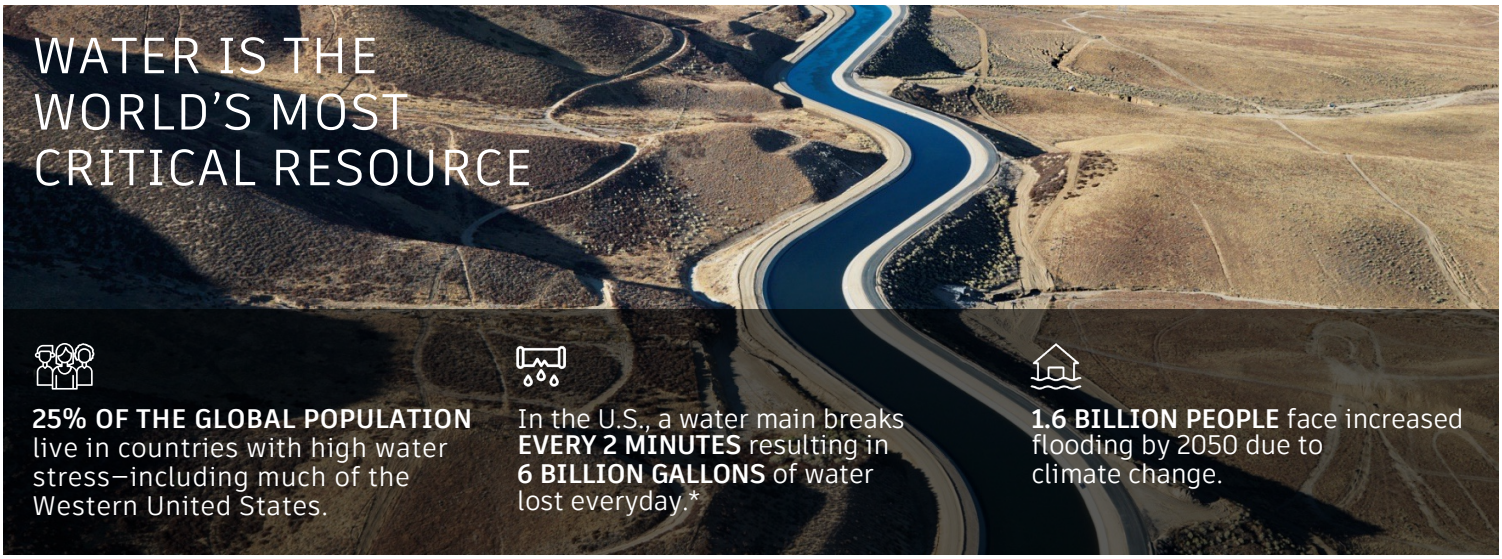
Optimizing water resources and infrastructure with technology

Using smart water to solve policy challenges



The water sector faces many challenges in the coming decades, including how to better manage water infrastructure and supply with limited budgets, flooding, drought, and water contamination. **Digital technologies and software can optimize water infrastructure from design and planning, to construction, operations, and maintenance**.

Managing water infrastructure & supply – Water managers often lack comprehensive data on the condition and functioning of their assets, in addition to limited budgets and increasing maintenance costs.

- **Digital asset management** can enable real-time insights and predictive maintenance capabilities to better prioritize resources and proactively fix problems, improving capital planning processes.
- **Digital twins** are virtual models of physical assets and systems that mimic behavior of the real world and predict the systems' behavior, enabling the highest levels of water quality service, capacity, and efficiency.

Flooding & drought – Digital tools can help communities simulate the effects of too much water or too little water and develop design alternatives to avoid these challenges and conserve drinking water in communities experiencing drought.

- **Green infrastructure design** is a powerful tool to mitigate flooding, using techniques such as green roofs, permeable pavement, bioswales, and other green drainage to reduce stress on water treatment systems by reducing runoff.

