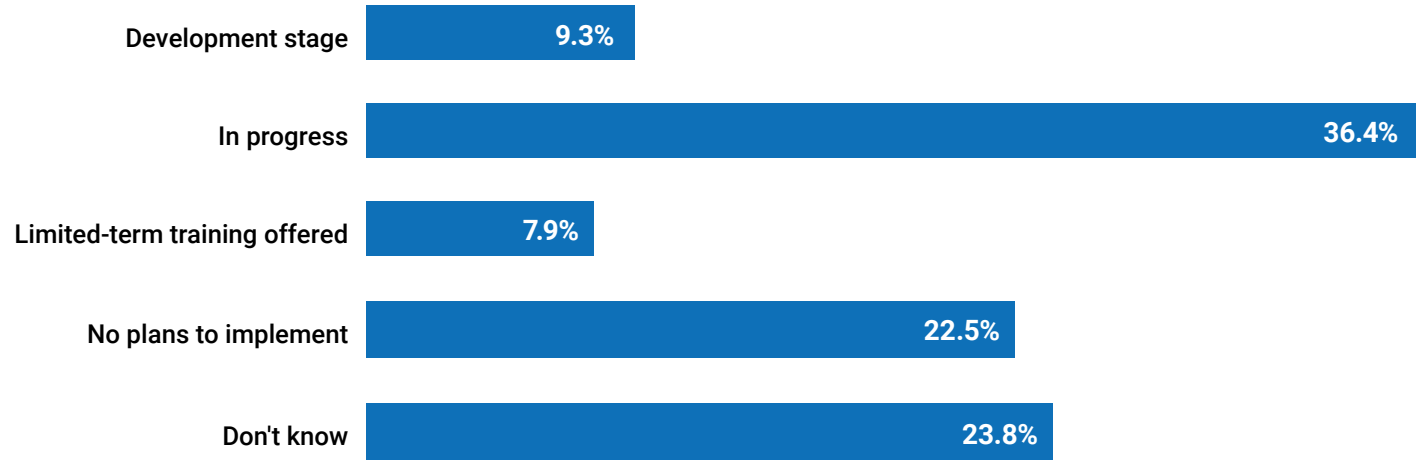
Figure 8 shows that 38% of utilities are addressing the replacement of lead service lines, 29% are addressing regional coordination, and 25% are addressing climate resilience.

Figure 8. Issues addressed by planned capital improvements



The 2021 and 2022 SOTWI surveys included a number of comments related to the importance of workforce to a sustainable water sector future. The 2023 SOTWI asked all respondents about the status of any organizational diversity program at their organization, with more than half, 53.6% (*n* = 3,247), indicating that they are in the progress of developing a program or offering limited term training, as shown in **Figure 9**.

Figure 9. Status of organizational diversity program



The survey also asked respondents with a diversity program if their organization has a senior leadership position focused on diversity, equity, and inclusion (such as a chief diversity officer), and asked all respondents if their organization has a position focused on sustainability or climate resilience, such as a climate or sustainability program director.

Figure 10 shows the findings, with the responses to the two questions being similar; 25% and 21%, respectively (*n* = 3,247), indicated that they do have these positions, although about half of respondents indicated they do not have plans for either type of position.

Figure 10. Specialized positions at utilities

Funding for Capital Improvements

Infrastructure improvement, water system sustainability, and financing top the list of water sector challenges with the following rankings.

1. Rehabilitation and replacement of aging water infrastructure
2. Long-term drinking water supply availability
3. Financing for capital improvements

With the passage of the U.S. Infrastructure Investment and Jobs Act (IIJA), also known as the Bipartisan Infrastructure Law (BIL), the water sector entered a new era of significant investment in rehabilitating and updating the nation's water infrastructure. With potential access to significant federal funding for capital projects, organizations are evaluating their funding strategies and project timelines for water infrastructure.

Utilities and state and local governments that want to invest in infrastructure can do so either by funding projects directly (spending reserves) or by financing (taking out loans or issuing bonds to obtain funds that will be repaid over time.) Financing can allow infrastructure projects to be paid for over a period that more closely matches the infrastructure's useful life and can make money available to pay for projects sooner. Financing can also add to grants and other funding for infrastructure projects. It's important to keep in mind, however, that revenues committed to paying back funds borrowed today will be unavailable for projects in the future.

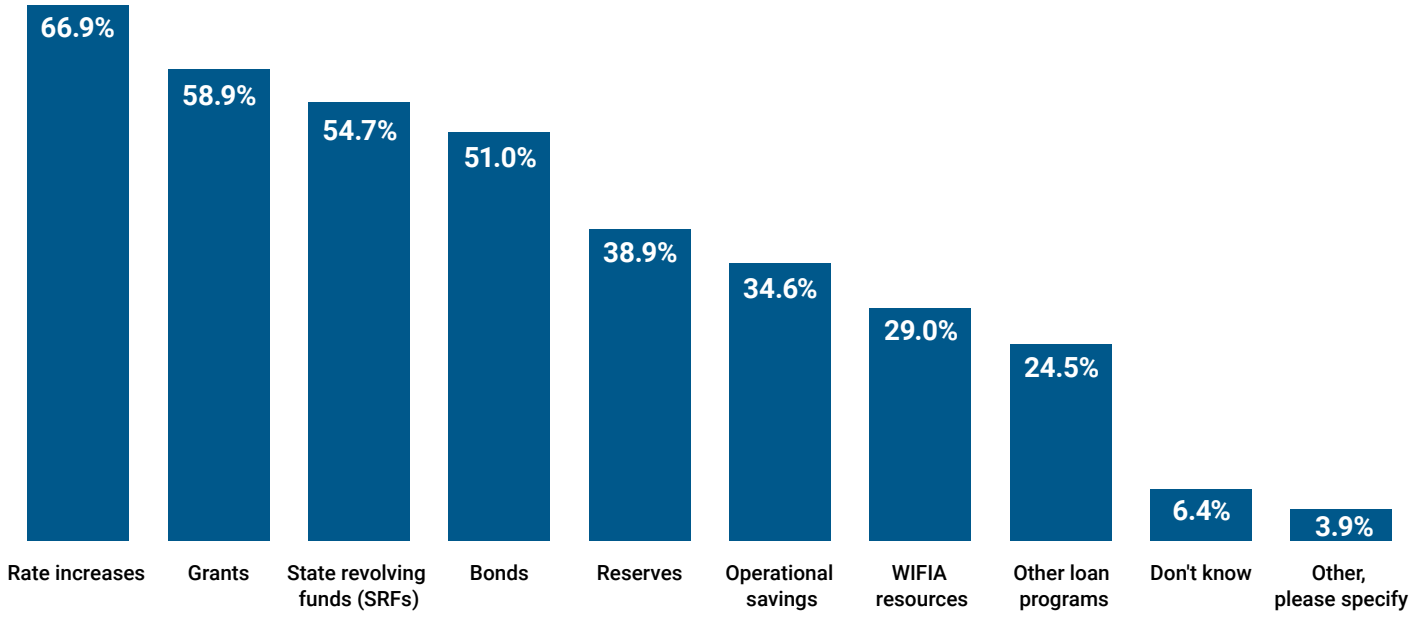
Even with the most diligent planning efforts, utilities often must handle unplanned or accelerated capital projects that are due to asset failures. Survey respondents ranked capital improvements as the third-greatest overall issue facing the water sector (Table 1). The 2023 SOTWI survey also asked utility personnel who identified as executive/management and financial officers the following:

- What are your utility's capital funding sources and/or strategies?

