



WATER AND WASTEWATER

Challenges, opportunities,
and the path forward



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Water and wastewater utilities across the United States are at a critical inflection point. Accelerating urbanization, climate volatility, and tightening regulatory requirements are increasing demand for reliable water services at the very moment when much of the nation's infrastructure is reaching, or has exceeded, its intended design life. Aging assets, deferred maintenance, and widening investment gaps now threaten system reliability, affordability, and long-term resilience.

National assessments consistently highlight the severity of the challenge. Many utilities are managing infrastructure that is decades old, with some communities still relying on century-old systems. Persistent low grades for drinking water, wastewater, and stormwater infrastructure underscore the scale of reinvestment required. These pressures are compounded by climate-induced extremes such as droughts, flooding, and sea-level rise, as well as regulatory mandates addressing lead service lines, PFAS contamination, and water quality compliance.

Water and wastewater systems are capital-intensive to operate and maintain, yet traditional rate-based funding models are increasingly strained by efficiency gains, affordability concerns, and public resistance to sharp rate increases. While historic federal investments through the Bipartisan Infrastructure Law, State Revolving Funds, and related programs are unlocking billions in funding, access remains uneven due to administrative complexity, inflation-

driven cost escalation, labor shortages, and material constraints. At the same time, private-sector participation remains limited by risk, financing conditions, and regulatory uncertainty.

Against this backdrop, digital and data-driven technologies represent a critical, but underutilized, opportunity. While tools such as analytics, sensors, digital twins, and automation have demonstrated their value across infrastructure sectors, adoption in water and wastewater has lagged due to conservative operating cultures, fragmented data environments, and integration challenges. Yet evidence suggests that technology-enabled improvements can materially reduce operating costs, extend asset life, strengthen risk management, and help close a meaningful portion of the sector's long-term funding gap.

This guide outlines the structural challenges facing U.S. water and wastewater systems, examines emerging funding and policy mechanisms, and highlights how technology-enabled capital planning, asset management, and risk management can help utilities move from reactive maintenance to proactive stewardship. The path forward will require coordinated action to align funding continuity, regulatory compliance, digital resilience, and community affordability. Utilities that act decisively today can strengthen system performance, improve public trust, and build more resilient, sustainable water infrastructure for the decades ahead.



Rising demand, aging systems, and mounting pressure

As urbanization accelerates in the United States, the demand for reliable municipal water and wastewater services is expected to continue rising. Municipalities face the dual challenge of maintaining aging assets while expanding system capacity to meet future demand, which increasingly exceeds the designed life span of the existing infrastructure.

According to the [American Water Works Association \(AWWA\) State of Water Industry Report](#), aging infrastructure has been a key concern for the past five years. Many water systems are simply aging out, with assets reaching the end of their intended lifespan and needing replacement.

Across the United States, there is a wide disparity in infrastructure quality: some cities and counties operate world-class water facilities, while many rural communities still rely on severely outdated systems, including century-old or even wooden water mains.

