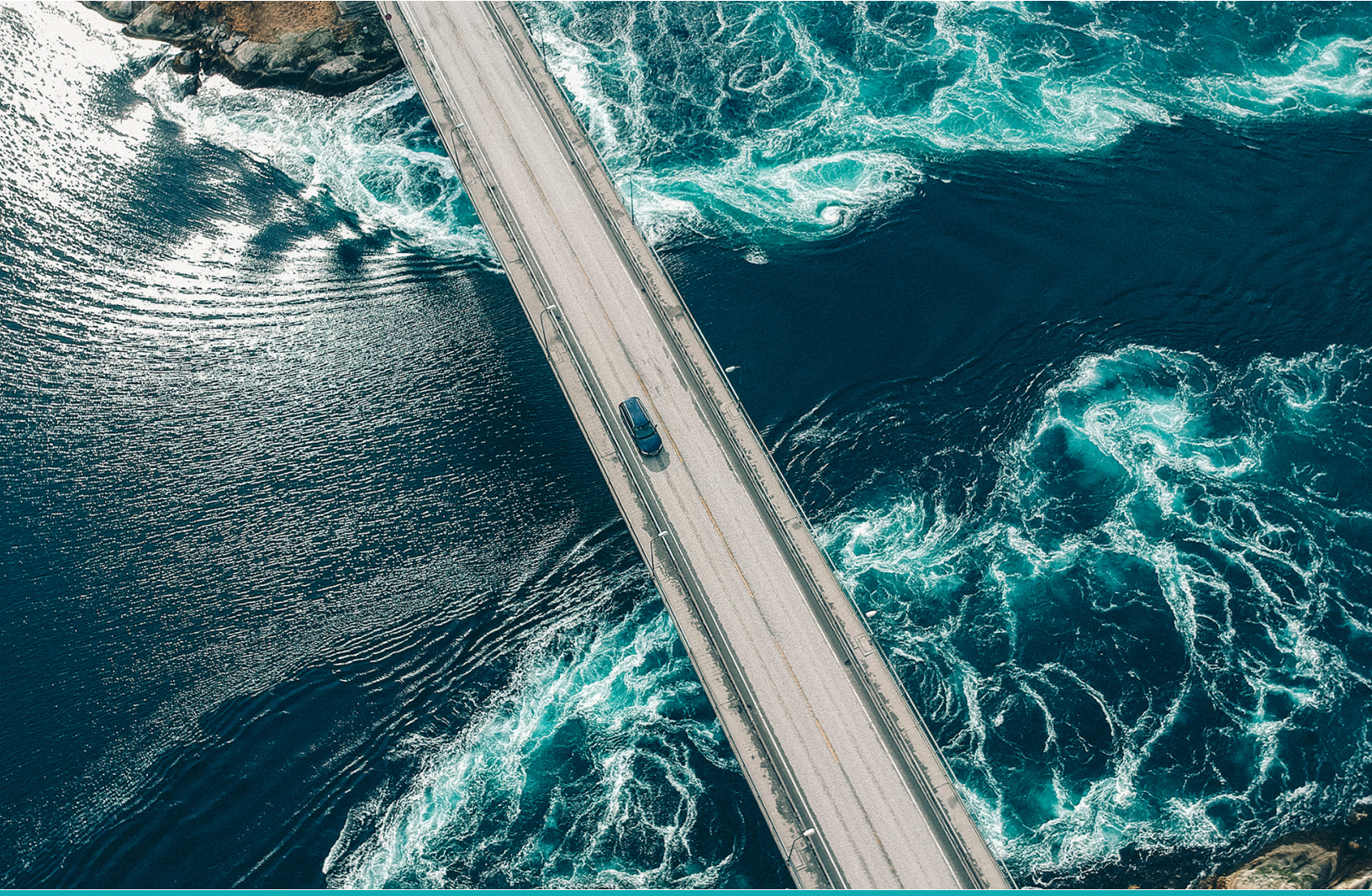

2021 US Water Industry Outlook

mazars

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Foreword

Jerome Devillers
Partner
Energy, Infrastructure
& Environment
Mazars in the US

With the fifth edition of the Water Industry Outlook, we celebrate ten years of research, publication, and commitment to the industry. It has been a very interesting and rewarding exercise, and on behalf of Mazars, I want to express my gratitude to the colleagues and friends that have made this possible.

Lately, it seems as if the nation wakes each morning to overwhelming news about fires ravaging the Western states (which are simultaneously experiencing dire droughts and heat waves), matched by reports from the East of a historically intense hurricane season.

These dramatic events would have more of an impact on the future of the industry if we were not still focused on dealing with an unprecedented global health crisis caused by COVID-19. The last 18 months have been challenging. We have been forced to think differently and to innovate. Technology adoption has accelerated, increasing the uptake of tools that had previously been available to us but remained unused. Building upon these unprecedented times, all organizations and stakeholders in water must consider how they can increase digitalization and innovate in order to be impactful and successful.

As we look to the industry's future, the focus remains on the investment needed in core infrastructure. Despite massive liquidity in the financial markets, and significant investor appetite for the sector, the water industry isn't close to filling the gap on infrastructure investment.

The uncertainties around political commitment, insufficient regulatory enforcement, and the need for more transactions and opportunities to be financeable are some of the key reasons water is having difficulty finding capital.

An interesting takeaway is that the pandemic caused a significant refocus on people at most companies across industries. Leaders have been re-awakened to the importance of their people and how valuable they are to their organizations.

Speaking of the people in water, it is important to reiterate for everyone across the country how we appreciate the many individuals who worked tirelessly through the pandemic to ensure that the communities they serve continue to have access to this essential resource.

As part of post COVID-19 strategies, successful water organizations will be those that recognize the value of human capital. This capital, like many other stakeholders, is also looking for a bigger purpose in all companies or organizations. Talent acquisition, development and retention, along with sustainability and water stewardship, will be key factors for success in the coming years - it will take significant innovation, investment, and organizational focus.

Introduction

Welcome to the fifth edition of the Water Industry Outlook, Mazars' flagship publication for the industry. We are pleased to continue playing our part by providing the education and research needed to support sustainable solutions for all forms of water services.

What's changed?
In this year's Outlook, we continue to deliver perspectives on key topics surrounding operations, finance, and future trends. In a continuous effort to improve this publication, increase its value and capture recent changes, we have added two new sections: COVID-19 and Diversity and Inclusion.

We have also increased the contributions from Mazars' experts around interpreting the survey results and trying to anticipate what's ahead in key areas for the industry. Each section therefore features the results of our survey and responses from professionals at Mazars or outside our organization.

How is the data gathered?
The Water Industry Outlook is based on a 26-question survey that was conducted in 2020/2021. This captured the perspectives of different stakeholders, including water and wastewater systems operators, procurement and other support for water and wastewater companies, government regulators and the investment community (See Figures 1-4 on page 5 for a detailed breakdown of the respondents' demographics). A list of the questions and where to find the data is also provided on page 38.

Thank you for your support!
We greatly appreciate the support of all our respondents and thank you for your contributions and taking the time to answer our survey.

We also want to extend a very warm thank you to Corey Williams, who was very kind to share his perspective as a leader in the industry. You can learn more about Corey on page 41.

This publication is made possible by the contributions of several of our professionals who we want to recognize and thank for their dedication: John Rowe, Paul Truitt , Patrick Zerbib, Wendy Stevens, Tifphani White-King, Fatbardh Veselaj and Samantha Parker.

How you can help
We welcome any ideas as to how we can continue to improve this publication and deliver more value.

Also, please share and promote the Outlook as we always seek to increase survey participation - the more respondents we reach, the more accurate our data becomes.

If you have a question, are looking to discuss the Outlook, or are interested in contributing, we invite you to connect with our team, whose contact information is provided at the end of the report.

Demographics

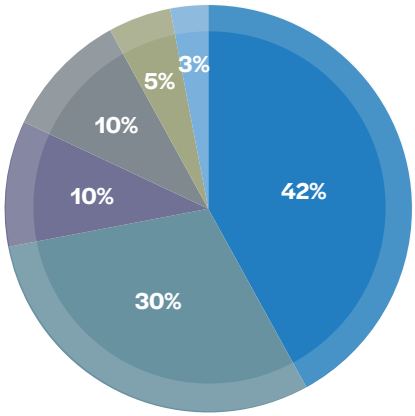


FIGURE 1
Primary Nature of Respondent's Business

Utility and Contract-Operator	42%
Engineering/Construction/Equipment Provider	30%
Investors (e.g. Lenders, Investment Bankers, Private Equity)	10%
Other	10%
National Association/Not-for-Profit/Public Interest	5%
Municipal or Local Public Authority	3%

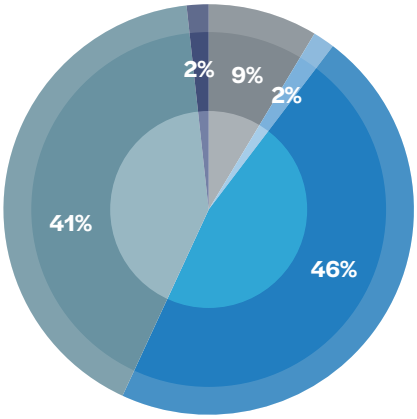


FIGURE 2
Respondent's Current Position / Title

Executive (C-Suite or Elected Official)	46%
Management	41%
Associate/Analyst/Staff	9%
Board Member	2%
Other	2%

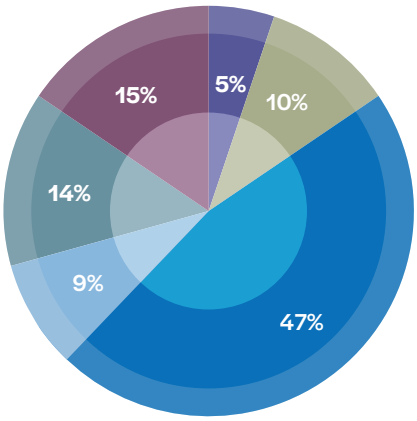


FIGURE 3
Respondent's Primary Function

General Management	47%
Other	15%
Operations	14%
Finance/Accounting	10%
Support Functions	9%
Customer Service	5%

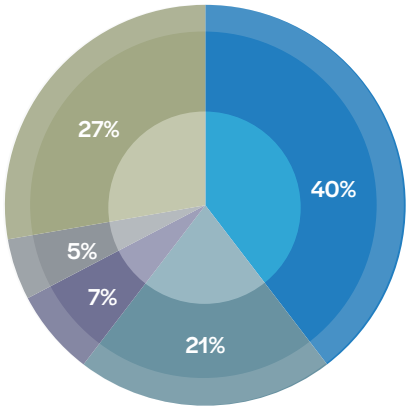
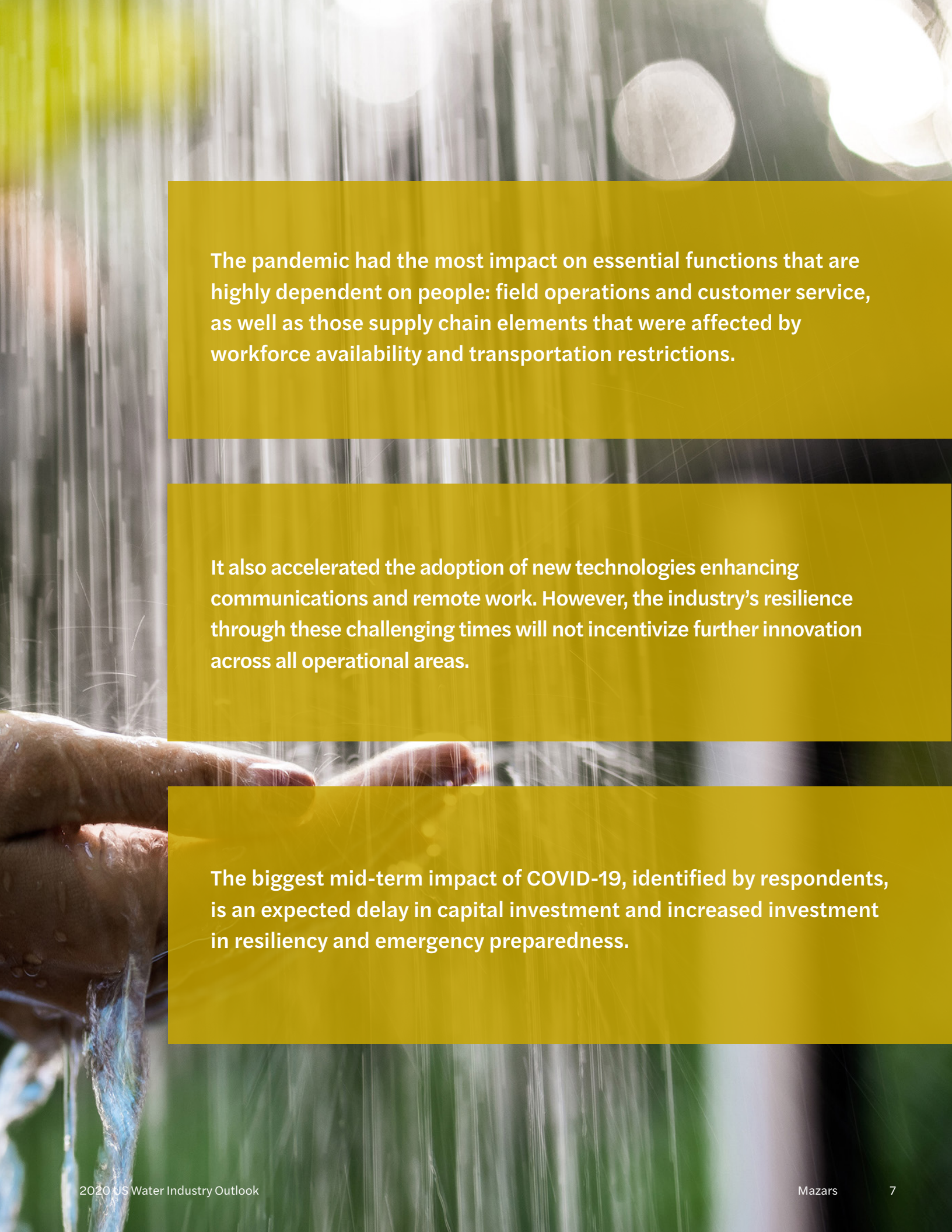


FIGURE 4
Size of Respondent's Organization by Number of Employees

1 - 50	40%
51 - 500	21%
501 -1,000	7%
1,001 - 2,500	5%
More than 2,500	27%

Section 1
COVID-19



The pandemic had the most impact on essential functions that are highly dependent on people: field operations and customer service, as well as those supply chain elements that were affected by workforce availability and transportation restrictions.