Respondents were asked to choose all that applied, and responses indicate that rate increases are the primary capital funding source, followed by grants and state revolving funds. This year, 54.7% (*n* = 464) indicated they are considering state revolving funds, compared with 46% in 2022 and 34% in 2021. Entries under the "other" category included ARP/ARPA (American Rescue Plan/American Rescue Plan Act), US Department of Agriculture (USDA) Rural Development, private funds, company funds, and special assessments (**Figure 11**).

As noted earlier, 78% (*n* = 863) of the utility executive/management and financial officer respondents indicated they planned a rate increase in 2023.

Figure 11. Utility capital funding sources



Access to Capital

To help clarify the current financing environment for the water sector, utility personnel who identified as executive/management and financial officers were asked the following:

- How would you rate your utility's current access to capital for financing infrastructure rehabilitation, replacement, and expansion?

Forty-nine percent of utility personnel identifying as executive/management and financial officers reported that their utility's access to capital was as good as or better than at any time in the past five years. This value, based on 856 responses in 2023, is down from 56% in 2022 and 55% in 2021. Thirteen percent reported that their utility's access to capital was as bad as or worse than at any time in the past five years, which is higher than 7% in both 2022 and 2021.

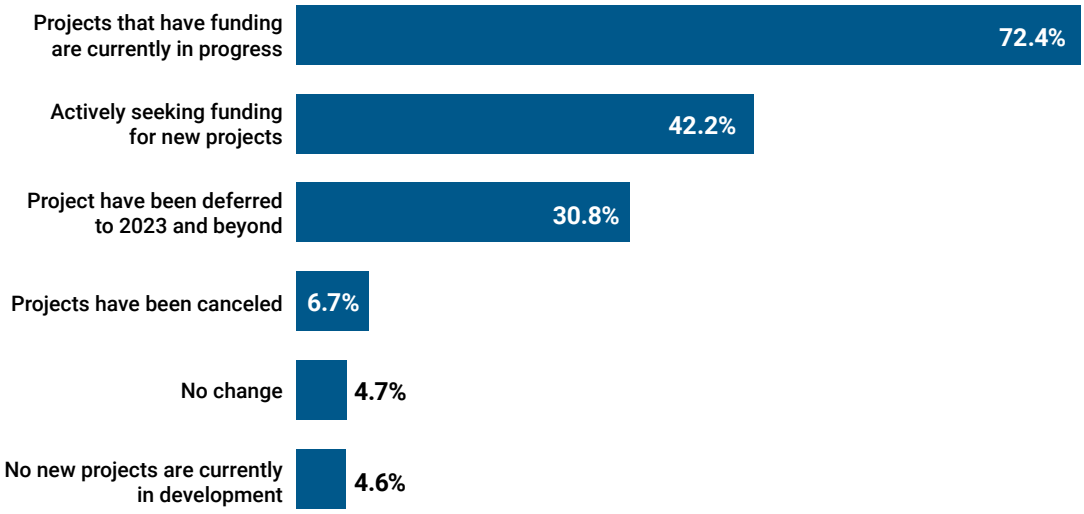
Capital Expenditures

The 2023 SOTWI survey included several questions about capital spending and asked utility personnel identifying as executive/management and financial officers the following:

- What is the current status of your utility's capital improvement projects (choose all that apply)?

Figure 12 summarizes those responses. Approximately 72% of respondents indicated that funded projects will continue, and approximately 42% of respondents (*n* = 855) indicated they are actively seeking funding for new projects. Nearly one-third of respondents also indicated that projects have been deferred to 2023 and beyond.

Figure 12. Current status of capital improvement projects



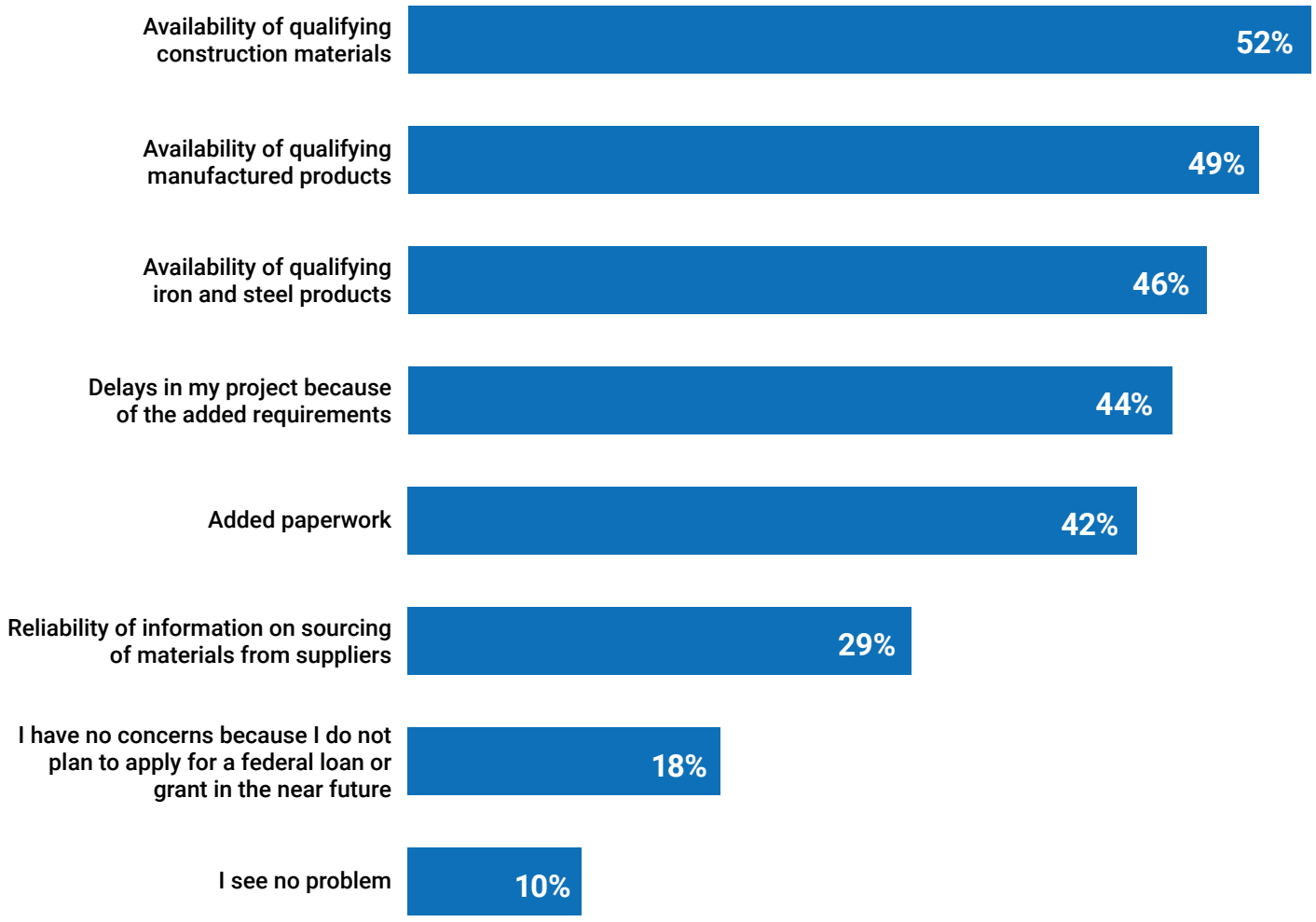
Build America, Buy America

The IIJA includes new domestic preference requirements for all federally funded water infrastructure projects. Utility executive, management, and financial officer survey respondents weighed in on the following question:

- What are the expected impacts of Build America, Buy America (BABA) requirements on ability to construct capital improvement projects with federal funding (select all that apply)?

