

UPSTREAM STRATEGIES: Future Water Research & Innovation Solutions

UTILITY OPERATIONS & MANAGEMENT



Asset Management



In the next 10 to 20 years, disruptive challenges like the need for enhanced asset management may impact the ability of water utilities to meet their committed levels of service for their changing service areas. As essential service providers, how can water utilities proactively plan for business continuity and adopt new processes and technologies?

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.



REGULATORY

In the future, new and revised regulations will require utilities to adjust their practices in many areas, including but not limited to treatment of emerging contaminants, nutrient removal, combined sewer overflows, point-of-use treatment, and more.



WORKFORCE

Utilities depend on skilled employees to manage their assets. Workforce challenges related to cost-of-living increases, attracting and retaining quality/knowledgeable staff, attrition, and a lack of interest in trades may affect utilities going forward.



INTELLIGENT WATER SYSTEMS/TECHNOLOGY

Technological advances in several areas will impact utility operations and management. Utilities need to be able to understand the cost-effectiveness and feasibility of implementation of things like artificial intelligence (AI), big data, advanced sensors, and more.

WRF's Upstream Strategies project convened diverse water sector leaders and experts to discuss future water challenges and related research opportunities.





FINANCIAL

Most utilities' activities vis-à-vis asset management are constrained by financial considerations. Changing economic cycles, increased energy costs, and challenges related to implementing necessary rate increases are just some of the financial factors utilities will have to consider.



SUSTAINABILITY/RESILIENCE

When it comes to water infrastructure, applying risk management concepts can be difficult, especially when many critical assets are buried. Utilities will need to identify efficient and innovative strategies to assess risks posed by potential asset failure and optimize asset life to minimize service disruptions.



RESEARCH OPPORTUNITIES

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



STRENGTHENING RESILIENCE TO CLIMATE CHANGE

Research is needed on strategies to create more resilient utilities, including the most effective asset management approaches, identifying categories of primary risk factors for critical resources, and ways that utilities can best account for uncertainties related to climate change in their business practices.



NEW MATERIALS

Research is needed to advance more resilient pipeline materials, e.g., the use of nanoparticles in pipeline coatings, and new non-corrosive materials.



INTELLIGENT WATER SYSTEMS

Research is needed on AI and machine learning, advanced robotics, reducing the cost of satellite imagery, ways to connect and leverage utility datasets to improve understanding of asset performance, and more advanced metering.



CONDITION ASSESSMENT

Research is needed on improved sensing and diagnostics to predict failures; new approaches for low-cost, non-destructive evaluations; use of drones in emergency response; risk stratification; underground utility detection that can discriminate material types; improved understanding of pressure transients and pipeline fatigue; and understanding interdependencies—how asset management can inform cascading failures and recovery.



WORKFORCE

Research is needed on how to attract, train, and retain a technically literate workforce; improve utilization of GIS at small utilities; and improve speed of bringing new technology to use.