It also accelerated the adoption of new technologies enhancing communications and remote work. However, the industry's resilience through these challenging times will not incentivize further innovation across all operational areas.

The biggest mid-term impact of COVID-19, identified by respondents, is an expected delay in capital investment and increased investment in resiliency and emergency preparedness.

John Rowe
Director
Organizational Resilience
Mazars in the US

We have all personally witnessed an unprecedented adoption of tools facilitating remote working and communication that were available to us but had not been widely embraced. What is there to be said about the role of new technology adoption and process automation with respect to preparing companies for, or protecting them from, similar events that may happen in the future? Also, did essential businesses, like the water industry, suffer relative to other sectors because of their lower need to innovate?

We have seen broad adoption of technologies, most of which already existed, such as online collaboration and meeting tools, primarily to address the immediate need to support a largely remote working environment. We have also seen several industries where consumer interactions were primarily face-to-face and/or high touch implement technologies to minimize interpersonal contact, with the aim of creating a touchless environment. This includes hotels using electronic keys to remove the need for in-person check-in, restaurants utilizing online menus for ordering and almost all industries evolving to paperless/electronic payment processing.

All of these innovations and the increased use of technology will make companies better prepared for future pandemic or health emergency events. However, in many instances, we have observed organizations that stopped at the "minimum" in adopting technology, doing only what was necessary to continue operating in a remote fashion, assuming there would be a return to normal at some point.

Companies should take note of the many examples of increased efficiency and reduced cost that the "COVID kick in the butt" forced and look to permanently embed innovation processes in their organizations and culture. For instance, there remain significant opportunities for use of Robotics Process Automation (RPA) or automation in general, especially in many back office type activities.

Historically, all utilities, including water, have been slow to innovate, not because of a lesser need to do so, but largely because there is no real incentive to be more cost efficient. The impact of "utility think" and need to find better ways to incentivize innovation and efficiency within regulated industries is a major issue that legislators and regulators should put at the top of their priority list.

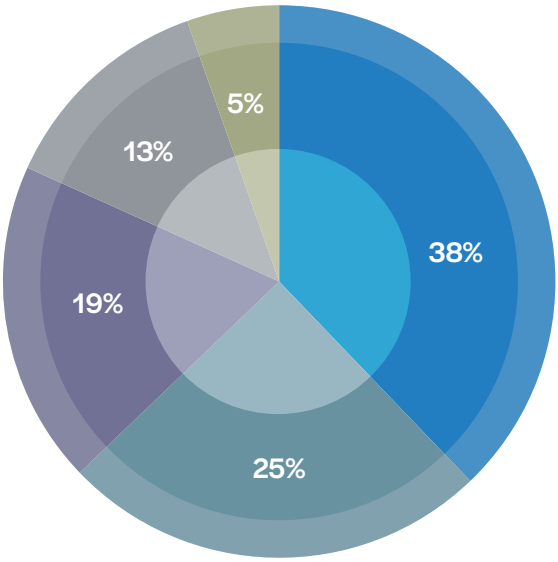
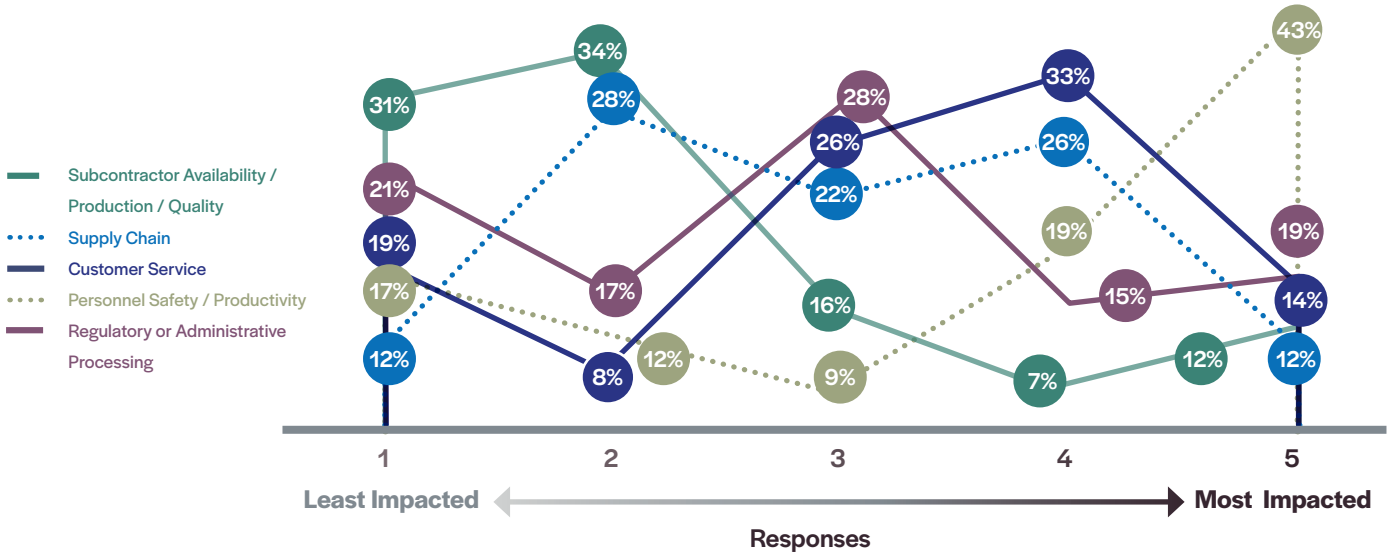


FIGURE 5
Which area of technology do you find that COVID-19 accelerated adoption most?

Remote working environment	38%
Communications	25%
Administrative functions	19%
Field operations	13%
Finance	5%

FIGURE 6
Which aspect of the industry's operations was most impacted by COVID-19?



Our survey respondents identified personnel safety and productivity, customer service and supply chain as the areas most impacted by COVID-19 (as seen in Figure 6 above). This appears to be consistent with many other industries, but what is the root cause of the disruptions in these areas and what are the lessons to be learned for the water industry specifically?

Regardless of the industry, employee health and well-being, as well as productivity when working remotely for extended periods of time, the best way to service their customers, and finally how to continue doing business were all questions that every organization's senior leadership team asked. However, at the time, no one really knew what the answer was.

The root cause is quite simple. If the thought was that "this could never happen," why would an organization spend capital and resources to solve a problem that may never occur? Often this can be "discovered" through a thorough review of all the risks that have an impact on the organization's continued ability to do business regardless of the disruption type.

Instead, organizations should look to identifying all risks, regardless of the likelihood of occurrence, and decide if there is a technology, business process change, location change, redundant supply lines, or something else that can be put in place to mitigate them. Every organization needs to decide what they are willing to invest to mitigate the risk, and remember, do nothing is always an option, in some cases it may be the only option. Regardless of the industry, knowing what you might be up against and exploring all options to address the risk is the most valuable tool an organization can have against the unknown.

28% of respondents said that due to COVID-19, they plan to increase investment in resiliency and emergency preparedness. What can companies do now to make sure their business is more prepared to face events like this and mitigate their impact in the future?

As with managing any organizational risk, knowledge is power. All companies, no matter their industry or size, should begin to establish Organization Resilience Programs or assess their current program. Every program is based on intelligence, driven typically by a Business Impact Analysis and or risk assessment. This intelligence will drive the development of integrated, actionable and sustainable plans across Emergency Management, Business Continuity, Disaster Recovery and Crisis Management.

However, the first step is understanding where you are and where you need to be. For this purpose, we recommend a full Program Assessment that will provide a clear picture of an organization's current capabilities and needs, resulting in an Organizational Resilience Strategy and roadmap that will guide the development of a right-sized framework and set of policies, procedures and plans aligned with the organizational culture and objectives.

While there is no one-size-fits-all approach, it is prudent for organizations to establish a program that addresses the key components of organizational resilience to help ensure the safety of their people, protection of their assets and the ability to effectively and efficiently deal with disruptive events.

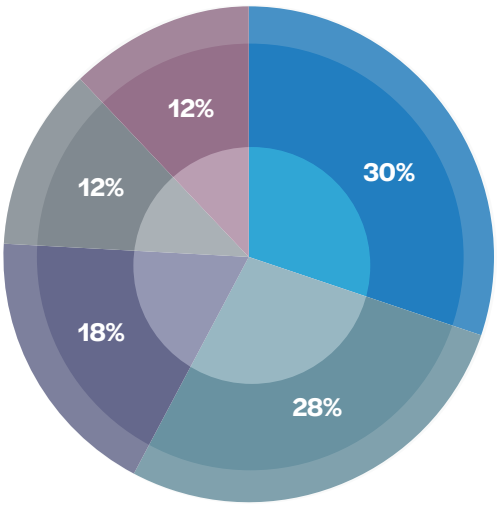


FIGURE 7
What do you see as the top long-term impact to the water sector as a result of COVID-19?

Delays in capital investments	30%
Increased investment in resiliency and emergency preparedness	28%
Regulatory changes/impacts to rates	18%
Increased consolidation and privatization	12%
Changes to the availability of financing or financial structure trends	12%

The COVID-19 pandemic has greatly impacted the way businesses have functioned since March 2020. From a risk management perspective, why weren't companies more prepared for an event like this? Are companies broadly speaking managed too efficiently and, as a result, extremely sensitive to shocks in any key area?

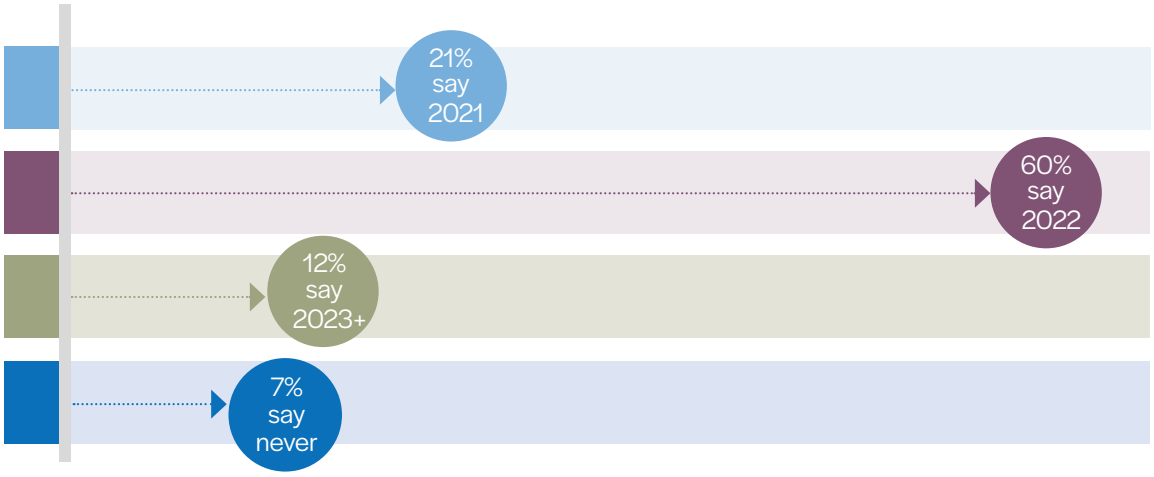
There are two primary reasons organizations were not more prepared for the pandemic and still are generally not ready for similar events in the future. First and foremost is the belief that events such as this "could never happen." The second factor is cost. It takes investment to properly plan and prepare for major disruptive events and often, given the unlikeliness of events such as a global pandemic, many companies choose to ignore the risk without proper data, analysis and consideration.