As shown in **Figure 13**, respondents had concerns about availability of each of the types of products covered by the BABA requirements, but the highest concern was for construction materials, with 52% (*n* = 790) identifying availability of construction materials as an expected impact. Nearly half of respondents to this question (49%) anticipate impacts related to manufactured products and 46% anticipate impacts related to iron and steel products. In addition, 44% expect delays in their construction projects due to the added requirements. Ten percent of respondents see no anticipated problems.

Figure 13. Expected impacts of BABA requirements



Water Resource Management

Long-term water supply availability

In the 2023 SOTWI survey, all respondents rated several issues related to water resources management in terms of importance, including long-term water supply availability (second most important), public understanding of the value of water resources (fourth most important), watershed/ source water protection (fifth most important), and groundwater management and overuse (ninth most important) (Table 1).

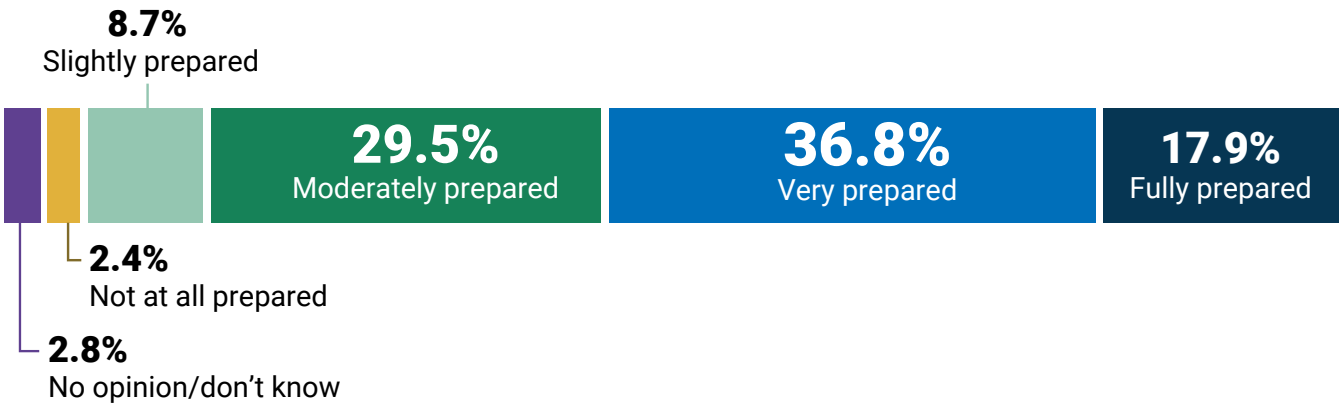
To understand the issue of long-term water supply availability, utility personnel were asked the following:

- How prepared do you think your utility will be tomeet its long-term water supply needs?

The summary presented in **Figure 14** shows that 11% of responding utility personnel indicated their utility will be challenged to meet anticipated long-term water supply needs (i.e., not at all or only slightly prepared), compared with 12% reported in 2022 and 8% in 2021.

Additionally, 54.7% of participants indicated that their utilities are very prepared or fully prepared, down from 64.5% reported in 2020.

Figure 14. Utilities' ability to meet long-term water supply needs



Water Shortages

Shifting from long-term to near-term water supply, water systems are dramatically affected by shortages resulting from drought, the severity of which will likely be influenced by climate variability and extreme weather events.

To gauge the effects of water shortages, utility personnel respondents were asked how many years in the past decade their utility had implemented voluntary or mandatory water restrictions. The responses summarized in **Figure 15** reveal that for a majority of the 2,271 utility respondents, voluntary and mandatory water restrictions were not needed. Of utility personnel responding, 12.6% indicated their utilities had five or more years of voluntary restrictions, and 8% had five or more years of mandatory restrictions in the past decade.

Figure 15. Utility history of implementing voluntary and mandatory water restrictions

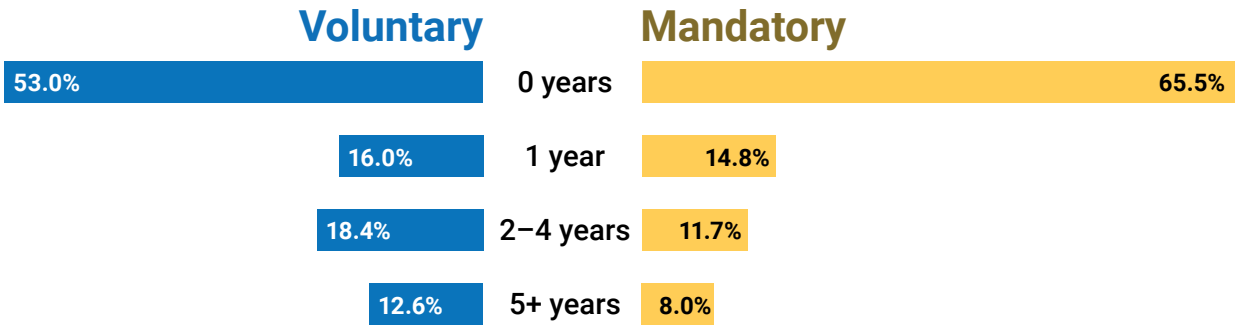
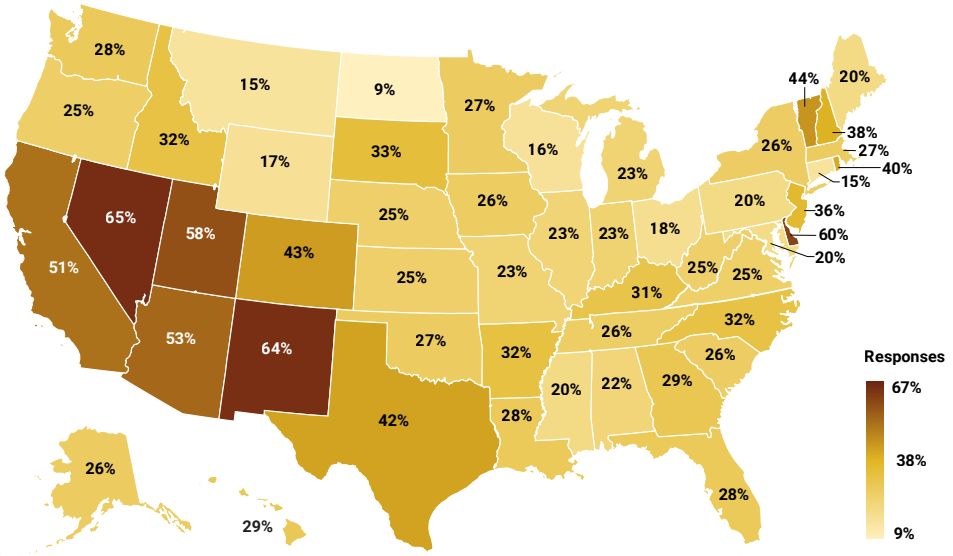


Figure 16 provides a visual representation of respondents by state that answered the question asking them to rate the importance of addressing water industry challenges with a response of the highest rank of "critically important" to the challenge of drought or water shortage. Unsurprisingly, respondents in the southwest are very concerned.