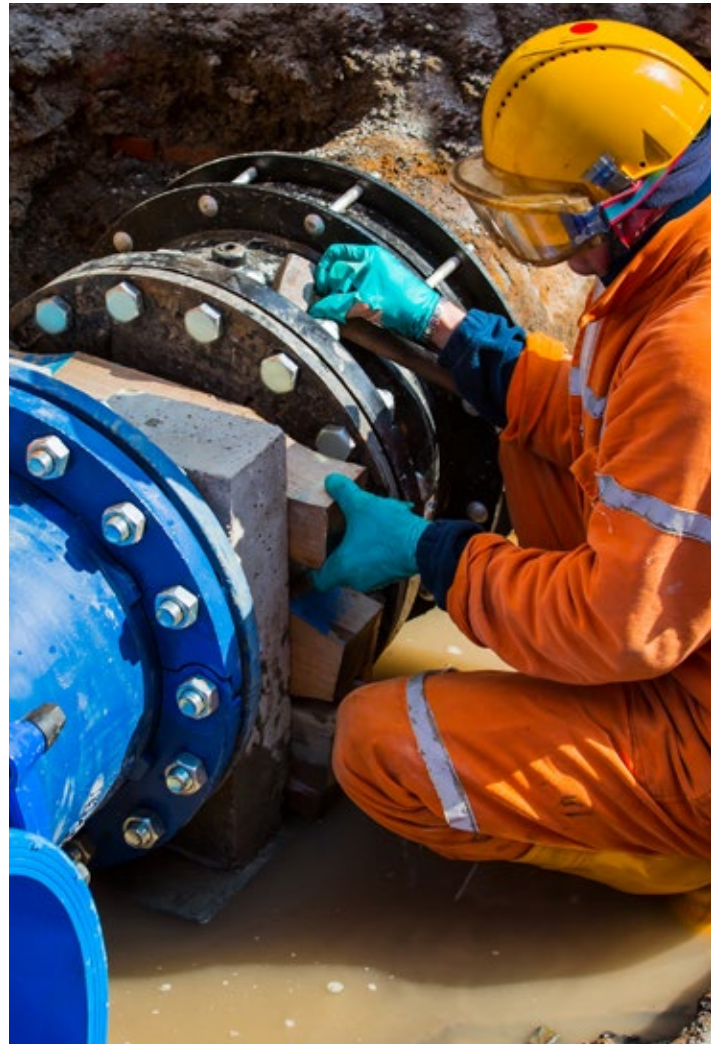
Most municipalities fall in between, managing aging infrastructure that suffers from deferred maintenance and urgent replacement needs. In fact, [the American Society of Civil Engineers' \(ASCE\) 2025 Infrastructure Report Card](#) retains the 2021 grades, wastewater: D+, drinking water: C-, and stormwater: D, highlighting the persistent issues and investment gaps across the nation's water and wastewater infrastructure systems.

Adding to these pressures are climate-induced extremes, including severe droughts, floods, and temperature fluctuations, which further strain already fragile systems. In coastal areas, rising sea levels have begun to cause "sunny-day flooding," where ocean water seeps into systems

and contaminates fresh water supplies, an early signal of how climate change directly affects system resilience and service reliability.

At the same time, regulatory drivers such as the Environmental Protection Agency's (EPA) [Lead and Copper Rule Revisions](#) and [PFAS mitigation](#) requirements are increasing the need for modernization and monitoring. Federal initiatives such as the [Bipartisan Infrastructure Law \(BIL\)](#) and [State Revolving Funds \(SRFs\)](#) are directing billions of dollars into water resilience projects nationwide.

With the global water and wastewater treatment market [projected to grow](#) from \$323.32 billion in 2023 to \$536.41 billion by 2030, optimism is fueled by emerging solutions despite the challenges posed by outdated infrastructure and rising demand.



Water infrastructure challenges



Funding, efficiency, and public perception

Treating, distributing, and removing wastewater is inherently capital-intensive. According to a detailed cost overview, average wastewater treatment costs in the United States range from \$2 to \$5 per 1,000 gallons treated, depending on facility size, treatment technology, local regulations, and operating conditions. Much of the country's water infrastructure dates back 50 to 100 years, with some systems relying on century-old cast-iron and wooden water mains. The aging infrastructure has also led to high leakage rates, frequent service interruptions, and increasing replacement costs.

Aging and undersized sewers, contaminated drinking water, and lead-tainted pipes imperil millions of

households and communities nationwide. The EPA's 2024 "final rule" for Lead and Copper Rule Improvements (LCRI) estimates the nationwide annual cost of replacing lead service lines and related compliance (monitoring, communications, and treatment when needed) at US\$1.47 to US\$1.95 billion.

Traditionally, ratepayers fund water improvement projects through usage fees—people who pay to use the water service are essentially paying for the upkeep and replacement of the system. Increasingly, as people have started using water more efficiently, they're using less of it, which results in less income from ratepayers. While water prices have increased, they quickly outpace ratepayers' ability and willingness to pay. Many ratepayers often don't understand the value of improvements or the actual cost of water delivery, making it harder for agencies to justify asset improvements.