There are far too many examples of "Black Swan Events," that "could never happen," actually occurring for leaders, management and Boards to simply set aside the risk without adequately understanding the potential impact and critically judging their "risk tolerance." By nature, Black Swans are rare, random, and high-impact events that are catastrophic and broad. The occurrence of such events without proper planning and foresight, as many have found, can mean the end of a business.

Most organizations tend to run "lean" and maximize short term profits. In good times, this strategy works well. However, when events, such as the pandemic or major changes in the economy occur, companies will suffer and may not survive. Every organization would be wise to assess their risk management program, processes and

strategies to ensure that potential catastrophic events are adequately known, analyzed and prepared for. The key to managing risk is clarity. There needs to be transparency in the risk process and effective measures put in place that will provide advanced warning of potential events or major changes in the environment that would impact the ability of an organization to achieve its goals.

FIGURE 8
Considering the Impacts of COVID-19 on your workplace - when do you expect to return to normal?



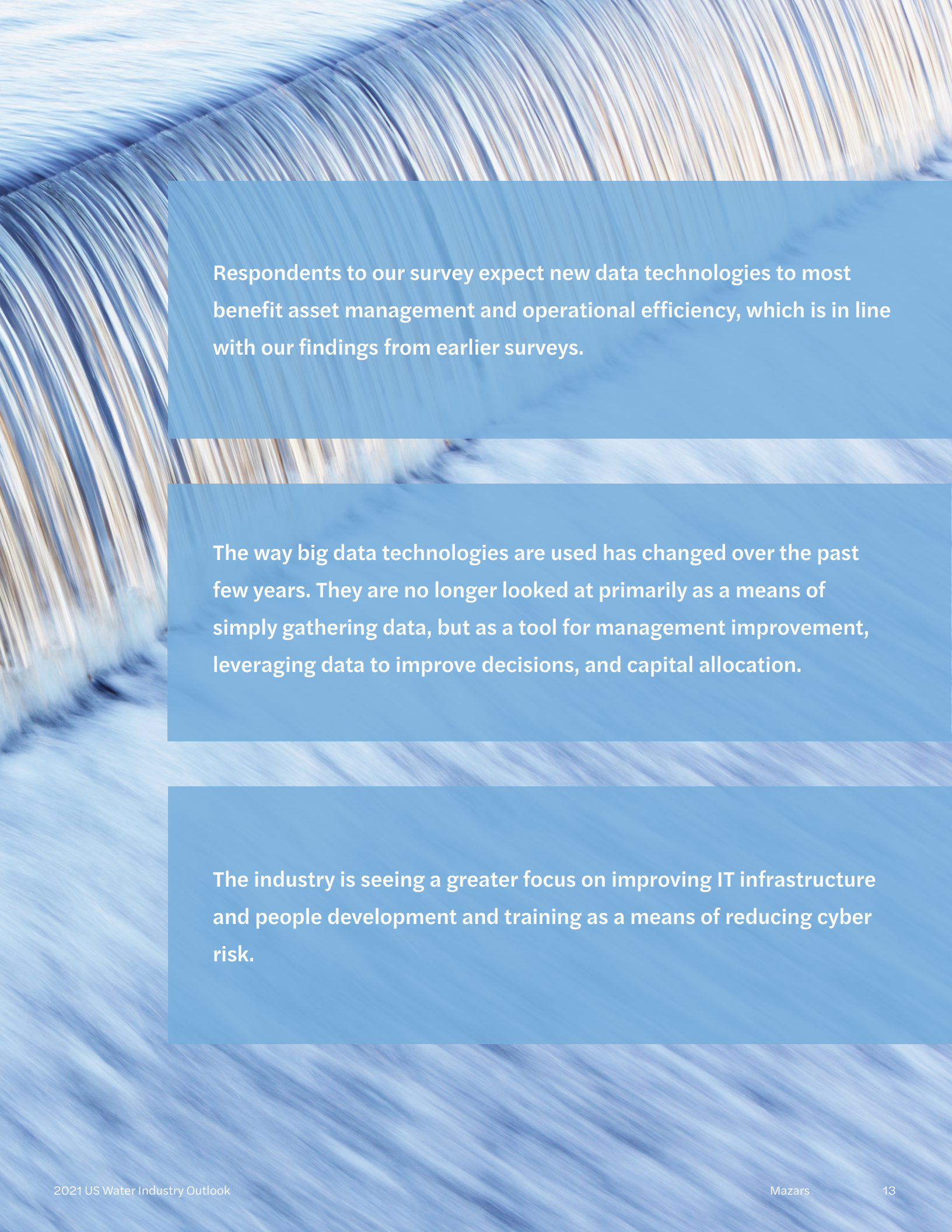
There is much discussion around returning to pre-COVID normalcy, but with that looking like more of a challenge as time passes, what will be the permanent changes to how companies operate, and which ones will particularly apply to the water industry?

The primary focus for organizations returning to a pre-COVID state is reviewing how they do business. It's important to determine what worked well during the pandemic and what did not work so well. This will involve looking at technologies that were brought online to solve the immediate issues facing the organization, and reviewing the way each business process is performed.

A modified version of the Organizational Resilience Program Assessment we discussed earlier can be performed, with the focus on changes to technologies, business processes, customer interaction, and overall employee health and well-being. This will give any organization, including those in the water industry, a baseline to start from, which is often the most arduous task.

By not rushing to make any permanent changes to the way the organization operates, this risk-based, in-depth look will allow for the identification of cost effective changes which will most benefit the organization, not only tomorrow, but into the future and allow for better preparation should the organization be faced with another "it will never happen" event.

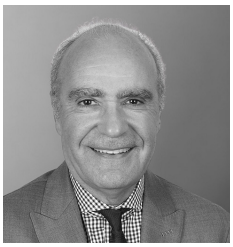
Section 2
Operations



Respondents to our survey expect new data technologies to most benefit asset management and operational efficiency, which is in line with our findings from earlier surveys.

The way big data technologies are used has changed over the past few years. They are no longer looked at primarily as a means of simply gathering data, but as a tool for management improvement, leveraging data to improve decisions, and capital allocation.

The industry is seeing a greater focus on improving IT infrastructure and people development and training as a means of reducing cyber risk.



Patrick Zerbib
Partner
Data Advisory Services
Mazars in the US

What is the overall use of big data across industries, not just water, over the past 2 years? Is the perceived benefit still strong, is data science in high demand, and are companies really using data, or is it just a buzz word?

Over the past few years, digital transformation has spurred an explosion in the volume of data generated across all sectors. The world of Big Data seems to be getting bigger mostly from the rise of mobile devices, applications, wearables, and the Internet of Things (IoT). By 2025, it is estimated that the global datasphere will grow to 175 zettabytes (i.e., 10^21 bytes), with 2 exabytes (10^18 bytes) generated each day. Unstructured and semi-structured data now make up an estimated 80% of that collected by enterprises. Big Data creates significant challenges: information is often siloed, hard to access, and may be unavailable due to multiple legacy systems; data quality, accuracy and integrity may be subpar; and data privacy is a major concern. Higher costs are also associated with larger data mart builds and/or maintenance.

To address these challenges, several infrastructure solutions have emerged:

- Growth of cloud storage: 82% of companies have a mix of legacy and modern cloud technologies, highlighting the rapid transition to the cloud year over year. By 2023, most enterprise companies will have their data stored in a public cloud data warehouse, like Snowflake, Amazon Redshift, and Google Big Query.
- Traditional data warehouses are evolving and being replaced with modern data like solutions. These new architectures are now generally accepted as the target in all industries and are broadly used to enable analytics applications.
- At the same time, many entities are moving away from a monolithic data lake to distributed data mesh/fabric to help overcome scaling issues.

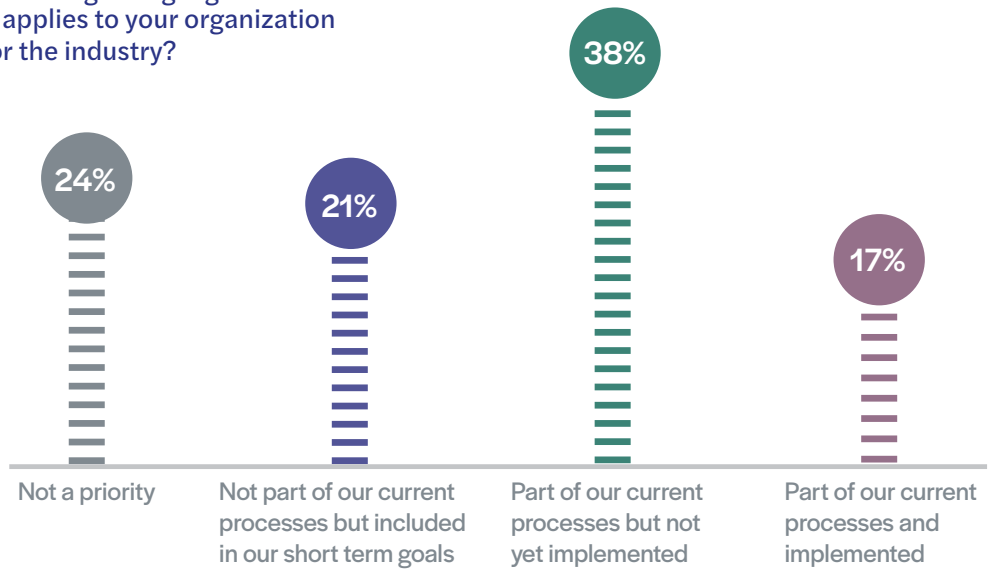
What key areas of water operations can benefit from data management and analysis practices? Can you provide an example?

Faced with aging infrastructure and limited capital to improve it, water operations increasingly require improved efficiency and better cost management, leading to a need for 'smarter" infrastructure - i.e., one that embeds real-time analytics in the operations.

Potential applications include:

- Real-time water quality monitoring and dashboarding, including turbidity.
- Cost optimization: optimize plant processes and allocation of resources in the field.
- Asset failure management: preventive maintenance through machine learning modeling.

FIGURE 9
Which statements regarding big data management applies to your organization or the water or the industry?



The Outlook this year has a major focus on people and training: what is the model for big data, is it more of a people matter or infrastructure? Should big data be accessible to everyone or should it be a tool for a few in the organization?

Amid a growing need to embed data and analytics in enterprise culture, the journey to becoming a true "data-driven organization" is challenging. Innovation only happens where people, technology, and process changes meet. If the objective is to build a self-serve infrastructure, water utilities will need to have access to relevant data engineering and science capabilities.

Water professionals often lack the expertise in data engineering and science required to develop relevant machine learning-derived models. Nevertheless, access to technology will need to be supplemented with certain components:

- People: data owners, stewards, producers, and consumers must be designated.
- Technology: master data and metadata management, data quality standards and management, data lifecycle and controls must be put in place.
- Processes: KPIs, data policies/standards/guidelines, and data decision processes must be defined.

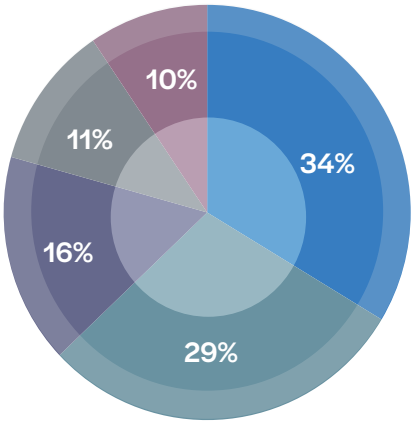
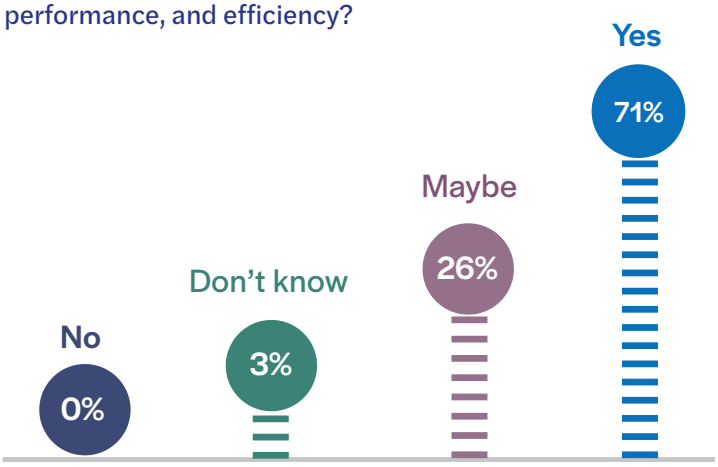


FIGURE 11
Please indicate which two challenges are most likely to benefit from big data analytics.

Asset management (network)	**34%**
Operational efficiency	**29%**
Anomaly detection and prevention (end customer)	**16%**
Water quality management	**11%**
Demand forecasting	**10%**

FIGURE 10
Do you believe big data and data analytics can play a role in improving your company's, or the water and wastewater industry's operations, performance, and efficiency?



Should organizations that are not yet on this big data journey be concerned about the scope of the undertaking/ investment and how should they get started?

The first step is to conduct a short diagnostic capturing the current baseline. This includes:

- Understanding current data capabilities.
- Understanding the challenges faced by internal users and business partners.
- Understanding organizational requirements for data, process, and technology.

