

INFRASTRUCTURE



Resilient Infrastructure



In the next 10 to 20 years, deteriorating infrastructure will continue to impact the ability of water utilities to meet their committed levels of service for their ever-changing service areas. How can utilities continue to manage these growing challenges in a way that allows them to deliver high-quality services and build resilient 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.



FINANCIAL

Many of the distribution system management challenges faced by utilities have a significant financial component, and utilities must make difficult choices between very large capital investments to repair and replace their aging infrastructure. Costs incurred to install more resilient materials will continue to increase, and despite the recent infrastructure bill, funding for major infrastructure repair and replacement projects will fall far short of the need.



EMERGENCE OF NEW TECHNOLOGY

The water sector will be disrupted by a plethora of new technologies including new pipe materials, technologies to support in-situ repairs, and artificial intelligence and machine learning tools to tailor treatment systems, manage water quality in distribution systems, and implement new real-time monitoring approaches. Choosing between the many alternative solutions that will be presented to utilities will present a significant challenge, and many utilities will need to recruit, train, and retain a highly skilled workforce to successfully implement these tools.



WATER SCARCITY

As water scarcity increases, customer demographics could shift and current infrastructure may not be sized appropriately to handle the changes in demand.



UNKNOWN UNKNOWNNS

Unpredictable climate-driven natural hazards like drought and flooding, as well as other natural disasters like seismic events will continue to impact the availability of water resources and infrastructure integrity.



RESEARCH OPPORTUNITIES

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



DATA

Research is needed to advance use of real-time monitoring and remote sensing as well as predictive tools to anticipate potential changes in home and building water quality. Research is needed to explore the potential of point-of-entry or point-of-use systems to maintain water quality in homes and buildings. Advancements in this area may also drive a need for additional research on effective strategies for implementation of distributed treatment systems for on-site building water recycling.



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.



ENERGY

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.



PIPE NETWORKS

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



ALTERNATIVE SUPPLY AUGMENTATION

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



AI AND BIG DATA

Research is needed on methods to convert automatic meter reading systems to advanced metering infrastructure with a radio interface to bridge with commercial cell technology, and lessons-learned and information management knowledge transfer opportunities from the oil and gas industry and energy sector.