Figure 16. Percent of respondents indicating drought or water shortages are a critical challenge



Water Supply Sustainability

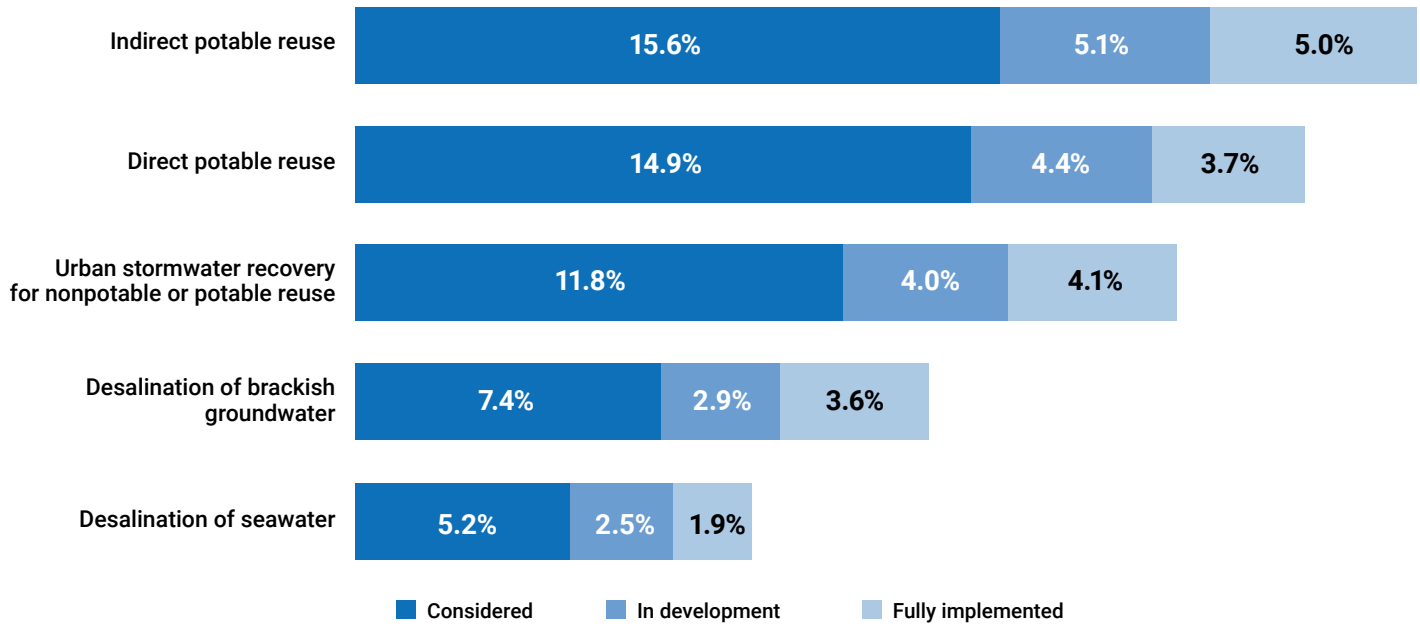
As communities evaluate their water shortage preparedness, there is also an opportunity to better understand regional water supply sustainability. In addition to reliability during water shortages, utilities and the communities they serve can evaluate or determine their policies and practices for water conservation and alternative water supplies such as desalination of brackish groundwater or seawater, non-potable reuse, potable reuse, and stormwater capture and reuse. The survey responses show that augmentation of water supplies is not a concern for the majority of utility respondents.

Although water restrictions can be a useful short-term management tool, most utility-sponsored water conservation programs emphasize long-term improvements in water use efficiency while maintaining quality-of-life standards.

To understand the status of conservation planning at water utilities, the 2023 SOTWI survey asked participants whether their utility has any water conservation or water-shortage-planning programs. The survey indicated that 32% of all utility participants have a fully developed drought management or water shortage contingency plan, and 31% of utility respondents have fully implemented a water conservation program.

In addition to water conservation, inclusion of other nontraditional sources of water supply, such as reuse, seawater, or brackish groundwater, into utilities' water portfolios is a way to improve long-term water supply sustainability. Utility participants were asked whether their utility has implemented or is considering any of the augmentation options listed in **Figure 17**. Of the 2,247 responses, 10.1% reported having or developing some type of indirect potable reuse to augment existing supplies. Those respondents identifying as consultants, manufacturers, and technical contractors were asked what approach they believe holds the most potential for innovation; potable reuse was one of the top responses to the write-in question.

Figure 17. Augmentation of existing water supplies



Protecting Water at the Source

Source water protection is the mitigation of potential risks to, and impacts on, drinking water supplies. It is one of the first critical barriers against drinking water contamination and other risks. A strong source water protection program can be one of the most cost-effective methods for maintaining, safeguarding, and improving the quality and quantity of source water and drinking water.

In most cases, states are responsible for implementing the regulatory requirements that affect water protection under the Safe Drinking Water Act and the Clean Water Act. States are also responsible for source water protection programs and often provide technical and financial assistance to drinking water systems that are pursuing source water protection programs.

The 2023 SOTWI survey asked utility participants the following:

- Has your utility considered and/or implemented any of the following plans or programs?—Source water protection program?

Seventy-one percent of utility respondents (*n* = 1,968) say their utility has fully implemented or is in progress of implementing a source water protection program. The percentage was greater for very large (more than 100,001 connections) utility respondents, at 83% (*n* = 331).

In the 2023 survey, groundwater management and overuse remain among the top 10 water sector concerns (Table 1).

Groundwater resources are essential; AWWA supports proper management and use of groundwater resources to protect the long-term quantity and quality of groundwater. AWWA also supports proactive planning and education efforts.

When utility respondents were asked what types of plans and programs they were considering, 52% of utility respondents (*n* = 1,894) indicated they had fully implemented a groundwater management plan or that plan implementation was in progress.

Regulations

The importance of current and future regulatory compliance remained a concern for all respondents in the 2023 SOTWI survey. Referring to Table 1, compliance with current regulations and compliance with future regulations were rated 10th and 15th (not shown in Table 1), respectively, in the current survey. It is worth noting that respondents from very large utilities rated current and future regulations as No. 5 and No. 6 concerns.