To contain risk and reduce the cost of getting started, best practice is to select one (or two) use case(s) that would help solve a specific challenge identified in the baselining exercise, while providing short to medium term measurable benefits. A good example would be to build a dashboard that provides a new way to monitor a data-rich process and generates alerts that will ultimately enhance decision-making.

Paul Truitt
Principal
Cybersecurity
Mazars in the US

Over the past two years, what has changed in the cyber world, are risks higher and are there any new risks?

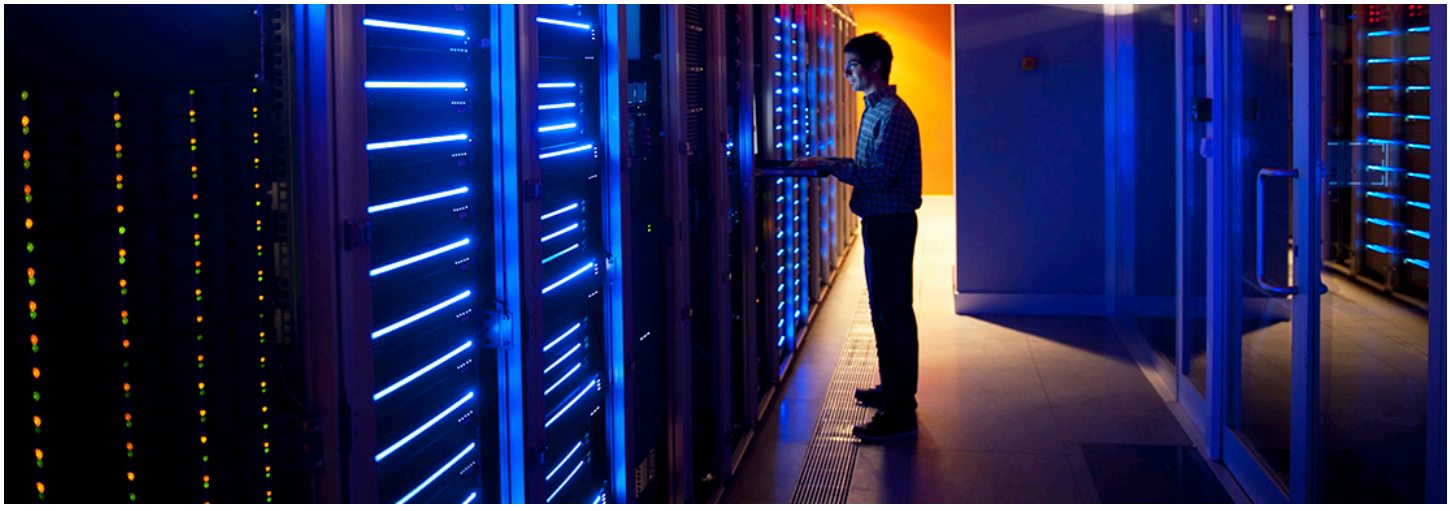
The most significant change I have seen in the last two years is the type of attacks that have occurred. The Solarwinds attack in Q4 2020 resulted in data breaches in many organizations running the Orion platform created a shift in mindset on where risk may exist. While this type of supply chain attack isn't entirely new, it is the first time we have seen such a significant impact on both the public and private sectors from a software vendor being breached. This changes the game in terms of an organization's risk posture. While we have seen third-party attacks create significant impact like the Target breach from an HVAC vendor, an attack that is entirely outside the control of an organization and likely not identified as a risk creates a new entry point into highly controlled environments.

The other major attack vector that has significantly changed is ransomware. We have seen these types of attacks in the past as well, with a similar approach to what we see today, starting with a phishing attack. What has changed is the frequency, sophistication and patience of the attacker. We are seeing ransomware attacks happen nearly every day, and big breaches hit the news every couple of weeks. Preparing an organization to identify a phishing email was much easier in the past, as there were many telltale signs such as poor grammar, unrealistic claims, or other easy to spot characteristics in an email trying to lure the employee to click a link. The new attacks are very well written, with research about the organization and are extremely difficult to differentiate from legitimate emails. Many times they include information about a project with real people's names included to make it feel like an internal message. We are also seeing these attacks sit dormant for long periods of time between the initial entry point (likely through a phish) until the attacker uses the point of entry to exfiltrate data or perform the ransomware attack. This length of time is allowing extra time for the attackers to place back doors, spread their foothold and have a much greater impact on an organization.

The third major change is related to the significant increase in the percentage of people working from home. We are seeing many ad hoc remote access holes poked into organizations' firewalls to allow their remote workforce to do their jobs, creating a much larger public facing footprint for organizations. This includes new VPN technology and, unfortunately, a large number of remote desktops listening directly on the Internet.

Attackers are taking advantage of these new paths into an organization. The simplest path appears to be Windows Remote Desktop (RDP), where the attack simply requires a brute force (repeated login attempts) attack that, after some period of time, a local login credential will gain them access.

We saw this type of attack hit the Bruce T. Haddock Water Treatment Plant in Oldsmar, Florida in February of this year. The attacker found a remote desktop that was added to



allow employees to work from home and was connected to an industrial controls system. This allowed the attacker to raise the levels of sodium hydroxide in the water from about 100 parts per million to 11,100 parts per million for a few minutes. While this was caught by the company quickly but shows the significant risk to systems that have not been connected to the Internet in the past and the potential damage that could be done by an attacker.

We expect to see similar risk continue to grow as the Internet of Things (IoT) increases in use as systems become increasingly automated, especially in the manufacturing, energy, and utility sectors, which have a large number of industrial control systems and SCADA networks that can see many business benefits to automation systems using IoT. Many of the IoT devices that are deployed are running simple, embedded operating systems that are not managed by the organization for patches and updates like typical computer systems, creating potential vulnerabilities and a path into the network through the IoT device.

Overall, the past two years have seen a major increase in attacker activity and sophistication of attack vectors, which are creating a significant increase in cyber risk for many companies.

In recent months, major cyberattacks against infrastructure assets in the U.S. have had unprecedented impacts on the economy, what could have been done to prevent this?

These attacks are different from what has been seen in the past and, therefore, many organizations weren't prepared to quickly identify and respond to them.

There are a number of changes needed to ensure improved protection against these types of attacks. The first is a defense in depth strategy. This is not a new term but is even more critical today than it has ever been. We have to assume we will be attacked and build controls to identify anomalous activity in our environment, along with alerts inside the network just as we typically have at the perimeter. No longer can the perimeter be the end of security control. This has been a topic for over 20 years, but many organizations continue to be missing basic controls. If we assume that an employee will click a link in a phishing email at some point, allowing an attacker access inside the firewall through their machine, then we must not rely on the firewall to protect us. These internal controls start with endpoint detection and response (EDR). Running anti-virus software on endpoints is no longer acceptable, EDR software allows automated action against many types of attack and, when centrally monitored, can be utilized to quickly isolate an infected machine to reduce the impact of an attack.

In addition, there are many other technologies and services that can help prevent, or reduce the impact of, attacks like we have seen over the past two years, including Managed Detection and Response (MDR), Security Information and Event Monitoring (SIEM), Data Loss Prevention (DLP), data encryption (file, database, transport), and email filtering. The second, and possibly even more critical, action that would have reduced the impact of these incidents is a well planned and tested incident response plan. We have to assume an attack will happen and, as such, we should be prepared to respond when it does. This includes knowing how to identify and escalate an incident, who performs what actions, when to alert outside parties (incident response firm, state/federal authorities, customers, employees), and how to handle communications.

Running tabletop tests to ensure the responding team is familiar with these actions and practices how to respond will allow a more organized and calm approach when a real incident occurs. These tests also allow improvements to be made to the response plan to ensure a smooth process. Too many organizations make major mistakes that, if planned out, could have allowed much quicker action and a coordinated response when an incident occurs.

The third mitigation control is a backup and recovery plan. Implementing a good backup strategy with disconnected backups can minimize the risk of an attack impacting your backups. These backup plans should be regularly tested to ensure recovery is possible from various forms of attack. In addition, a Business Continuity Plan (BCP) should be developed to ensure the organization can perform basic activities without the use of computer systems while restoration is being performed. If organizations have a good backup and recovery plan, there is no need to pay a ransomware attacker for a key that is unlikely to even work. The organization can utilize its incident response plan to take action to stop the attack and at the same time kick off their recovery plan to bring the business back to normal operations while using the continuity plan to keep it running while in an impacted state.

We always talk about aging infrastructure, referring to these invisible pipes and mains underground, but there are far more quickly aging invisible assets in IT. Which ones are particularly of concern?

The impact of closed systems that are now being exposed through advances in technology such as IoT and remote workforce access are exposing aging industrial control systems that in the past had never been exposed. This risk exists even if these systems are not on the public Internet but instead being added to the internal company network to allow remote control, data collection or automation of systems.

These systems are often running on old hardware with embedded operating systems unable to be patched or maintained. Any changes made to the environment creating connection points from more modern network systems to an industrial control network should come with a risk assessment of the environment to ensure appropriate controls have been implemented with the new technology. The business gains may outweigh the risk generated, however appropriate controls can be implemented to minimize the risk and impact to older IT systems.

The cost of compliance and the required investments in cybersecurity/data privacy are increasing. Is funding easily available for smaller companies or utilities?

I have not seen much easy access to funding to assist small companies or utilities with cyber investments. However, after the Colonial Pipeline attack, the federal government issued new legislation to define control frameworks to follow, with recommendations on implementing better controls. I expect to see additional grants or funding opportunities coming out of these continued attacks.

Unfortunately, it often takes major incidents with an impact on the country to drive this assistance. The Colonial Pipeline attack did appear to create a significant improvement in awareness of the potential damage when a major fuel pipeline is shut down, which should result in improved assistance to implement security controls on critical infrastructure and utilities.