Rate hikes can be drastic, sometimes increasing many times over, making modernization unpopular among consumers. Federal and state funding programs that support modernization help smooth this transition by offsetting costs and reducing the financial burden on local utilities and consumers.



Competing priorities and agencies for public funding

Another challenge in funding infrastructure improvements involves the size of the projects. As water systems grow and integrate, some infrastructure upgrades span multiple municipalities, complicating cost allocation.

Federal initiatives, such as the Infrastructure Investment and Jobs Act (IIJA), earmark more than \$55 billion for water infrastructure. However, slow grant disbursement, SRF bottlenecks, and administrative transitions continue to delay access to the very funds utilities need to modernize their systems.

Competing agencies vying for those funds can also limit their availability. Much of the earlier funding emphasis under IIJA has been eroded by inflation, which diminished its purchasing power. The Water Infrastructure Resilience and Sustainability Act aims to build upon and expand these efforts, ensuring momentum toward modern, resilient water systems.

Further, some IIJA requirements can make it difficult for the water industry to access funding effectively. Among the most significant challenges are labor shortages and material constraints. The "Buy America" requirement, which mandates the use of U.S.-made materials in federally funded projects, further restricts access to water and wastewater components that are often unavailable domestically.



High infrastructure costs

Building in the U.S. has become more expensive recently, impacting governments' ability to catch up on lagging infrastructure investments. As maintenance and construction costs rise, [utilities report](#) difficulties covering the costs of providing services, including repairs and renewals of aging infrastructure.

The BIL promised a [\\$1.2 trillion investment](#) from 2022 through 2026 to improve the state of the country's buildings,

roads, bridges, and water supply systems. However, construction costs have [increased by 20–30%](#), reducing the value of that funding. According to the [Federal Highway Administration's National Highway Construction Cost Index](#), highway construction costs have risen 68% since 2021.

Elevated prices may persist for decades. Every major sector of the civil market is experiencing growth, creating sustained demand for labor and materials. When combined with the fact that federally funded infrastructure projects are historically prone to higher costs, the value of funding dollars is diminished.



Limited private-sector investment

As revenues diminish and costs rise, Public-Private Partnerships (PPPs) are becoming increasingly necessary to fund water infrastructure projects. Under PPPs, private investment helps finance infrastructure projects while transferring some risk to public entities.

Rising construction costs, higher interest rates, and recession risks have intensified the financial challenges for the private sector in supporting public infrastructure investments. Investors must understand the risks associated with each asset to ensure their risk-return balance is appropriate.



Complex regulatory requirements

The U.S. water sector is facing growing regulatory complexity as the EPA tightens contaminant limits and mandates costly compliance with regulations related to PFAS and lead service lines. McKinsey notes that evolving water-quality and permitting standards now account for a significant portion of utilities' funding gap, projected to reach [\\$194 billion by 2030](#).

Regulations can vary between municipalities, so when water systems span multiple jurisdictions, rules can compound, often requiring significant infrastructure upgrades or advancements, which makes the entire undertaking more expensive.

Lengthy federal permitting, which can add [4–5 years and up to 30% cost escalation](#), further strains budgets, requiring utilities to plan proactively, streamline compliance, and coordinate across overlapping state and local regulations.

Technology integration



Low adoption rates

Although the water sector has access to technologies like IoT sensors, analytics, digital twins, and AI, adoption has been slower than in other infrastructure sectors. A 2023 [KPMG Global Construction Survey](#) found that only 55% of infrastructure project owners use basic data analytics across all their projects, and just 39% utilize Building Information Modeling (BIM). Due to long project timelines and extended asset life cycles, the water sector has historically been conservative and slow to adopt new technologies.



Difficulty integrating new technology

Despite growing access to advanced digital tools, the water and wastewater sector struggles to integrate new technology into business processes and apply it across existing assets and operational frameworks.

When integrating technology into water utility operations, utilities face both technical and operational challenges. Many lack consistent digital input or sensor coverage, resulting in fragmented or insufficient data that weakens analytics and decision-making. Staff reluctance to adopt new practices, or a lack of proper workforce training, can also limit the impact of digital systems in the water and wastewater sector. Furthermore, implementation and adoption are often lengthy processes, as regulators and utilities require extensive testing of new technologies and procedures.