All survey participants were asked about their levels of concern regarding the water sector's ability to comply with current regulations and health advisories, and their responses are summarized in **Table 3**. Scores are on a scale of 1 to 5, where 1 = not at all concerned and 5 = extremely concerned.

Current health advisories regarding per- and polyfluoroalkyl substances (PFAS) were the top concern among those with opinions on the topic. Point source pollution regulations followed closely by lead and copper regulations were ranked second and third. Microplastics and nonpoint source pollution regulations were also ranked in the top five concerns. These rankings were similar to 2022 and were also similar across different-size utilities, although concern for pathogen regulations outranked concern for microplastics regulations in smaller utilities.

Table 3. Regulatory concerns ranked by all survey respondents

Contaminant	Weighted Average	% Extremely Concerned	All
Respondents (*n* = 3,655)			
PFAS/PFOAs (health advisory)	3.46	19.6	3,307
Point source pollution	3.27	13.8	3,415
Lead and copper	3.26	15.0	3,535
Microplastics	3.22	14.4	3,354
Nonpoint source pollution	3.16	10.9	3,327
Pathogens	3.13	14.0	3,460
Combined sewer overflows	3.10	12.6	3,338
Disinfection byproducts (DBPs)	3.09	10.1	3,443
Cyanotoxins	3.05	10.4	3,166
Nutrient removals	3.02	9.1	3,332
Perchlorates	2.94	9.1	3,119
Arsenic	2.93	9.4	3,355
Manganese	2.79	6.7	3,268

PFAS—per- and polyfluoroalkyl substances, PFOA—perfluorooctanoic acid

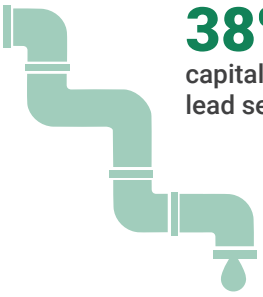
PFAS

PFAS are a large class of synthetic chemicals used in a variety of industrial processes and everyday consumer products; they are the most prominent emerging contaminants of public health concern. PFAS have earned the nickname "forever chemicals" because they do not readily break down in the environment or in the human body. In the 2023 SOTWI survey, PFAS ranked as the highest regulatory concern, with 19.6% of respondents (*n* = 3,307) selecting "extremely concerned" regarding their ability to comply with the PFAS health advisory. EPA is in the process of developing a proposed National Drinking Water Regulation for PFOA and PFOS, which the agency anticipates will be finalized by the end of 2023.

Lead and Copper

Lead and copper enter drinking water mainly from corrosion of plumbing materials that contain lead and copper. While the use of lead in plumbing materials has been banned for more than 35 years, the release of lead into drinking water remains a serious concern. Lead and copper contamination appears as the No. 3 regulatory concern in Table 3. As mentioned earlier in a question about the types of plans and programs systems are considering, 68% of utility respondents (*n* = 2,067) indicated their utility has fully implemented or is in progress of implementing a lead service line replacement program. Another 16% indicated having considered implementing a lead service line replacement program. In a question about planned capital improvement projects, the highest rated response (38% of utility executive or financial officers (*n* = 829)) indicated that their planned capital improvement projects include lead service line replacements.

Utility respondents are actively planning or working on lead service line replacements:



38% indicated their planned capital improvement projects include lead service line replacements.

68% indicated they are implementing lead line replacement programs.

Service Provider Assessment

The SOTWI survey classifies as a utility any entity—public or private—engaged in water production or water/wastewater treatment, including water wholesalers. The service provider category consists of manufacturers, distributors, distributors' representatives, technical service companies, and consultants—in essence, anyone supplying products and services to utilities. This is a broad group, representing diverse business interests.

Global Markets

Service providers were asked how challenging each of the concerns listed in **Table 4** are as they relate to developing water-related markets outside of North America. Service providers indicated that the largest obstacle to developing business outside the United States was financing, followed closely by financial concerns, overall cost, and contract risks. Table 4 is a summary of the barriers to foreign commerce identified by survey respondents. These were the same concerns indicated by service providers in recent, SOTWI surveys. Two responses to the "other" option were political instability and cultural differences.

Table 4. Summary of barriers to foreign commerce

Rank	Foreign Market Concerns	Weighted Average	% Extremely Challenging
1	Financing	3.70	21
2	Financial concerns	3.68	20
3	Overall cost	3.60	21
4	Contract risks	3.54	20
5	Distribution	3.42	15
6	Divergent standards	3.34	14
7	Intellectual property security	3.34	18
8	Foreign exchange risks	3.22	15
9	Tied aid	3.09	9
10	Redundant test/compliance	3.04	11
11	Language barriers	2.81	9

The North American Market

Doing business in North America presents its own set of business challenges. To better quantify service providers' top challenges, they were asked the following:

- How concerned are you with the following as they relate to water industry business development in the North American market?
- In your opinion, how important are the following to the North American water industry market growth?
- What single water industry issue do you feel holds the most potential for innovation?

The survey provided a list of potential water sector development concerns about the North American markets. As shown in **Table 5**, service providers (*n* = 608) see budgetary issues faced by utilities as the greatest challenge to doing business, followed by cost/price and low-bid mentality, and regulatory concerns (including permitting, approvals, certifications). Responses to the "other" option included attracting and retaining talent, aging of staff, politics, failure to internalize costs of unsustainable resource use or greenhouse gas emissions from new plants, over-regulation, adopting new technologies.

In **Table 6**, water scarcity, water quality issues, and innovation ranked as the biggest concerns for North American water utilities, with water scarcity being ranked critically important by 47% of service providers (*n* = 601). Responses to the "other" option included affordability, data management, political and economic sustainability, sustainability and resilience, resource management.

When asked what single water sector issue they believed held the most potential for innovation, the majority of service providers selected technologies related to potable water reuse.

Table 5. North American water market challenges as indicated by water sector service providers