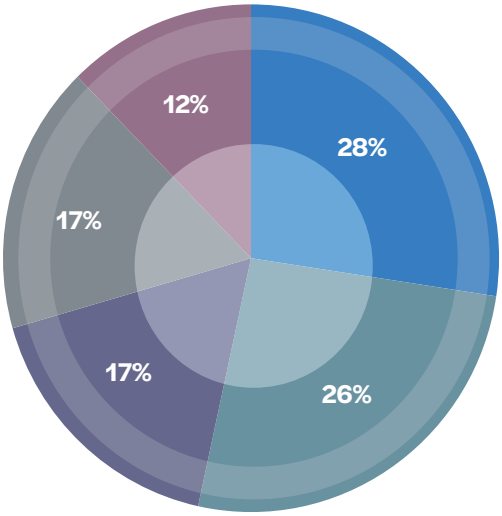
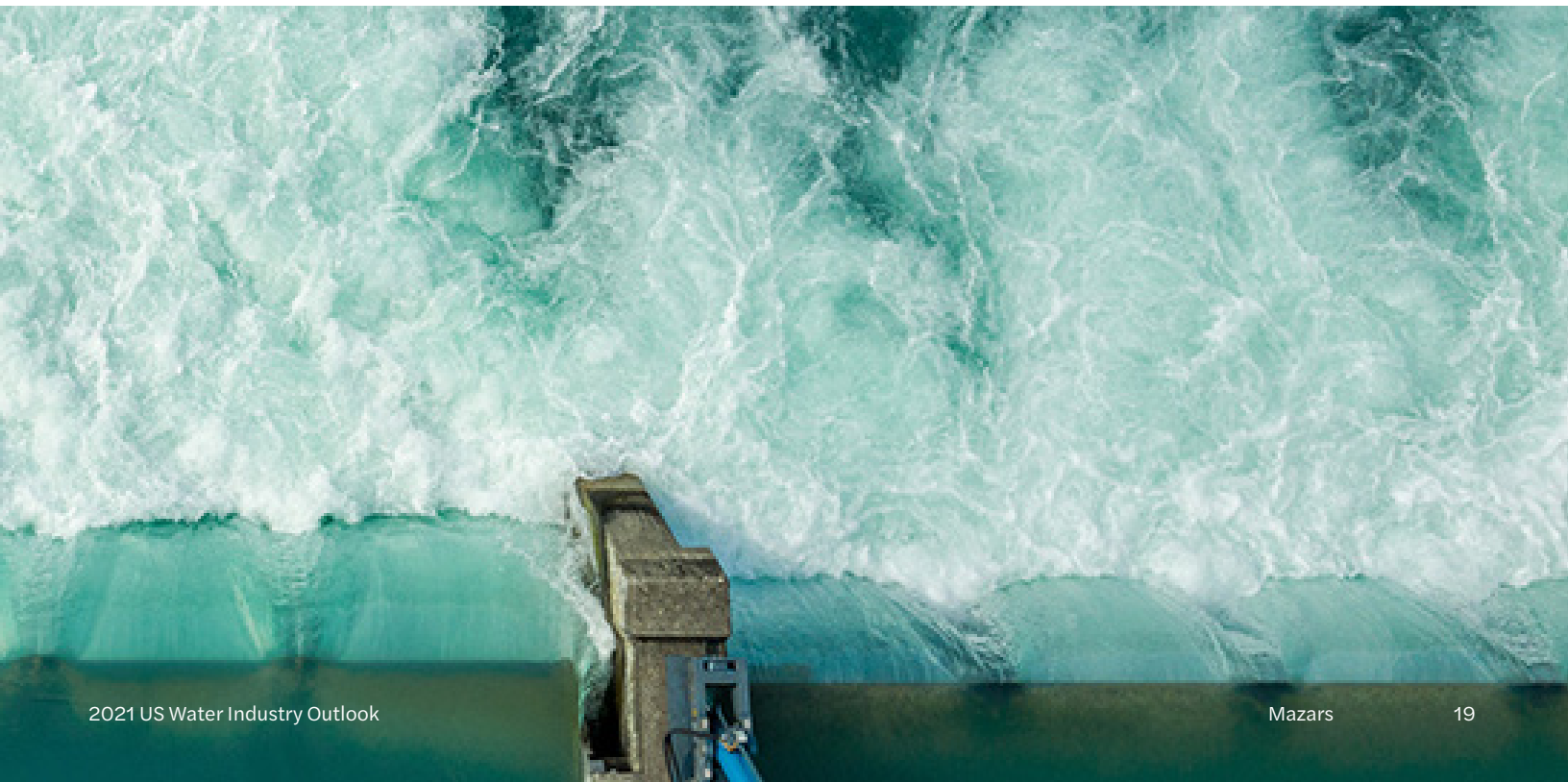
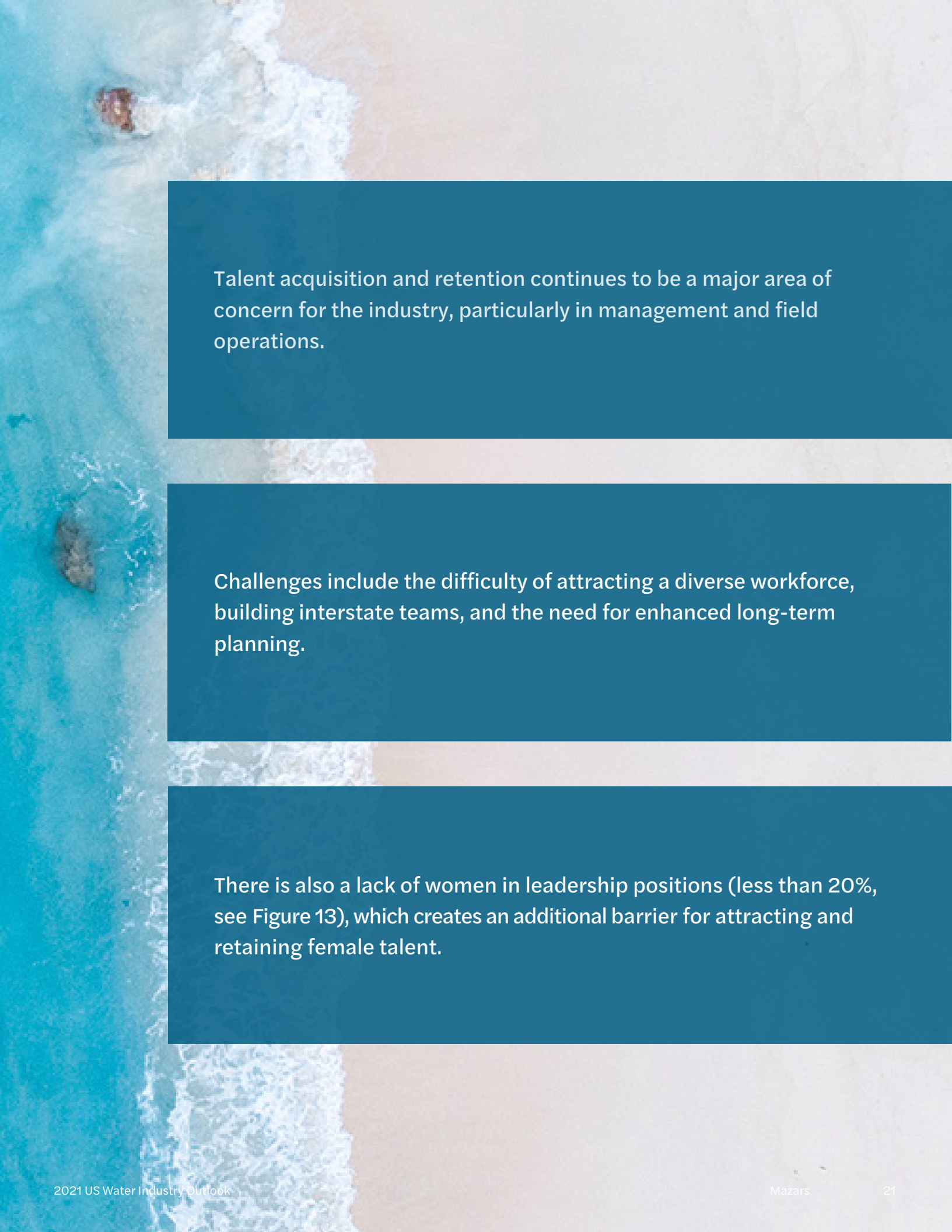


FIGURE 12
Which additional measures or corporate practices do you believe are most effective at mitigating IT security risk?

Increased training and employee skill development	28%
Investment in new IT infrastructure	26%
New risk management procedures	17%
New monitoring systems	17%
New corporate policies/procedures or codes of conduct	12%



Section 3
Talent & Diversity



Talent acquisition and retention continues to be a major area of concern for the industry, particularly in management and field operations.

Challenges include the difficulty of attracting a diverse workforce, building interstate teams, and the need for enhanced long-term planning.

There is also a lack of women in leadership positions (less than 20%, see Figure 13), which creates an additional barrier for attracting and retaining female talent.

Wendy Steven
Partner
Quality & Risk Management
Mazars in the US

Tifphani White-King
Partner
Tax Leader
Mazars in the US

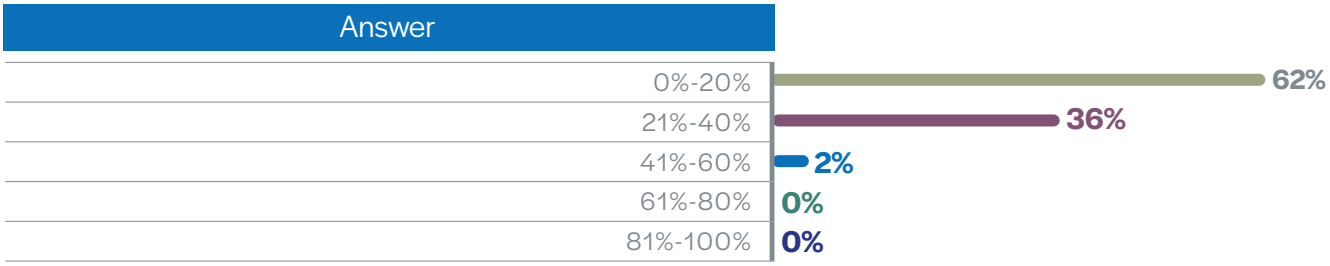
Wendy, Tifphani, the majority of our respondents stated that around 20% or less of water industry leadership identifies as women (Figure 13), is this below other industries, and what is the industry missing with such a low number?

Wendy: This is similar to percentages for industries that only made a concerted effort toward gender diversity in the past ten years. Without a strategy to change, an increased share of women in the industry will not "just happen." The current leadership has to recognize the need and focus on recruiting and retaining to build the talent pipeline. Specific strategies depend on the size of organization – data collection is the first step, a baseline assessment and focusing on the "whys" at all levels. Organizations miss out on profits with a low percentage of women due to employees not seeing a "picture" that reflects their experiences and leave. A low percentage of women generates an observer bias that the company is "old fashioned" and lacks a broad perspective. Other misses include poor reputation, lack of diversity in thinking, inefficient problem solving, loss of broader talent pool/increased turnover, and loss of productivity.

Tifphani: This statistic trends low compared to other industries, but like Wendy mentioned, it's commonplace among industries that have only put an emphasis on increasing women in leadership in recent years. Despite this, there are many women who deal with water issues every day in non-formalized roles. I would challenge our readers to think 'outside the box' here and reflect on how this percentage is multiplied by the number of women that are innovating creative solutions as heads of households around the world, daily to fix their own personal water crises. These women are the architects and CEOs of their families, and some have even become actual CEOs of their own companies with their STEM knowledge, technical prowess, ideas and design. This makes me think of Beth Koiji, Founder & CEO of Water Majik in Kenya. She developed a water filtration system that pulls water from the atmosphere, cycles through condensers, and filters it to make it safe for drinking. What started as an idea for her own family to have safe drinking water transformed the community in which she lives, including a local orphanage, so that children in Kenya have a safe drinking supply. Her motto is "as long as you have air, you can have clean drinking water."

These are the innovators that are truly making a difference in the water industry; and sadly, many of their stories are uncelebrated, and their numbers go uncounted among the masterminds of the industry. That said, clearly, we still have a long way to go within and without the industry to achieve true gender parity in leadership roles.

FIGURE 13
Approximately what percentage of the industry's leaders identify as women?



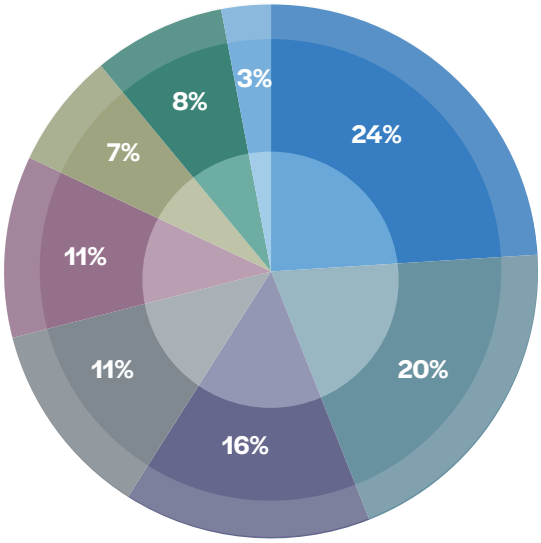


FIGURE 14
Where is the greatest current need for skills and talent in the industry?

Field Operations	24%
Effective and efficient leadership/management	20%
Engineering	16%
Information technology	11%
Site/plant/contract management	11%
Data scientists	7%
Regulatory/legal	8%
Accounting and finance	3%

The two major areas of concern are management and field operations (Figure 14). While the attraction of women in management seems achievable, do you believe that areas like field operations are too big of a challenge and should companies just accept that it is no place for a diverse workforce?

Wendy: Absolutely not. Improvement requires a plan and can be incremental. It means going from the baseline number to a bigger number- from 1-2 or 2-4...it takes time and focus and not accepting "it is what it is" or the "status quo." It's necessary to challenge the organization, get buy in, have organized strategic steps, and track data over time.

Tifphani: Nothing is too big a challenge - accepting failure, for me, presents a very limiting mindset. Instead, we need to start at the foundational level to encourage women and girls to enter the water industry, whether it's in the field, technical, management, or thought leadership in whatever capacity they wish.

The water industry, in particular, is still very conservative in its thinking on gender abilities, roles and inclusion. You can see this illustrated foundationally starting with our kids. For example, when you open kids' STEM books, do you see many women scientists, technologists, engineers and mathematicians? Are we blind to the multitude of programs, initiatives, and opportunities supporting women and girls in STEM all around us today?

Generally, it's the STEM fields that feed the talent pipeline for the water and utilities space. Unfortunately, we still see low percentages of women and girls entering these areas in higher education. We need to do more within our educational channels to increase career awareness and ambition for women in water!

In order to succeed, does an organization need to have tangible objectives and implement metrics to measure diversity in its workforce? If so, why?

Wendy: Yes – you don't get what you don't measure. Learn from mistakes, celebrate the wins. Education and awareness is critical. Study your organization – is there pay and promotion equity?

Tifphani: I believe an organization needs to have strength through diversity and inclusion at the core of its vision and values. This should not only be a statement for an organization, it needs to be their culture. When you have a culture that encourages, supports, and exemplifies diversity and inclusion, then the workforce and ideas of the workforce begets optimal solutions and ideas that truly change the world. This is necessary for the success of any global organization, and, further, positively drives recruitment, retention, and the bottom line.

Both of you have been instrumental in our firm's journey on this path, what are the key challenges and lessons learned that can help leaders in the water industry reading this?

Wendy: Never believe change will happen because you wish it, don't listen to naysayers, plan and choose your goals carefully, employ strategic methods, and recognize that one size does not fit all. Each organization is different, goals must be tailored and be time sensitive, learn from your failures along the way, reward success, women and men must engage together – collaboration is needed, gender diversity is an organizational challenge, not a "women's issue."

Tifphani: Well said, Wendy! I would also add that many times as women, we do not see ourselves in leadership roles and, as such, think it impossible to elevate to these roles. I would challenge us all to be visionaries that see beyond limitations and be the change we wish to see in the world. Lastly, mentorship (but especially sponsorship) is critical for the advancement of women in leadership, and it's great to see that mentorship programs are available within 20% of our respondents companies (Figure 15). All of us (men and women) should mentor and sponsor someone deserving and meritorious in order to be this change!