Opportunities to use technology in water and wastewater

Digital technologies, if widely adopted and integrated, have the potential to enhance capital asset management, enabling utilities to become more resilient, innovative, and efficient. The [2024 KPMG U.S. Technology Survey](#) found that 88% of U.S. businesses across sectors reported improved profitability and performance through their digital transformation initiatives.

Water utilities are learning to harness advanced analytics to improve efficiency within water and wastewater systems. However, as utilities increasingly automate core processes such as reservoir management, pressure regulation, and flow control, cybersecurity has become a growing concern. Many control systems still rely on legacy IT infrastructure, leaving them vulnerable to intrusion or disruption. A McKinsey study suggests that tech-enabled operational improvements could [cover up to 15–25% of the annual financing shortfall](#) for U.S. water systems. Technical analysis provides a better understanding of asset health and management, enabling teams to prioritize repair and replacement efforts in the most critical and high-risk areas.

More targeted efforts can extend the life of capital assets, reduce leaks, prevent cyber-attacks, and avoid abnormalities in distribution network service levels. Operational improvements enhance supply reliability and water conservation while also increasing revenue through greater efficiency.

Opportunities in funding water and wastewater projects

Recent federal funding has become available through several channels to support water and wastewater infrastructure projects. Federal funding can help municipalities finance their water infrastructure projects; however, individual timelines, application processes, and oversight requirements can complicate access to these funds. Using federal funds requires significant time and coordination from local teams.

The EPA has [increased its funding limits](#) for the Clean Water and Drinking Water State Revolving Funds (CWSRF) to provide federal assistance to states and local communities for water and wastewater infrastructure projects.

The Bipartisan Infrastructure Law committed [\\$55 billion](#) to U.S. water and wastewater upgrades from 2022–2026, while the [Water Infrastructure Resiliency Act](#) strengthens resilience against climate and cybersecurity risks by enabling materials, design, and digital protections.

The IIJA funding was issued in early 2022, marking the largest federal investment in the water and wastewater industry since 2009. As of July 2025, the EPA has contractually obligated [approximately \\$20.4 billion in IIJA SRF funding](#) to state agencies, representing roughly 70% of the allotted funding.



Advantages of adopting technology in managing water and wastewater projects



Strategic funding usage

Utilities face unique implementation challenges that do not affect private projects. For example, publicly funded water projects must determine how to encumber and spend each year's capital budget to justify future fund allocations and rate increases.



Successful program management

Like all construction projects, managers must strive to complete water infrastructure projects on time and within budget, avoiding scope creep or negative impacts on quality.

The nationwide shortage of skilled labor further challenges the industry to achieve more with fewer resources.

Opportunities for better program delivery through technology

Program management technology enables utilities to track funding usage throughout a project, allowing management teams to use resources effectively and justify investments. It also provides tracking and analysis to help secure future funding.

Analysis of past and current project information can better inform projections for ongoing and future work, while budget management tools can help allocate funds to cover unexpected costs.

Capital program delivery and cost control



Long-term cost forecasting

Like other infrastructure projects, water programs are often large, complex undertakings that can take years to implement. Calculating costs at the outset of a program can be extremely challenging, as they can vary significantly across different design, construction, and operational phases.

Construction Analytics reports that nonresidential costs increased by 12.8% in 2022, with even higher inflation in the infrastructure sector. ENR's 2024 indexes indicate that materials and building costs remain under pressure, despite moderating to a 2–4% annual growth. ABC's PPI-based data shows construction input prices rose 3.5% YoY in October 2025.



Asset management



Low accessibility

To plan effectively, utilities must accurately assess the condition and lifespan of existing assets and maintain them to ensure they last as expected. Without accurate, comprehensive data, utilities may struggle to analyze asset wear. Much of the water infrastructure system is inaccessible for inspection, leaving managers without the information needed to optimize maintenance efforts.