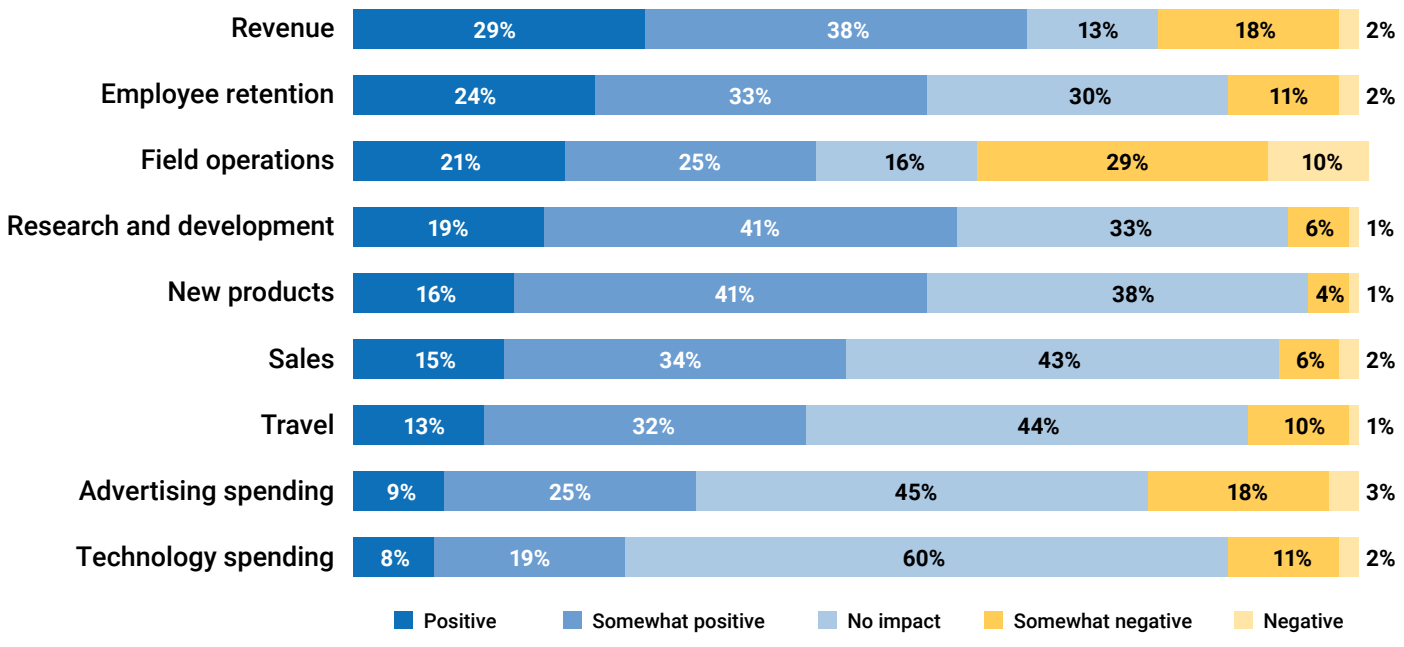
Rank	Market Challenge	Weighted Average
1	Budgetary issues faced by utilities	3.72
2	Cost/price/low-bid mentality	3.71
3	Regulatory (including permitting, approvals, certifications)	3.29
4	Policy	3.16
5	Water sector attitudes toward change	3.13
6	Federal funding	3.10
7	Financial performance of the water industry	2.92
8	Venture capital or equity investments	2.71
9	Availability of good market data	2.63
10	Specifications	2.58
11	Competition	2.50

Table 6. Issues ranked by importance to North American water market growth

Rank	Issues Important to North American Water Market Growth	Weighted Average	% Critically Important
1	Water scarcity	4.20	47
2	Water quality issues	3.98	32
3	Innovation	3.80	22
4	Advanced treatment technologies	3.76	25
5	Federal, state and provincial, or local regulations	3.66	21
6	Greater efficiency	3.62	17
7	Secondary and tertiary wastewater treatment	3.60	16
8	Research	3.55	19
9	Smart water market	3.43	15
10	Solids removal technologies	3.42	12

To understand continued impacts on businesses, participants identifying as service providers were asked to rate a list of issues on a scale from 1 to 5, where 1 = negative impact and 5 = positive impact. **Figure 18** illustrates the full results. The highest ranking positive results were for revenue (67% positive), research and development (60% positive), and employee retention and new products (57% positive). The highest ranking negative result was for field operations (39% negative) which likely ties in with concerns about workforce.

Figure 18. Service provider expected business impacts in 2023



The Canadian Perspective

The 2023 SOTWI survey had 172 respondents, or 4.2% of all survey respondents, representing nearly all provinces of Canada. This response rate is similar to previous surveys; however, it remains too small for statistical significance. **Figure 19** Canadian response by province to the SOTWI survey shows the provinces from which survey responses were received; not all respondents indicated their province.

Figure 20 shows the average health of the water sector as rated by Canadian participants. The 2023 SOTWI data indicate Canadians are relatively optimistic about the present and future health of the water sector: they recorded 5.4 and 5.7 rankings, respectively, for the current and future health of the water industry on a scale of 1 to 7, where 1 = not at all sound and 7 = very sound. It is interesting to note the Canadian perspective has historically shown a more positive future outlook than for the current state, which is opposite of the state of the water industry responses from the overall pool of respondents. This optimism for the future was only reflected in the overall data on the first four years of the survey 2004–2008.

Figure 19. Canadian response by province to the SOTWI survey

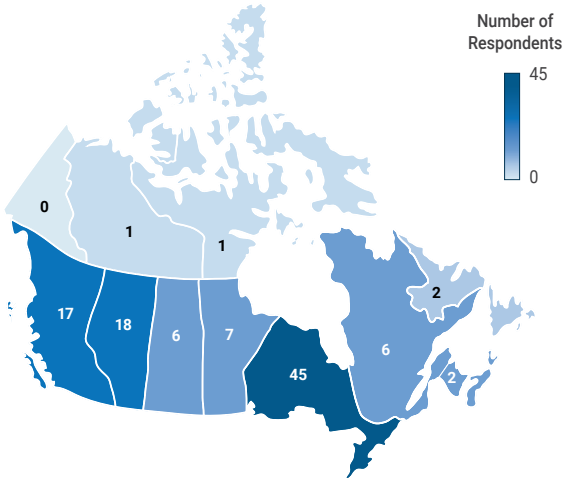
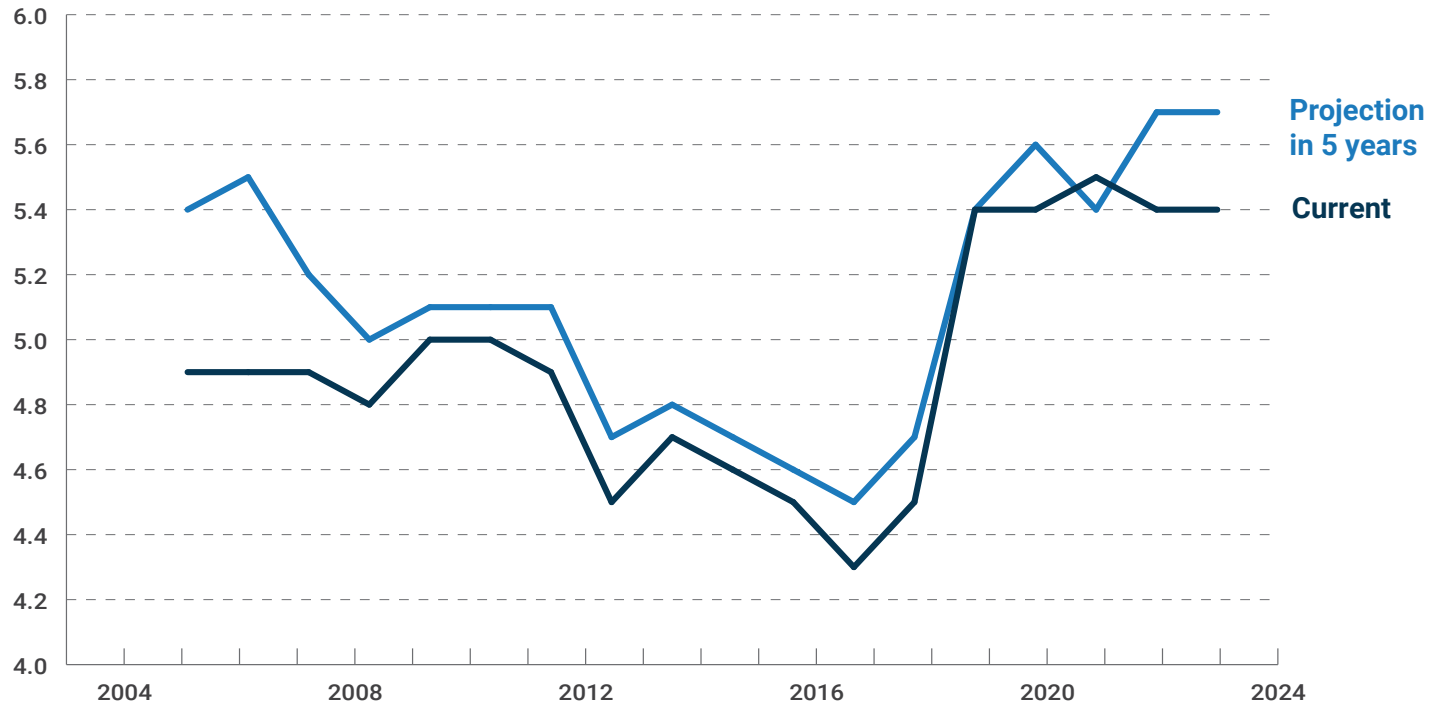