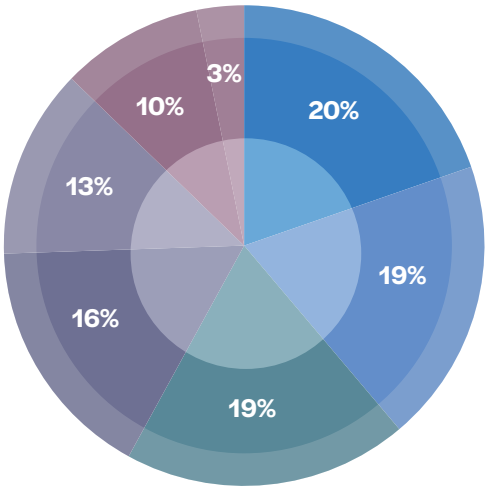


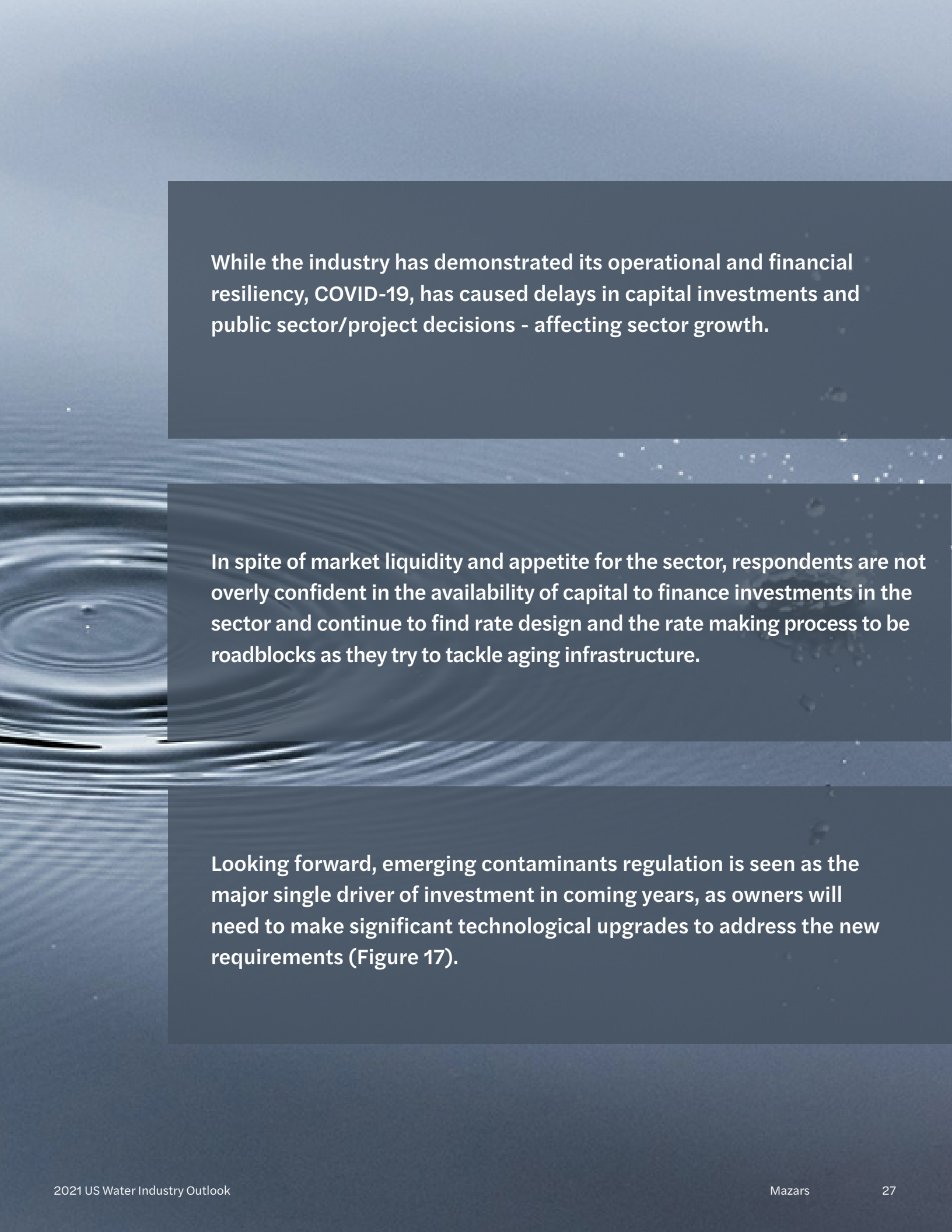
FIGURE 15
Which of the following programs/policies are available within your business or more broadly in the industry?

Mentor/mentee program	20%
Antidiscrimination policies	19%
Diversity/inclusion policies	19%
Family tools (parental leave, healthcare assistance, childcare assistance)	16%
Equitable pay program or policy	13%
Cultural competency training	10%
None	3%

Women of Water

One initiative that Mazars is spearheading to help improve diversity in the water industry is the Women of Water Program. In January 2020, Mazars hosted the inaugural Women of Water Summit in Washington DC. The event brought together hundreds of leading water and utilities industry executives and business owners from private and public companies, government officials, and academia for a full day of discussions on enhancing the position of women in the sector. The event celebrated industry-leading women and introduced future women leaders in a venue centered on open dialogue. This event was just the beginning of our commitment to make a difference in water.

Section 4
Finance



While the industry has demonstrated its operational and financial resiliency, COVID-19, has caused delays in capital investments and public sector/project decisions - affecting sector growth.

In spite of market liquidity and appetite for the sector, respondents are not overly confident in the availability of capital to finance investments in the sector and continue to find rate design and the rate making process to be roadblocks as they try to tackle aging infrastructure.

Looking forward, emerging contaminants regulation is seen as the major single driver of investment in coming years, as owners will need to make significant technological upgrades to address the new requirements (Figure 17).

Fatbardh Veselaj
Manager
Energy, Infrastructure & Environment
Mazars in the US

What is the overall situation in the financial markets? Is there a shortage of financing available in the market or is it specifically a shortage for water (and wastewater) related assets?

We are not seeing a shortage of financing available in the market, and especially not for water. Indicators across all sources of financing are suggesting an important supply of liquidity - mergers and acquisitions are seeing high volumes and transaction multiples, capital raise, whether it is public offering (IPO or SPAC), private equity or issuances in the bond markets, corporate, municipal, and green bonds alike, is very strong.

Low interest rates are an opportunity for more water and wastewater projects to become bankable. Investors' growing appetite for investments with positive impacts on the society or the environment should also benefit the water industry. Sustainable finance is expected to play a bigger role going forward in the overall financing spectrum, and the water industry should also attract a greater allocation of the overall capital available.

As an illustration, issuance of green bonds is at $348 billion[1] , already up 17% through nine months compared to full year 2020 number of $297 billion[1]. By contrast, issuances of corporate and municipal bonds combine at $1,915 billion for nine months[2], which is lower than in 2020. With the current data available, Climate Bonds Initiative (CBI) has forecasted that nearly half a trillion dollars of green bonds could be issued by the end of 2021 and the $1 trillion mark in issuance by 2023 could be broken[1].

Finally, the economic package currently in congress could provide an unprecedented funding boost for the industry. All this is in addition to the many tools that already exist and that we have covered in previous Outlooks, including tax-exempt bonds, WIFIA, etc.

To recap, plenty of financing is available and actually all stars are aligned for the water industry to thrive.

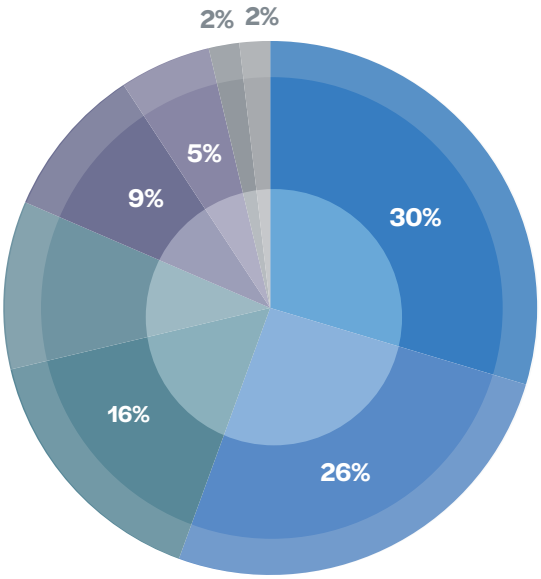


FIGURE 16
What will be the primary considerations driving industry investment in the next three to five years?

Emerging contaminant treatment	30%
Deferred maintenance on aged infrastructure	26%
Lead and copper infrastructure replacement	16%
Leading edge technology deployment	10%
Mergers & acquisitions	9%
Sustainability	5%
IT infrastructure	2%
Research & development	2%

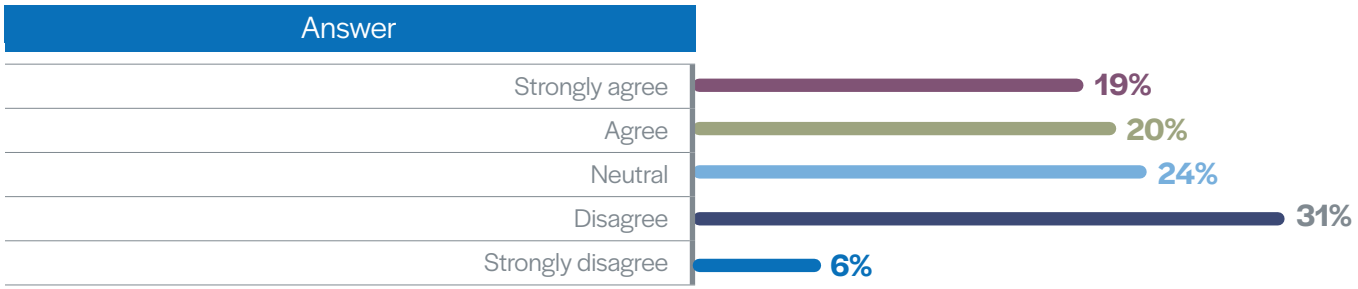
[1]Source: Climate Bond Initiative
[2]Source: SIFMA

Respondents to the survey find that this financing isn't easy to find, how do we explain this response in the context discussed in the previous question?

The appetite for financing public infrastructure projects may seem insatiable to the outside observer. However, with recent natural disasters showing the importance of having reliable and consistent access to clean and safe drinking water, the constituents of various municipalities have supported greater investment in sustainable water supply and infrastructure. Investing in sustainable water supply and infrastructure continues to be a significant priority for the United States Environmental Protection Agency (EPA), the United Nations Department of Economic and Social Affairs (UNDESA), states such as California and Texas, publicly traded companies such as Coca-Cola, water utilities, and the current presidential administration.

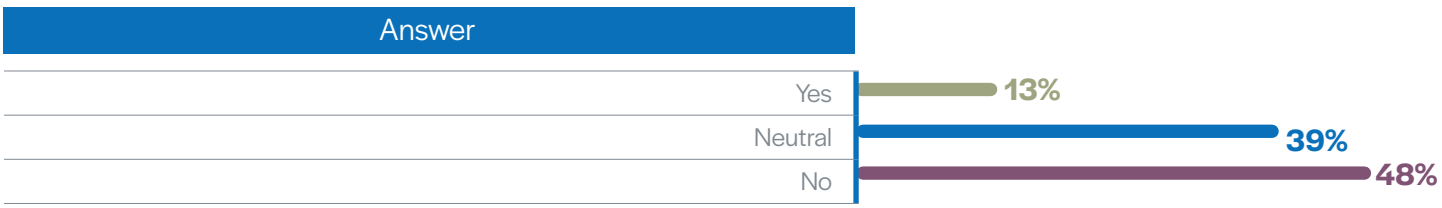
Interestingly, our respondents were split on whether it is difficult to obtain financing from potential investors and lending institutions for critical upgrades and modernization of facilities (Figure 18). Upon a closer look at the data, it appeared that larger companies had less difficulty in obtaining financing than smaller companies. This seems natural considering larger companies are typically better

FIGURE 17
Indicate your level of agreement with the following statement: Financing from potential investors and lending institutions for critical upgrades/modernization of facilities and infrastructure within the water and wastewater sector is difficult to obtain and limited in availability.



Nearly half of our respondents noted that the current process in obtaining approval for a change in regulated rates from public utility commissions was not agile enough, while only 13% said that it was (Figure 19). Similarly, there was a clear trend in the data of larger organizations having more difficulty with the speed at which regulators are able to address returns on investments. Larger companies typically have more complex economic and financial issues that affect the basis used to determine water utility rates for customers. Streamlining the process by offering more frequent interactions with regulators, not only when public utility companies submit a rate proposal, and a universal template for quicker rate decision matters would alleviate these concerns as noted by our respondents to this question.

FIGURE 18
Do you believe that the current process for obtaining approval for a change in regulated rates from public utility commissions is agile enough to meet the sector's needs?



capitalized and offer investors a lower risk.

