UPSTREAM STRATEGIES: Future Water Research & Innovation Solutions

ENVIRONMENTAL SYSTEMS

Watershed Health

In the next 10 to 20 years, disruptive challenges like watershed degradation may continue to affect 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 while delivering high-quality services to their customers, protecting the environment, and meeting regulatory requirements?

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.

CLIMATE CHANGE

Climate change is key for watershed health. It influences how much water there is, how you get it (do you get it all at once during the year, or throughout the year). Climate change drives extreme weather events, and one such event is wildfire—wildfires have significant impacts to watershed health. Climate change may also result in sea level rise and brackish water, flooding, and algal blooms/cyanotoxins.

NEW CHEMICALS OF CONCERN

As new technologies allow us to more effectively detect chemicals and other substances at lower levels, we can zero in on substances that were either previously not measurable or may be newly introduced. From medicines and personal care products to pesticides and flame retardants, many compounds wind up in our wastewater systems, potentially making their way into our water sources. There is uncertainty about their short- and long-term health effects, as well as the best processes to reduce or remove them.

NEW PATHOGENS

Over the past decades, many "new" pathogens have been found in natural water sources and/or detected in drinking water. Water utilities will have to continue adapting their treatment processes to deal with these pathogens. Examples of emerging pathogens include antibiotic resistant bacteria and animal pathogens.

AGING ASSETS

The problem of aging assets is not limited to drinking water pipes and treatment plants. Aging assets also impact watersheds, e.g., aging dams and reservoir infrastructure.

RESEARCH OPPORTUNITIES

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

TECHNOLOGY FOR UPSTREAM RISK/VULNERABILITY ASSESSMENT

Further investigation is needed to better understand the best indicators for overall watershed health. Research is also needed on the best tools to map and address upstream risks. More research is needed on technologies that could be deployed to provide a more "real-time" understanding of how various events impact watersheds. This data, in turn, could better inform risk and vulnerability assessment for watersheds. More research is needed on drones and robotics, sensors, and monitoring.

WATERSHED COORDINATION

Research is needed on the best approaches and strategies to pursue strategic partnerships that are protective of watersheds. Such partnerships could focus on a variety of issues, including erosion mitigation, upstream flooding, dealing with road salts, and more.

EXTREME EVENTS

More research is needed on extreme event impacts and mitigation strategies for various types of watersheds (e.g., a wildfire will impact an urban watershed differently than a more rural, forested watershed).

GREEN INFRASTRUCTURE

More research is needed on green infrastructure, especially low-maintenance, nature-based solutions at scale.