Contamination – Water pollution remains a persistent concern, particularly in disadvantaged communities. Advanced digital design and simulation techniques can help communities measure, track, predict, and subsequently reduce pollutants and sewage overflow.

Digital smart water tools enable **more cost-effective, productive, and sustainably designed and managed water distribution networks, collection systems, treatment plants, and flood protection**.

For example, case studies show digital smart water tools can save costs, up to 10% annually, and increase productivity as much as 15%. Together, these capabilities allow civil engineers, water utility companies, sanitation plant operators, and water experts to better respond to issues before they become emergencies and to improve long-term planning.

*According to ASCE estimates

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As water infrastructure ages, and water scarcity grows, digital smart water offers a policy opportunity.

Digitalizing the design, construction, and operation of water infrastructure reduces water loss, improves sustainability, and saves time and money.

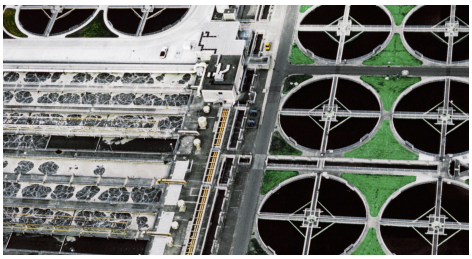
The water sector needs public policy help to unlock efficient, safe, and sustainable water management for all. Below are a set of **policy recommendations** to promote technology and innovation in water infrastructure and delivery:

- Funding should allow flexibility for states, localities, and water utilities to innovate and improve upon water infrastructure design, construction, and management methods. Pilot projects, demonstrations, and grant programs are effective ways to promote new ways to design, construct, and operate water infrastructure with digital tools, including smart water, virtual simulation, digital asset management, and predictive analytics.
- States, local governments, and utilities should be encouraged and supported in developing and maintaining active, up-to-date digital asset management plans for water infrastructure to provide water managers the data and insights needed to streamline system management and maintenance, improve capital planning, and enhance overall system sustainability.
- Federal agencies responsible for environmental stewardship need to educate and encourage use of smart water tools to avoid or resolve *Clean Water Act* and other regulatory violations. Such interventions not only help to achieve compliance, but also improve water quality, save money, and enhance long-term sustainability.
- To address drought, stakeholders should use the latest science and most advanced technology to monitor and adjust water distribution in real-time. Digital water tools must be prioritized to mitigate the impacts of drought and better manage limited water resources.

Case study: Toledo, Ohio water treatment plant reduces risk of water contamination

In August 2014, Toledo, Ohio faced a crisis. A toxic algae bloom in Lake Erie caused a "do not drink" advisory, creating the threat of severe illness. Declared a state of emergency, the system's half-million residents were without water for three days.

Toledo moved to modernize its system and expand capacity on an aggressive timeline. The city ran a completely digital design process in the cloud and collaborated across geographies and time zones. Using reality capture and augmented reality, they created precise representations of site conditions and enabled virtual site visits. This saved thousands of hours and completed the project on time, even during the pandemic.



Case study: Ross Valley Sanitary District's asset management program

The Ross Valley Sanitary District (RVSD), located in Marin County, was established in 1899 and is one of California's oldest sanitary districts. Before implementing a proactive asset management program, the wastewater system was experiencing major failures, and came under a Cease and Desist Order (CDO) from the California Regional Water Quality Control Board.

RVSD's response was to propose risk-based asset management. With a combination of investment in tools and software as well as training staff, and collaboration with regulators, software companies, and other agencies with similar approaches, RVSD was able to exceed the CDO requirements. Since then, RVSD developed an asset registry, performed thorough condition assessments, and used advanced risk analysis to intelligently and effectively manage their wastewater infrastructure.

RVSD's implementation of the risk-based asset management program has enabled the district to lengthen wastewater asset life. It has also provided a decision-making tool, improving decisions made with regards to asset rehabilitation, repair, and replacement.

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