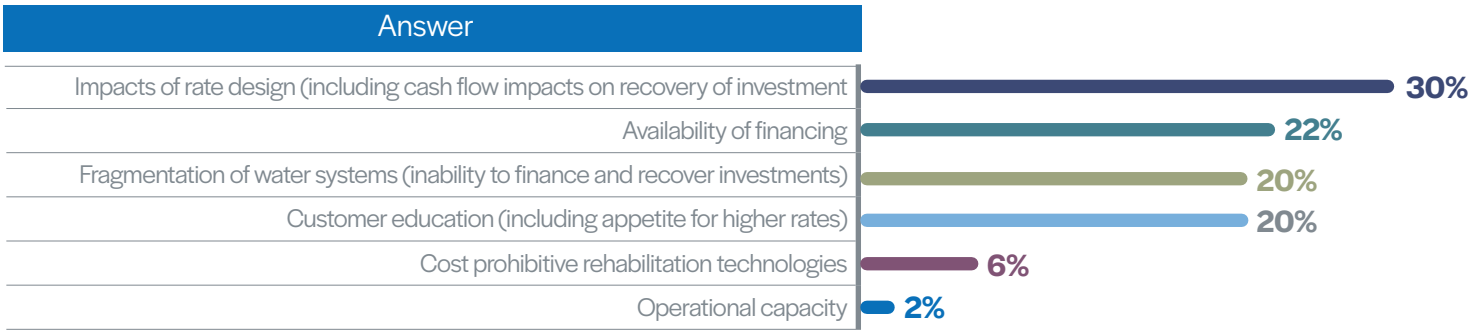
We have elaborated on the infrastructure gap in prior Outlooks, how has that gap evolved in 2021? Also, it is widely believed that this gap cannot be reduced without federal support, what are the updates from that perspective?

According to our respondents, "availability of financing" represents one of the major roadblocks in addressing aging infrastructure (Figure 20). With interest rates at historic lows and governments around the world committing to sustainability, we have seen considerable progress in addressing financing for water infrastructure projects from the public sector. On August 10, 2021, the United States Senate passed a $1 trillion infrastructure bill which, among many other things, addresses aging infrastructure in the water sector. Approximately $55 billion of the $1 trillion investment has been apportioned for clean drinking water including funding to replace lead service lines and to in technology to remove the dangerous chemical PFAS (per- and polyfluoroalkyl).

The $55 billion price tag will replace all of the nation's lead pipes and service lines from rural towns to struggling cities, including tribal nations. Additionally, over $50 billion will be invested in resilient infrastructure (including electricity), reducing the impact from extreme weather events and natural disasters, which cost the United States almost $100 billion in 2020 alone. Unfortunately, the bill is in the House of Representatives and has not yet been voted on for approval. However, the industry is generally optimistic that the public sector is committed to financing more resilient and sustainable infrastructure projects throughout the United States.

FIGURE 19

What are the major roadblocks in addressing aging infrastructure?



Abundance of liquidity, low interest rates, appetite for the sector, federal support... it seems like we are set to see more transactions in the coming years. Where is this money going to be invested?

Natural disasters can strike at any time with varying degrees of ferocity. Developing a sustainable water supply, in tandem with sustainable water infrastructure, ensures that utility companies can meet the needs of their customers in the face of natural disasters and extreme weather events such as flooding from storms, drought, and extreme temperatures. Providing communities with a resilient water infrastructure and supply system is in the interest of all stakeholders.

The high risk of not having such a system in place were apparent this summer when boil advisory notices were issued to customers as a result of the of tropical storms and hurricanes that impacted aqueducts, flooded water wells, disabled pumps at water treatment plants due to power outages, and contaminated water lines with sewage. Many of these failures were due to aging infrastructure and illustrate the need to upgrade to resiliency infrastructure. The damage from natural disasters can be mitigated for both the water utility company and the customer by investing in strategic resiliency programs and developing a sustainable water supply.

The participants in our survey noted that emerging contaminant treatment, deferred maintenance on aged infrastructure, and lead and copper infrastructure replacement will be the primary considerations driving industry investment in the next three to five years (Figure 17). It is no surprise to see the media attention that PFAS has received over the past few years. Polyfluoroalkyl substances (PFAS) are a group of synthetic chemicals that have contaminated the water supply and pose significant health risks to humans. Two of the most produced PFAS chemicals are Perfluorooctane sulfonate (PFOS) and Perfluorooctanoic acid (PFOA). These emerging contaminants do not degrade. Instead, they build up over time causing health issues such as cancer, thyroid disruption, and more. Delaying investment in replacing aged water lines that contain traditional contaminants such as lead and copper and emerging contaminants such as PFAS will make communities less safe.

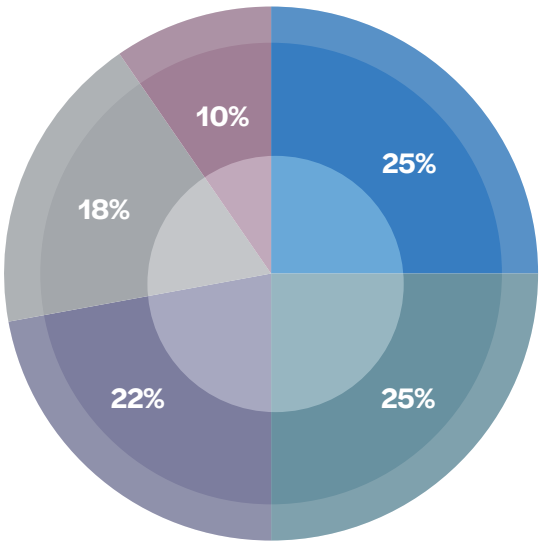
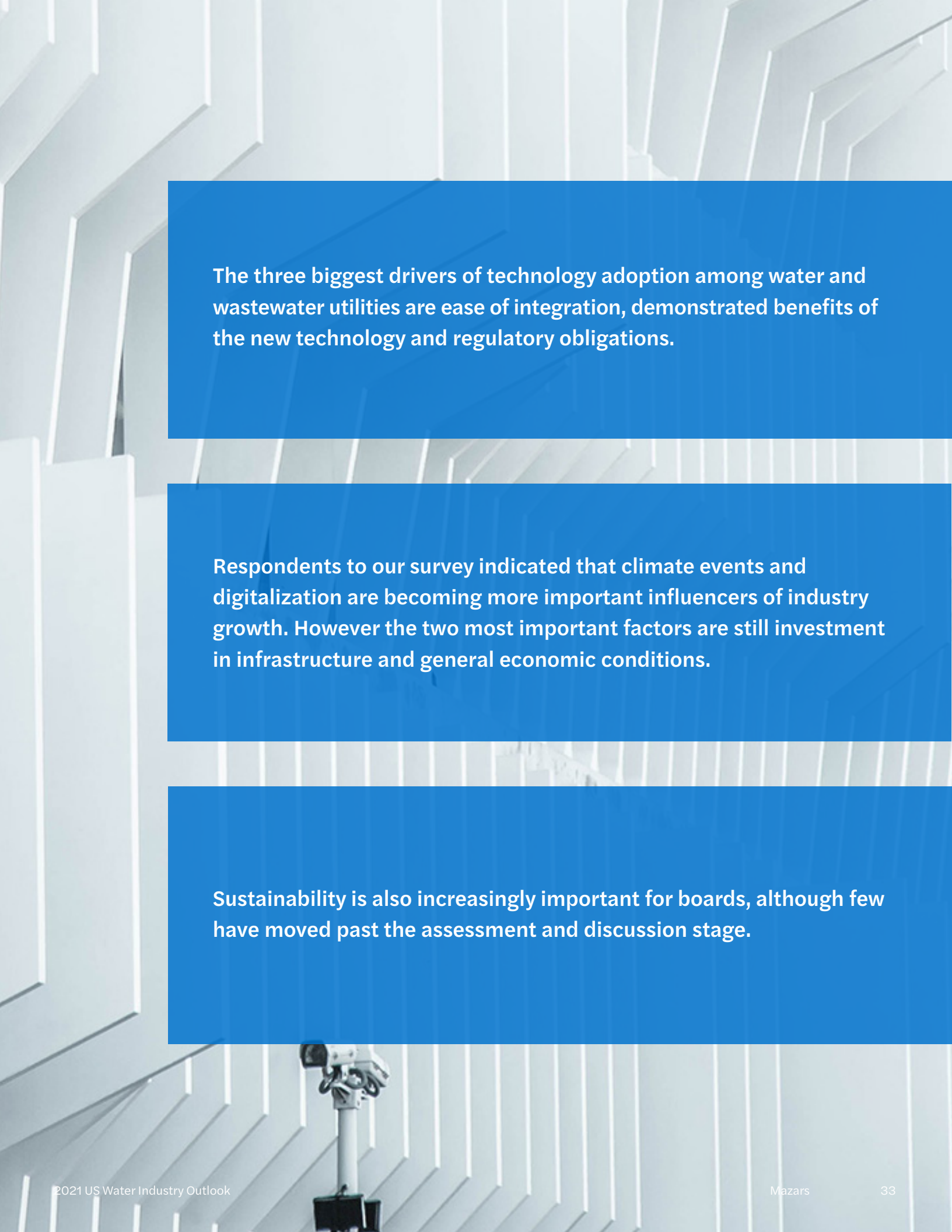


FIGURE 20
In which of the following areas, do you believe current reporting standards for water companies should be enhanced to provide users/investors with more relevant insight?

Environmental/compliance risks	25%
Operational risk	25%
Capital expenditure programs	22%
Sustainability reporting	18%
Supply risks	10%

Section 5
Future of the Industry



The three biggest drivers of technology adoption among water and wastewater utilities are ease of integration, demonstrated benefits of the new technology and regulatory obligations.

Respondents to our survey indicated that climate events and digitalization are becoming more important influencers of industry growth. However the two most important factors are still investment in infrastructure and general economic conditions.

Sustainability is also increasingly important for boards, although few have moved past the assessment and discussion stage.

Section 5
Future of the Industry

Corey Williams
President and CEO
SmartCover

Corey, you have successfully introduced new technologies to the water and wastewater market. How much is the industry really committed to innovation and do you observe a change over the years in this commitment?

That is a very tricky question. In my heart, I want to believe we are. And in my head, I can rationalize the critical importance of new technologies, but I think we're still climbing the curve a little bit. I don't believe there is an ingrained reluctance to innovate by utilities, but I think sometimes we, as startups and even large companies, fail to appreciate the complications and complexities of new technology adoption.

For starters, there are significant procurement issues; if I have a truly new invention, then how can I present it to procurement within a product category that exists in their systems? That isn't the fault of procurement teams, but rather sort of an inherent 'traditionalism' in what we buy and where we buy it from.

I can't easily get three bids on something newly invented. I'm oversimplifying this for sure, but I think most in the industry can follow the logic and understand that our procurement processes aren't well established to solicit cutting edge technology. I do believe more and more utilities are developing procurement or 'proof of concept' processes, enabling innovation to be more readily examined, tested, and ultimately purchased.

Creators of new technology and 'the next big thing' also tend to underappreciate the amount of change management and workflow disruption any new product has in a utility. We may know the product has an amazing ROI, but what about the staff resources necessary to even conduct and oversee a pilot/proof-of-concept. I don't know many people in utilities that aren't busy, but to get to that promised ROI, I have to add to my already overburdened schedule (and determine which one of the 20-odd vendors that have come in with these promises I should take the time to evaluate).

This isn't to provide a 'pass' on any failure to adopt new technologies, but I think they underscore the relatively slow pace utilities have, it isn't so much a lack of commitment as there is a lot more to it than just "sure, we'll try it." In particular, I think the last 5 to 7 years have seen a broadening of the 'early adopter' category of utilities and even in the early majority (i.e., those willing to pursue before a technology has matured). In addition to creating some openings in procurement (and associated legal matters) I see utilities embracing technology as one part of their effort to maintain affordability, overcome staffing and operational challenges, and gain greater insight into their business across all departments.

The future for new technology in water and wastewater is bright!

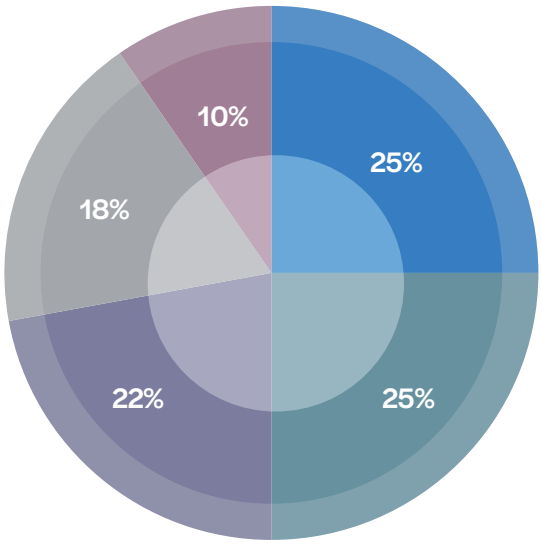


FIGURE 21
In which area do you believe current reporting standards for water companies should be enhanced to provide users/ investors with more relevant insight?