Figure 20. State of the water industry: Canadian responses (2006–2023)



Survey Respondents

The 2023 SOTWI survey asked participants a series of demographic questions. Responses were not required, and not all participants chose to provide information. All data are self-reported.

Table 7 shows the total number and percent of respondents based on the type of organization they work for. Nearly 70% of all participants (*n* = 2,825) indicated they worked for a utility/water provider; another 18% (*n* = 731) identified as service providers (manufacturers, distributors, distributors' representatives, technical service companies, and consultants).

Table 7. Total number and percent of 2023 SOTWI survey respondents by organization type

Organization Type	%	Count (*n* = 4,123)
Combined water/wastewater utility (may include other services, too)	30.7	1,267
Drinking water utility	29.9	1,232
Consulting firm/consultant	11.0	453
Wastewater utility	5.9	245
Manufacturer (including products, representatives, and/or distributors)	5.2	215
Non-utility government (municipal, provincial, federal, etc.)	3.0	122
Regulatory authority/regulator	2.6	107
Other, please specify	2.6	107
Retired	2.4	100
University/educational institution	1.9	77
Technical services/contractor	1.5	63
Water wholesaler	1.4	58
Nonprofit organization	1.2	49
Stormwater utility	0.3	12
Reuse/reclamation utility	0.3	11
Law firm/legal organization	0.1	5

A more detailed look at utility respondents shows that individuals identifying as executive/management and O&M personnel were the largest group of respondents (**Figure 21**). The greatest percentage of respondents represent large utilities serving a population between 10,001 and 100,000 (**Figure 22**).

Nearly all responding utilities, 87.6%, were publicly owned entities (**Figure 23**). The largest percentage of respondents have been in the water sector for 20 or more years (**Figure 24**) and the largest percentage is in the preretirement age group of 50 to 64 (**Figure 25**).