Maintaining customer supply

Water and wastewater utilities must balance maintenance and repair efforts with consistent, reliable customer service, while managing replacements within a limited budget.

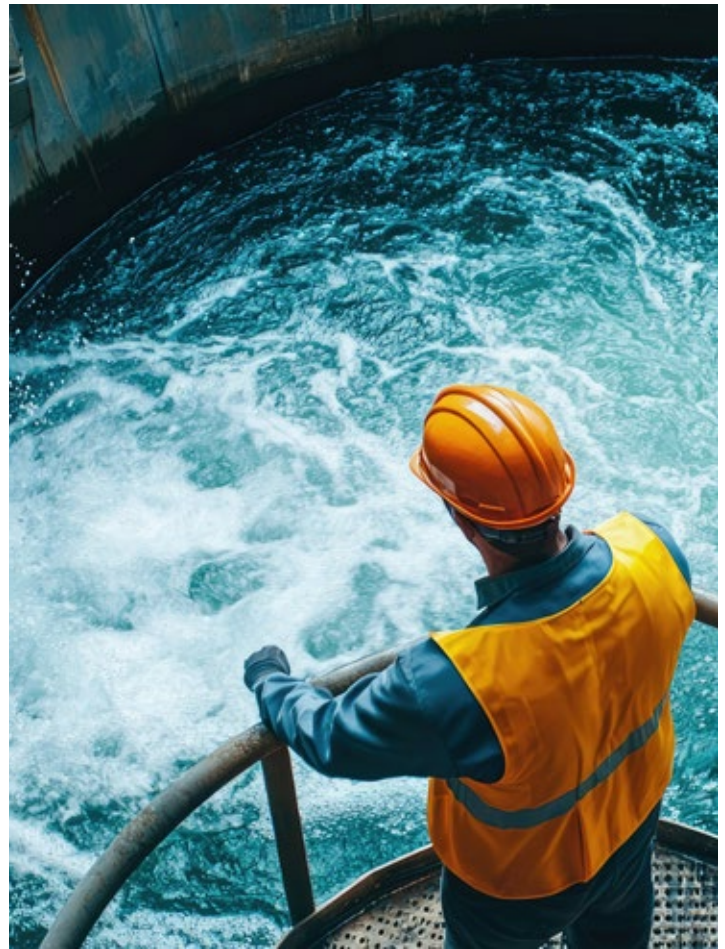


In-built challenges

Many of the top industry issues, including aging infrastructure, managing capital and operational costs, and justifying investments and rate increases, are inherent to capital asset management rather than flaws.

Opportunities for technology use in asset management

Digital tools with advanced analytics and diagnostics enable utilities to optimize maintenance and replacement efforts, ensuring funding is used efficiently and preventing larger problems. These technologies provide precise data on asset conditions and lifespans, helping utilities prioritize repairs and plan maintenance effectively, even for hard-to-reach infrastructure. These tools support long-term sustainability by extending asset lifespans, reducing leaks, and optimizing resource use. Data-driven insights also help justify investments, enhance water conservation, detect abnormalities in distribution networks, and mitigate the risk of major failures, addressing the challenges posed by aging systems and operational demands.



Risk management

Water infrastructure often requires extensive subsurface construction, which increases financial risk due to unknown conditions and geotechnical uncertainties, as subsurface environments are challenging to assess using standard testing methods

Opportunities for leveraging technology in risk management

Technology functions as an early warning system, enabling teams to identify and address potential risks proactively. By incorporating real-time data, these systems allow teams to respond quickly to on-site changes, minimizing delays and preventing costly disruptions. This approach enhances project efficiency and reduces unforeseen complications, particularly in complex subsurface environments.