Environmental/compliance risks	25%
Operational risk	25%
Capital expenditure programs	22%
Sustainability reporting	18%
Supply risks	10%

We are seeing changes in regulation, both economic and environmental. Could you talk about the role of regulators/regulation in driving innovation?

Although I appreciate our governmental officials and regulators, I wouldn't want to encourage more regulation. Factually, however, it is inarguably a driver of innovation as it essentially forces us to confront the need for additional funding vs. unfunded or underfunded mandates. I don't think any of us particularly likes to have regulation as the impetus for change, but it makes us step back from the problem and craft new solutions. As a utility, we can't just raise rates forever without disenfranchising an increasing percentage of the population, and our capital financing puts a lot of burden on future generations (not to mention necessitating more operational cash to service debt). Technology and innovation are our opportunity to not just 'throw money at the problem,' because we're rapidly running ourselves out of the ability to do that.

I think we'd be remiss to not think of other major drivers of innovation in our industry. Particularly in recent history, the recognition and advocacy for social and environmental justice is, and should be, a major catalyst for innovation. Technology is the opening to make immediate and recognizable differences in people's lives.

Not to focus too much on our product, SmartCover, but imagine trying to generate the funding necessary to replace or repair major sewer infrastructure in a Consent Program or to eliminate sewer overflows in a historically underserved part of town. What if I could eliminate these overflows within hours (not days, weeks, or years) for a tiny fraction of the capital cost of replacement?

Technology like SmartCover has this ability, it has immediate positive effect on the community and, if nothing else, allows the utility to best manage, properly fund, and execute without rushing capital intensive projects. To be clear, I am not suggesting technology is always an equal substitute for major capital projects, only that it can lessen the need or help lower the economic impact.

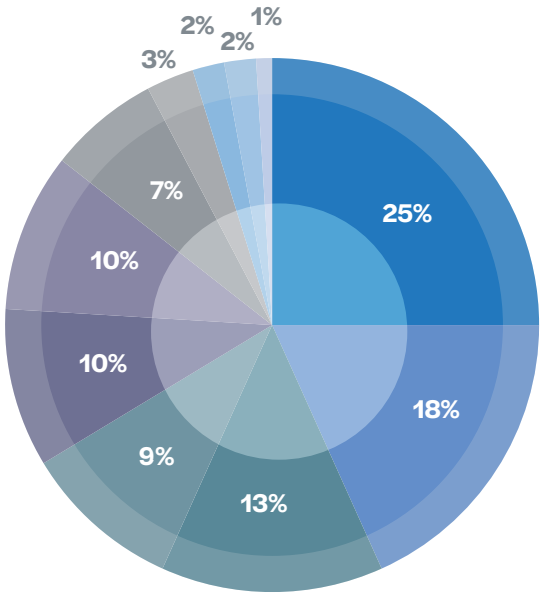


FIGURE 22
Which of the following would drive a greater number of water projects or greater industry performance?

Investment in new infrastructure and equipment	25%
General economic conditions	18%
Public/Private Partnership arrangements	13%
Greater enforcement of environmental regulations	10%
Digitalization	10%
Exceptional climate events (drought, flooding, etc.)	9%
Merger/acquisition	7%
HR/Talent Management	3%
Private activity bonds' cap	2%
WIFIA/PIFIA	2%
Other	1%

The recently passed infrastructure plan is expected to address some of the investment needs of the water industry. In more general terms, is finance properly supporting innovation and will this new plan help?

I think there remain many, many unknowns in the infrastructure bill and the last I heard there is $55 billion allocated for water and sewer; to help fill a gap of nearly $1 trillion in need. We'll take all the help we can get, but I hope our collective expectations (or maybe optimism) for how far that money will extend remain practical.

This is absolutely an area in which I think technology can help. Think of companies like Optimatics, where their software and algorithms consistently remove 20% or more from capital programs and large-scale infrastructure projects or Transcend that can trim thousands of hours from facility design, or an EmNet/Blu-X that makes maximum use of available collection systems. In essence, all of these offer the ability to turn $1 of funding into $2 or $3 of benefit. If there was ever a time to try these kinds of technologies (and I am apologetically leaving out lots or other very smart and sharp companies and products), it is now when we must think about maximizing the money that will be made available.

Resilience and the ability to cope with more frequent intense climate events (storm rainfall, for example) is a priority in the sector, how does technology play into the responses that are being prepared?

In addition to more frequent hurricanes and major rainfall events, we should also expect things like wide-scale drought in the West and below zero temperatures in Texas and the Southern States. There is nothing particularly predictable about the changing climate and that is precisely where technology comes in.

I think it was the great philosopher, Mike Tyson, who said "Everyone has a plan until they get punched in the mouth." Iron Mike was right, and his wisdom is applicable to climate change. Technology in the form of smart devices in our networks to best give insight into the real time situation, AI/ML and advanced algorithms that drive digital twin solutions to run scenario after scenario, and business intelligence platforms that leverage all available data to best inform the disaster response. These solutions already exist and can be put into place to help utilities prepare and act.

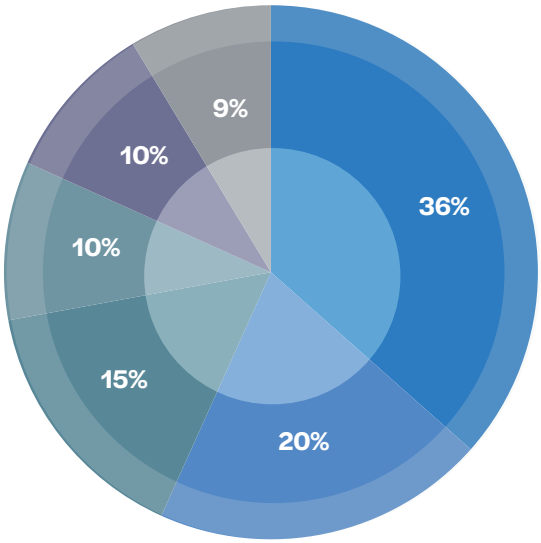


FIGURE 23
Please indicate which of the following technology advances will bring the greatest benefits to the water industry

Smart metering/data analytics	36%
Energy efficient advance water treatment technologies	20%
Energy efficient advance wastewater biosolid technologies	15%
High efficiency pumping systems	10%
Energy management program ranking	10%
Decentralized systems	9%

There is a lot of talk around technologies focused on data. In your opinion, what technologies should we be looking forward to and what are the areas that will benefit most from innovation in the next three to five years?

My area of specialization is IT/OT/IoT in utility technology, so can't fully cover the exciting treatment, physical infrastructure, and "non-digital" innovations that I'm sure are coming. In the digital space, however, I think the next few years will see a) a fairly rapid extension of sensors and instrumentation into distribution and collection systems networks, particularly in our wastewater and stormwater systems, b) the advancement of powerful and predictive (but not yet proscriptive) AI and ML tools, and c) leveraging the aforementioned technologies, the broader adoption of digital twin solutions. I believe we will also see tremendous technology uptake in cybersecurity, but this won't be exclusive to the water industry.

In the water industry, three to five years passes pretty quickly, so I think the instrumentation and sensors will be 'widespread,' some dependency on AI will be 'normal,' and digital twin solutions will be 'not uncommon.' In all of these areas we will have a much greater reliance on technology to guide daily activities and our broader priorities as an industry. When faced with a significant operational or capital issue, we should first be looking at where technology can help us solve issues at a fraction of the cost.

Learn more about our interviewee, Corey Williams, on page 41.

Figures

Demographics

Figure 1 Primary Nature of Respondent's Business

Figure 2 Respondent's Current Position / Title

Figure 3 Respondent's Primary Function

Figure 4 Approximate Size of Respondent's Organization

COVID-19

Figure 5 Which area of technology do you find that COVID-19 accelerated adoption most?

Figure 6 Which aspect of the industry's operations was most impacted by COVID-19?

Figure 7 What do you see as the top long-term impacts to the water sector as a result of COVID-19?

Figure 8 Considering the impacts of COVID-19 on your workplace - when do you expect to return to normal?

Operations

Figure 9 Which statements regarding big data management applies to your organization or the water or the industry?

Figure 10 Do you believe big data and data analytics can play a role in improving your company's, or the water and wastewater industry's operations, performance, and efficiency?

Figure 11 Please indicate which two challenges are most likely to benefit from big data analytics.

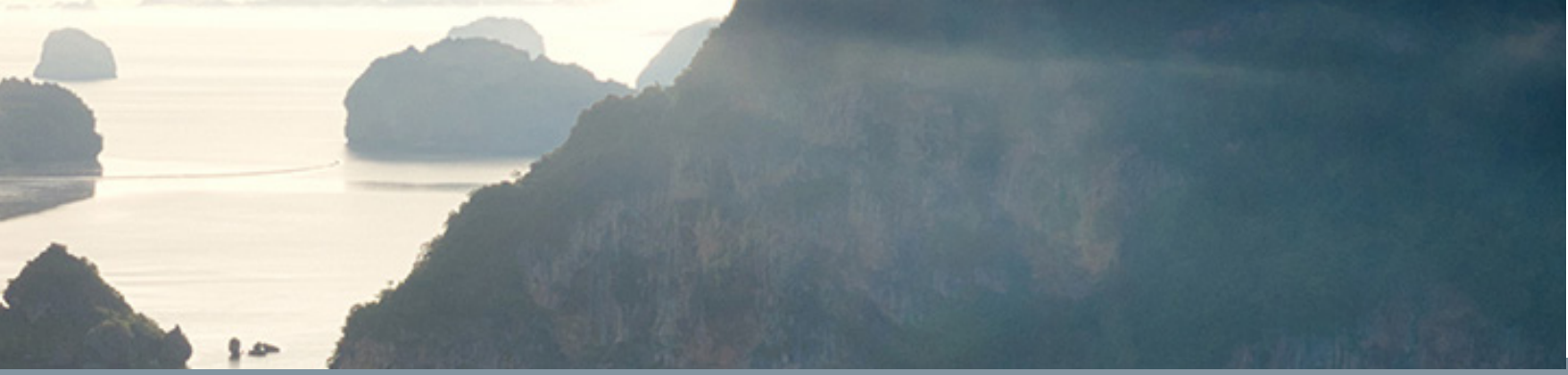
Figure 12 Which additional measures or corporate practices do you believe are most effective at mitigating IT security risk?

Talent & Diversity

Figure 13 Approximately what percentage of the industry's leaders identify as women?

Figure 14 Where is the greatest current need for skills and talent in the industry?

Figure 15 Which of the following programs/policies are available within your business or more broadly in the industry?



Finance

Figure 16 What will be the primary considerations driving industry investment in the next three to five years?

Figure 17 Indicate your level of agreement with the following statement: Financing from potential investors and lending institutions for critical upgrades/modernization of facilities and infrastructure within the water and wastewater sector is difficult to obtain a and limited in availability.

Figure 18 Do you believe that the current process for obtaining approval for a change in regulated rates from public utility commissions is agile enough to meet the sector's needs?

Figure 19 What are the major roadblocks in addressing aging infrastructure?

Figure 20 In which of the following areas, do you believe current reporting standards for water companies should be enhanced to provide users/ investors with more relevant insight?

Future of the Industry

Figure 21 In which area do you believe current reporting standards for water companies should be enhanced to provide users/investors with more relevant insight?

Figure 22 Which of the following would drive a greater number of water projects or greater industry performance?

Figure 23 Please indicate which of the following technology advances will bring the greatest benefits to the water industry

About Corey Williams, SmartCover

Corey Williams currently serves as President and CEO of US-based SmartCover, the innovation leader for intelligent, real-time sewer monitoring systems. Prior to his role at SmartCover, Corey served as the CEO of a Suez subsidiary, Optimatics and as Vice President and General Manager of Inflection Point Solutions (now Westin Technology Solutions), a software development and management consulting firm also serving the water industry.

In his nearly 30-year career, Corey has guided multiple companies, engaged in advisory board positions for startups, and served as Project Manager or Executive-in-Charge of over 125 projects for water and wastewater utilities in the US, Australia, and Europe. Corey has authored more than seventy-five (75) papers including most recently Cybersecurity: A Practical Guide for Utility Executives, An Experts Guide to Aligning IT and OT, and Demystifying the SMART Utility. Corey is active in many industry professional associations and research initiatives related to the application of technology to drive business value in utilities. He is the co-founder and moderator of both the Water and Wastewater CIO and CFO Forums.

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Mazars works as a single, integrated team, committed to helping our clients and people succeed by respecting who they are and how they work, adapting our approach accordingly. We take pride in what we do and are committed to playing our part in building the economic foundations of a fair and prosperous world.

Our industry specialists deliver tailored services to a wide range of clients across sectors, including individuals, high-growth emerging companies, privately -owned businesses and large enterprises. Water is a precious resource that requires significant investment in infrastructure, quality assurance and operational excellence to ensure success, while waste management is a critical societal service. We offer business-critical services to this sector, including assurance, financial advisory, tax, and risk management solutions, to help the water and waste community meet growing global needs.

We leverage our resources, expertise and experience to assist clients with their most significant challenges and help them achieve compliance, risk mitigation, sustainability, innovation, efficiencies, growth and returns on capital.

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