Figure 21. Respondents by job category

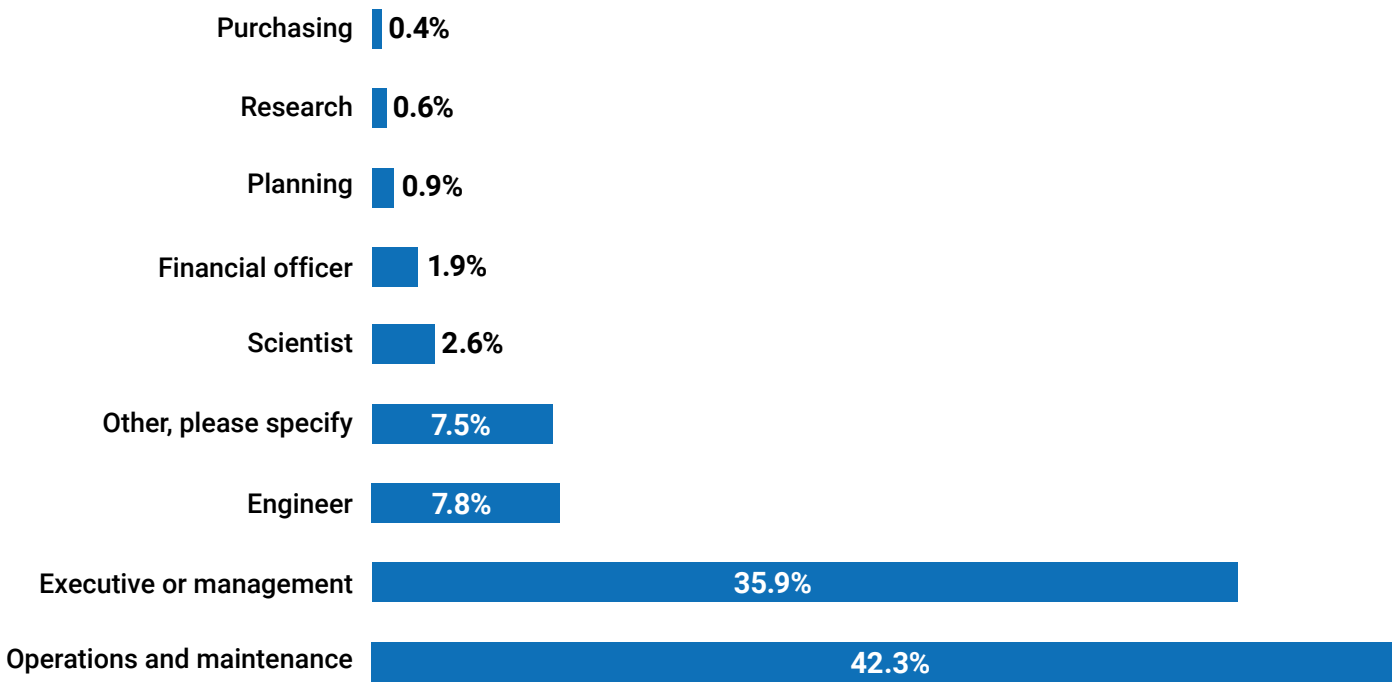


Figure 22. Utility respondents by system size

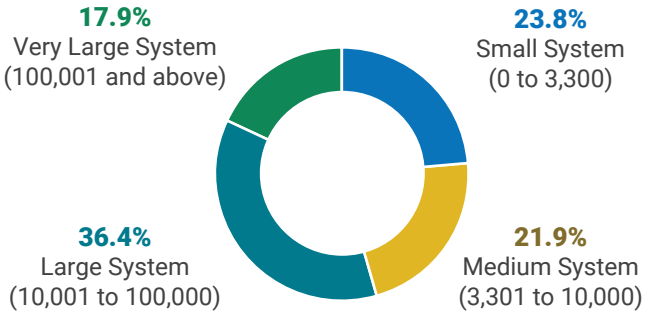


Figure 23. Utility respondents by utility ownership type

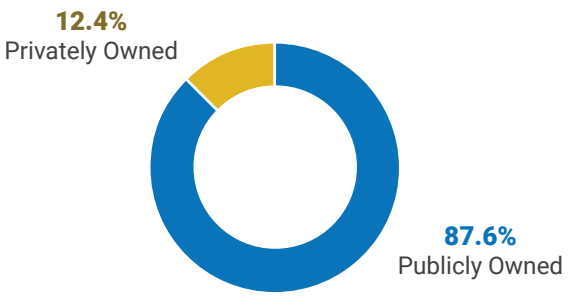


Figure 24. Respondents by time in the water sector

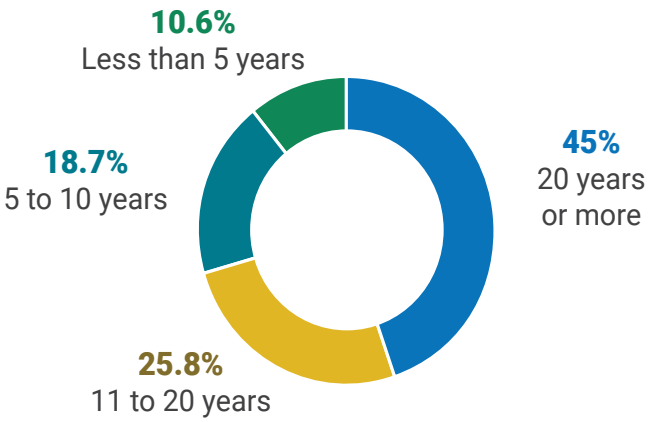
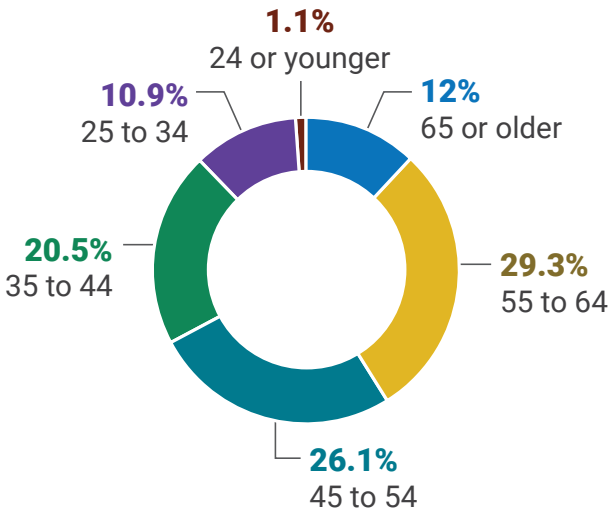


Figure 25. Respondents by age



Survey Methodology

The SOWTI survey population includes all water professionals—i.e., those with a working understanding of the issues facing the entire water sector. The SOTWI survey classifies participants on the basis of which of the following 15 categories best describes the type of organization for which they work:

- Drinking water utility
- Wastewater utility
- Combined water/wastewater utility
- Water wholesaler
- Reuse/reclamation utility
- Stormwater utility
- Consulting firm/consultant
- Manufacturer
- Technical services/contractor
- Regulatory authority/regulator
- Non-utility government (e.g., municipal, federal)
- University/educational institution
- Nonprofit organization
- Retired
- Other (respondents were asked to specify)

AWWA made deliberate efforts throughout the 2023 SOTWI survey to anticipate and minimize errors from coverage, sampling, nonresponse, and measurement. The 2023 SOTWI sample frame consisted of a general list of AWWA members and nonmember contacts. The survey primarily reflects water industry concerns in the United States, but participants from Canada and Mexico also contributed their thoughts.

Initial email invitations were delivered in October 2022 to more than 132,000 email addresses on the basis of the criteria described. Subsequently, four follow-up emails were sent to this same group between October 2022 and November 2022. Links to the survey were also posted on AWWA social media. After removing wholly incomplete responses (i.e., surveys submitted with no response at all), the total number of 2023 SOTWI survey participants was 4,123.

Of the 4,123 participants, all answered some questions, but many skipped questions or were not shown certain questions, meaning that not all charts in the report add up to 4,123. Data points such as percentages were calculated on the basis of number of responses received for that particular question. Responses of “do not know,” “no opinion,” or “not applicable” were omitted in certain calculations. Also, where questions had multiple parts, the “n” value was based on the number of people who answered at least one part of the question rather than any particular line item unless otherwise noted. Data were analyzed using Office 365 and Qualtrics statistical tools from December 2022 through January 2023. All data points addressed on the survey were included in this report.

LEARN MORE Additional Resources

Books & Data Publications

- AWWA Utility Compensation Surveys—large, medium-sized, and small utilities
- AWWA Utility Benchmarking
- The Water Workforce: Strategies for Recruiting and Retaining High-Performance Employees
- Water and Wastewater Rate Survey

Technical Reports

- Lead Communications Guide and Toolkit
- Designing and Evaluating Effective and Ongoing Drought Communication
- Governmental Policies for Drinking Water Utility Water Loss Control
- Increasing consumer benefits & engagement in AMI-based conservation programs
- Strengthening the Cyber Resilience of America's Water Systems: Industry-Led Regulatory Options
- Source Water Protection Toolkit
- Strategies to Obtain Customer Acceptance of Complete Lead Service Line Replacement

Manuals

- M1 Principles of Water Rates, Fees, and Charges
- M12 Simplified Procedures for Water Examination
- M19 Emergency Planning for Water and Wastewater Utilities, Fifth Edition
- M24 Planning for the Distribution of Reclaimed Water, Fourth Edition
- M28 Rehabilitation of Water Mains
- M29 Water Utility Capital Financing
- M36 Water Audits and Loss Control Programs, Fourth Edition
- M47 Capital Project Delivery
- M50 Water Resources Planning, Third Edition
- M52 Water Conservation Programs, Second Edition
- M54 Developing Rates for Small Systems
- M58 Internal Corrosion Control in Distribution Systems
- M60 Drought Preparedness and Response, Second Edition
- M68 Water Quality in Distribution Systems
- M71 Climate Action Plans - Adaptive Management Strategies for Utilities
- M77 Condition Assessment of Water Mains

Standards

- ANSI/AWWA J100-10(R13) Risk and Resilience Management of Water and Wastewater Systems
- ANSI/AWWA G300-14 Source Water Protection Operations and Management
- ANSI/AWWA G410-18 Business Practices for Operation and Management
- ANSI/AWWA G481, Reclaimed Water Program Operation and Management
- ANSI/AWWA G485, Direct Potable Reuse Program Operation and Management
- ANSI/AWWA C810-17, Replacement and Flushing of Lead Service Lines
- Source Water Protection Operational Guide to AWWA Standard G300

Programs

- Transformative Water Leadership Academy
- Partnership for Safe and Clean Water
- AWWA Career Center
- AWWA Cybersecurity Resources

References

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EPA (US Environmental Protection Agency), 2023. *Addressing PWS Cybersecurity in Sanitary Surveys or an Alternate Process*. bit.ly/3UhTpBG

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