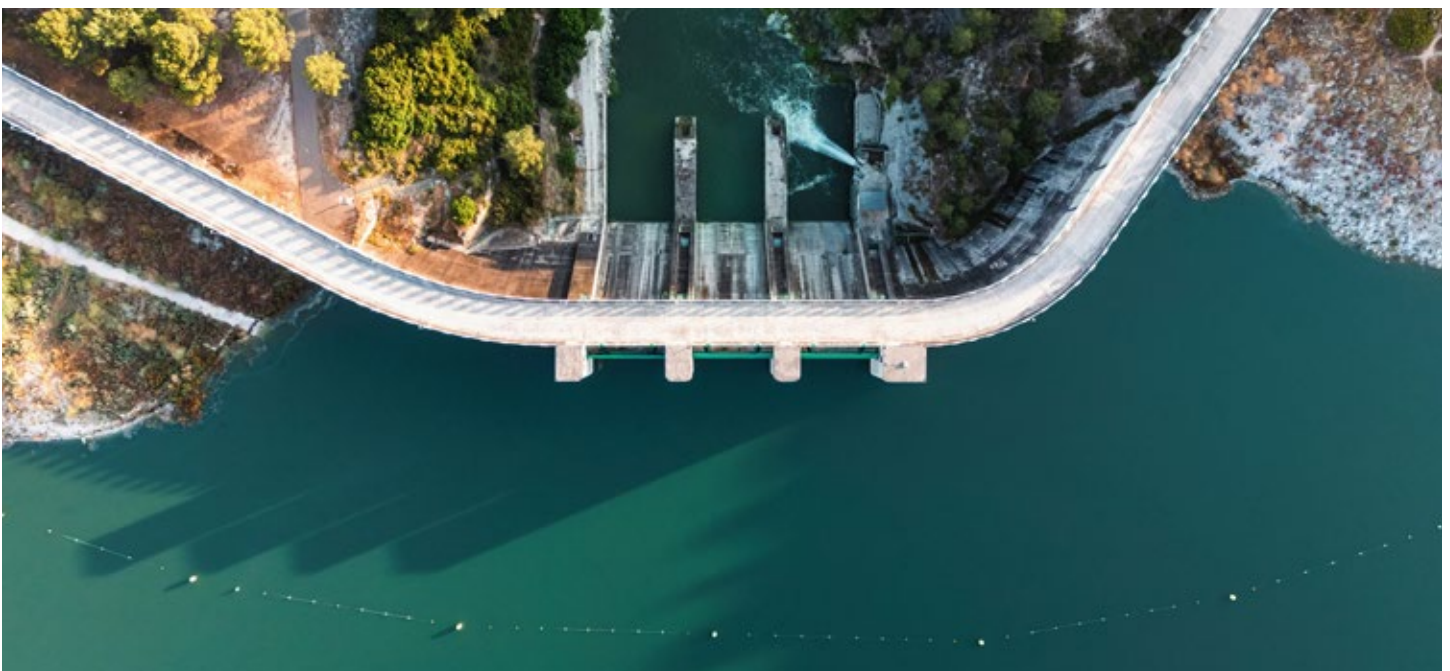
Final thoughts

The water and wastewater industry will face significant challenges in the coming decades. Aging infrastructure, rising construction costs, and fierce competition for limited public funding threaten the nation's ability to deliver reliable, affordable water services. With the introduction of the Water Infrastructure Resiliency Act, utilities have an opportunity to transition to safer, smarter, and more sustainable systems that strike a balance between affordability and long-term durability.

Technology integration is no longer a “nice-to-have” but a strategic necessity. The water and wastewater industry has historically been slow to adopt technologies that could make infrastructure more efficient and easier to manage, as retrofitting old systems is challenging. Over time, increasing water safety and quality regulations have also made delivery more costly.

However, opportunities for growth and innovation in the water and wastewater industry could help mitigate some of these challenges in the future. Utilities' ability to implement new solutions will largely depend on their willingness to invest, the regulatory environment, and the availability of funding for system improvements.

Given current market conditions and mounting challenges in the water and wastewater sector, utilities must accelerate the adoption of new ideas, technologies, and solutions to sustain their ability to deliver safe, clean, and affordable water to an increasingly urban U.S. population. A coordinated approach, linking funding continuity, digital resilience, and community affordability, will be critical to ensuring sustained progress in water infrastructure transformation. By acting decisively and embracing data-driven management, resilient design, and collaborative funding models, utilities can shift from reactive maintenance to proactive stewardship.



About Aurigo Software

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