

INFRASTRUCTURE



Distribution System Management



In the next 10 to 20 years, disruptive challenges to management of drinking water distribution systems and wastewater/stormwater collection systems may impact the ability of water utilities to meet their committed levels of service. How can utilities best manage these challenges in a way that allows them to deliver high-quality services and maintain their aging infrastructure?

CRITICAL FUTURE DISRUPTORS

For the purposes of this effort, a disruptor is defined as something that interrupts an event, activity, or process by causing a disturbance, problem, or opportunity. Disruptors can arise as barriers to normal operations or may present opportunities to do things differently/innovate.

The following items were chosen by a diverse group of water leaders and experts as the most significant future disruptors that water utilities must anticipate and plan for.



FINANCE

Many of the distribution system management challenges faced by utilities have a significant financial component, e.g., future economic recessions/depressions, limited financing, increased liability, and increasing costs of infrastructure replacement.



INFRASTRUCTURE

With aging and deteriorating infrastructure, limited budgets, restricted flexibility in rates, ongoing infrastructure replacement needs, and increasing customer expectations, utilities will be on a continual quest for the most appropriate asset management practices to meet these competing demands.



TECHNOLOGY

The water sector will be disrupted by new tools that provide real-time demand and distribution system water quality monitoring, and other new technologies that will also require a specially trained workforce.



CLIMATE

Climate change will continue to impact the availability of water resources. Many utilities may have to enforce more water use restrictions, as drought becomes more frequent and severe, while others will have to manage significantly intensifying storm flows. Decreased water use in some areas could cause increased water age within the distribution system and/or lower sewer flows, which can cause a host of other challenges, while intensified storm flows could challenge the ability of utilities to meet their CSO obligations.



CHANGING CUSTOMER BASE

Even as distribution system management challenges increase, customer demographics could continue to shift as people relocate from cities to rural locations or as residential or industrial customers relocate to areas with water availability appropriate for their needs.



ENERGY

The energy needed to pump and move water through the distribution system is often one of the largest expenditures at a water utility. In the future, utilities will face pressure to reduce their energy use and to utilize more sustainable/renewable energy sources.



RESEARCH OPPORTUNITIES

Based on these critical future disruptors, experts prioritized the following targeted research areas:



ISSUES BEYOND THE METER

Research is needed to advance home and building water systems and endpoint devices to maintain water quality. Advancements in this area may also drive a need for new/additional water quality regulations related to in-building water recycling and point-of-use treatment.



INFRASTRUCTURE REHAB AND MAINTENANCE

Research is needed on more cost-effective condition assessment of pipes, efficient water main rehabilitation/replacement technologies, and effective dewatering methods for submerged infrastructure while meeting regulatory requirements. Research may also be needed on emerging issues like effective corrosion protection systems for pipelines submerged by sea level rise.



DISTRIBUTION SYSTEM PROCESS CONTROL

Research is needed on automated remote water testing, advanced/real-time pressure and pump monitoring and management, real-time leak monitoring, leveraging drone and satellite technology for leak detection, and data management best practices for utilities.



MATERIALS/CONSTRUCTION INNOVATION

Research is needed on new indestructible, sustainable, and “smart” water main materials. Pressure to reduce energy consumption will also drive additional research on improved pump efficiency.



ALTERNATIVE DISTRIBUTION SYSTEMS

Research is needed to evaluate centralized vs. distributed vs. point-of-service treatment, use of the distribution system for potable water needs only (no fire or irrigation), innovative fire protection systems, and automated water quality monitoring at point of use.



AI AND BIG DATA

Research is needed on methods to implement advanced metering infrastructure with a radio interface to bridge with commercial cell technology, opportunities to implement new AI-based treatment and monitoring tools, opportunities to leverage big data to drive change, and lessons-learned and information management knowledge transfer opportunities from the oil and gas and electricity sectors.



DISTRIBUTION SYSTEM CHALLENGES IN VARIOUS ENVIRONMENTS

Research is needed to develop an alternative paradigm for how we develop and use regulations to manage distribution systems, rural water systems management strategies, and holistic management of phosphorus for corrosion control and nutrient recovery.